



**Federal Energy
Regulatory
Commission**

**Office of
Energy
Projects**

June 2009

FERC/EIS-0225F

Final Environmental Impact Statement

TRANSMITTAL MEMO



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON, DC 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Final Environmental Impact Statement

Attached is the final environmental impact statement (final EIS) for the South Feather Power Project (Project No. 2088-068), located on the South Fork Feather River (SFFR), Lost Creek, and Slate Creek, in Butte, Yuba, and Plumas counties, California.

This final EIS documents the view of governmental agencies, non-governmental organizations, affected Indian tribes, the public, the license applicant, and Federal Energy Regulatory Commission (Commission) staff. It contains staff evaluations on the applicant's proposal and alternatives for relicensing the South Feather Power Project.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The final EIS will be part of the record from which the Commission will make its decision. The final EIS was sent to the U.S. Environmental Protection Agency and made available to the public on or about June 5, 2009.

Copies of the final EIS are available for review in the Commission's Public Reference Branch, Room 2A, located at 888 First Street, N.E., Washington DC. 20426. The final EIS also may be viewed on the Internet at www.ferc.gov/ferris.htm. Please call (202) 502-8222 for assistance.

Attachment: Final Environmental Impact Statement



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EXECUTIVE SUMMARY



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

EXECUTIVE SUMMARY

The South Feather Water and Power Agency (South Feather) proposes to continue to operate its existing 117.3-megawatt South Feather Power Project (project) located on the South Fork Feather River (SFFR), Lost Creek, and Slate Creek, in Butte, Yuba, and Plumas counties, California. The project occupies 1,977.12 acres of federal lands administered by the Plumas National Forest and 10.57 acres of federal lands administered by the U.S. Bureau of Land Management.

Proposed Action

The project is a water supply/power project composed of four hydroelectric developments: Sly Creek, Woodleaf, Forbestown, and Kelly Ridge, and it is described in more detail in section 2.2. South Feather proposes no capacity or operating changes, but does propose measures for the protection and enhancement of environmental resources including increased minimum flows, measures to improve aquatic habitat and protect sensitive species, and measures to maintain and enhance existing recreation opportunities and provide new whitewater boating opportunities.

Alternatives Considered

This environmental impact statement (EIS) analyzes the effects of continued project operation and recommends conditions for a new license for the project. In addition to South Feather's proposal, we consider three alternatives: (1) staff alternative; (2) staff alternative with mandatory conditions; and (3) no action—continued operation with no changes.

Staff Alternative

Under the staff alternative, the project would be operated as proposed by South Feather, but would include these additional measures:

- increasing minimum flows;
- real-time monitoring of water temperatures to support the California Department of Water Resources efforts to protect anadromous fishes below the downstream Oroville Project's (FERC No. 2100) dams;
- implementing ramping rates to protect fish and sensitive amphibian species;
- implementing amphibian surveys and habitat monitoring;
- providing for the operation of gages to measure streamflows;
- annually consulting with resource and management agencies to facilitate adaptive management;
- implementing the Historic Properties Management Plan with staff's additional measures; and

- developing and implementing plans for fuel treatment, road management, and aesthetics.

We include all but one of the section 4(e) measures specified by the U.S. Department of Agriculture, Forest Service (Forest Service) in the staff alternative: Condition No. 18.1, minimum instream flows. We recommend the streamflow regime described in South Feather's alternative 4(e) condition, which we conclude would provide substantial protection and enhancement of these resources.

Staff Alternative with Mandatory Conditions

Under the staff alternative with mandatory conditions, the minimum flows specified by the Forest Service would replace the minimum flows that we recommend.

Public Involvement and Areas of Concern

Before filing its license application, South Feather conducted pre-filing consultation. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues before an application is formally filed with the Commission. After the application was filed, we conducted scoping to determine which issues and alternatives should be addressed. A scoping document was distributed to interested parties on May 17, 2007. Scoping meetings were held in Oroville, California, on June 13, and 14, 2007. On February 14, 2008, we requested conditions and recommendations in response to the notice of ready for environmental analysis.

The primary issues associated with relicensing the project are appropriate minimum flows in project-affected reaches, measures to enhance habitat for amphibians, effects of any new minimum flow regime on reservoir-based recreation, and potential effects of project operation on water temperatures and listed anadromous fish downstream of the Oroville Project's fish barrier dam.

Project Effects

The South Feather Power Project impounds two sections of the SFFR and one section of Lost Creek, and alters flows in the SFFR and in Lost Creek via seasonal water storage in two reservoirs and diversion of flows to meet water supply needs and to generate power at four powerhouses. In addition, diversion of water from Slate Creek into Sly Creek reservoir reduces flows in lower Slate Creek and in lower Slate Creek and the North Yuba River downstream of the Slate Creek confluence, and increases flows in the Feather River downstream of the project.

Geology and Soils—Under South Feather's proposal: (1) large woody debris would be passed downstream of the Little Grass Valley, Sly Creek, and Lost Creek reservoirs, enhancing downstream aquatic habitat; (2) supplemental streamflows would continue to be passed into Lost Creek to cleanse accumulated fine sediment from spawning gravels, reduce encroachment of riparian vegetation, and enhance geomorphic

characteristics in Lost Creek; and (3) sediment pass-through measures at the Slate Creek diversion would restore sediment transport processes and improve the reliability of minimum flow releases and diversion operations by preventing excessive sediment accumulation upstream of the dam.

With our modifications to South Feather's proposal and under the staff alternative with mandatory conditions, development and implementation of soil erosion control and revegetation plans during construction of any facilities would ensure that native species revegetate disturbed areas and would minimize the potential for adverse effects from erosion or sediment deposition.

Aquatic Resources—Under South Feather's proposal: (1) minimum instream flows in project-affected reaches would be increased to benefit trout and other aquatic biota, but would cause a minor reduction in water levels in Little Grass Valley reservoir, resulting in minor adverse effects; (2) streamflows and habitat for trout in Slate Creek would be enhanced during critical high temperature periods; (3) a wild trout supplementation program would enhance trout populations in reaches where recruitment does not meet fisheries objectives; and (4) fish and invertebrate populations would be monitored to assess trends and guide adaptive management under the new project operating regimes.

With our modifications to South Feather's proposal: (1) minimum instream flows and trout habitat in project-affected reaches would be further enhanced, but would cause a slight additional reduction in water levels in Little Grass Valley reservoir; (2) ramping rates would be implemented to reduce stranding mortality of trout and invertebrates; (3) streamflow measurement capabilities would be ensured for the term of the license; and (4) real-time flow and water temperature information would be provided to DWR to assist it in its decision-making process for meeting water temperature objectives specified in the Oroville Project Settlement Agreement to protect anadromous fish downstream of the Oroville Project's dams.

Under the staff alternative with mandatory conditions, the amount of physical trout habitat in project-affected reaches would be slightly enhanced as a result of higher minimum instream flows, but water temperatures would become less suitable (colder than optimal) for trout spawning and rearing in the reaches downstream of Little Grass Valley and Lost Creek dams, and for hardhead in the Forbestown bypassed reach. Similarly, higher summer flow releases required downstream of Little Grass Valley and Lost Creek dams would likely reduce invertebrate diversity and production due to the influence of coldwater outflows. In addition, higher minimum flows would cause a greater reduction in water levels in Little Grass Valley reservoir, which would cause some minor adverse effects on reservoir fish habitat.

Terrestrial Resources—Under South Feather's proposal, annual training of employees, consultation with the Forest Service, and development and implementation of vegetation and invasive weed management plans would further the protection of sensitive areas and sensitive species and help to control the spread of noxious weeds; controllable

pulse flows that could adversely affect amphibians would be avoided; and the effectiveness of wildlife crossings and escape facilities would be maintained through design consultation with Cal Fish & Game when they are replaced or retrofitted.

With our modifications to South Feather's proposal, ramping rates developed to protect amphibians would minimize adverse effects on reproduction; amphibian surveys would allow the effects of operation on sensitive amphibians to be monitored; and additional data collection on habitat conditions, population size, and growth rates would inform adaptive management decisions and enhance conservation efforts for amphibians within the project area. Also, South Feather would be required to maintain all wildlife crossings and escape facilities that are necessary to protect wildlife.

Under the staff alternative with mandatory conditions, the higher flows specified by the Forest Service in the South Fork diversion dam and Forbestown diversion dam reaches would likely reduce habitat suitability for amphibians by reducing water temperatures below levels required for breeding.

Threatened and Endangered Species—Although valley elderberry longhorn beetle and the California red-legged frog are not likely to occur in the project area, their presence there cannot be ruled out. Therefore, we conclude that the alternatives considered in this EIS may affect, but are not likely to adversely affect, these threatened and endangered species. On December 12, 2008, FWS filed a letter concurring with our determination.

Under South Feather's proposal, continued operation of Kelly Ridge powerhouse, including its releases of variable temperature and magnitude during the summer months, may result in incrementally higher water temperatures in the upper portion of the Oroville Project's Thermalito diversion pool. However, because of the small volume of these releases in comparison with the volume of the Thermalito diversion pool and the effects of Oroville project operation, it is unlikely that any temperature effects would be detectable at or below the Oroville fish barrier dam, the upstream limit of listed salmonids and their critical habitat.

Under the staff alternative and staff alternative with mandatory conditions, South Feather would provide real-time water temperature monitoring and flow data to DWR to help it in its decision-making process for meeting its water temperature objectives, thereby improving temperature conditions for Central Valley spring-run Chinook salmon and California Central Valley steelhead. Therefore, we conclude that all three of the alternatives considered in this EIS may affect, but are unlikely to adversely affect, these threatened and endangered species or their critical habitat.

Recreation—Under South Feather's proposal, South Feather would be responsible for the following measures to maintain and enhance recreational opportunities: (1) operation and maintenance of recreational facilities; (2) rehabilitation of existing recreational facilities; (3) construction of a new multi-use trail below Little Grass Valley dam to improve access to the SFFR for recreational boating and angling; (4)

management of reservoir levels to facilitate recreational use while achieving project purposes; (5) provision of whitewater boating flows in the Little Grass Valley dam reach during the fall in all water years; (6) provision of whitewater boating flows in the spring in Above Normal and Wet water years in the South Fork diversion dam and Forbestown diversion dam reaches; (7) provision of flow information for whitewater boating to the public; and (8) maintenance and enhancement of public safety by installation of safety buoys each year in Little Grass Valley and Sly Creek reservoirs.

With our modifications to South Feather's proposal, higher minimum flow releases would cause some adverse effects on reservoir recreation by increasing the drawdown of Little Grass Valley reservoir, and would reduce the amount of water that is available for whitewater releases.

Under the staff alternative with mandatory conditions, the adverse effects of drawdown on reservoir recreation would be increased, and the amount of water available for whitewater releases would be further reduced.

Cultural Resources—Under South Feather's proposal, cultural resources would be protected under provisions specified in the Historic Properties Management Plan included in South Feather's license application.

With our modifications to South Feather's proposal, additional measures included in the Historic Properties Management Plan would provide a higher level of assurance that important cultural resources are adequately protected.

Land Use and Aesthetics Resources—Under South Feather's proposal, public safety would be maintained and enhanced by developing and implementing a fire prevention, response, and investigation plan.

With our modifications to South Feather's proposal, fire risk would be further reduced by developing and implementing a fuel treatment/vegetation management plan, road management would be improved throughout the project vicinity, and aesthetics would be protected and improved by implementing a visual management plan that would bring project facilities into compliance with land resource management plan direction.

Under the staff alternative with mandatory conditions, the adverse effects of drawdown on aesthetic conditions at Little Grass Valley reservoir would be increased.

General—With our modifications to South Feather's proposal, annual consultation with the management agencies would assist with interpretation of monitoring results and adaptive management.

Under the no-action alternative, environmental conditions would remain the same, and there would not be any enhancement of environmental resources.

Conclusions

Based on our analysis, we recommend licensing the project as proposed by South Feather, with some staff modifications and additional measures. The recommended staff

modifications include or are based in part on recommendations made by the federal and state resource agencies with an interest in the resources that may be affected by continued project operation. The additional measures include enhanced minimum flows in project bypassed reaches, development of ramping rates and additional monitoring and data collection to determine and address project effects on amphibian populations, and provision of flow and water temperature information to DWR to help it maintain suitable water temperatures for downstream anadromous fish.

In section 4.1 of the EIS, we estimate the annual net benefits of operating and maintaining the project under the three alternatives identified above. Our analysis shows that the annual net benefit would be \$27,095,100 for the proposed action; \$25,860,110 for the staff alternative; \$25,643,810 for the staff alternative with mandatory conditions; and \$28,403,000 for the no-action alternative.

We choose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (475,904 megawatt-hours annually); (2) the project may save the equivalent amount of fossil-fueled generation and capacity, thereby continuing to help conserve non-renewable energy resources and reduce atmospheric pollution; and (3) the recommended environmental measures proposed by South Feather, 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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SECTION 1 - INTRODUCTION



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

1.0 INTRODUCTION

1.1 APPLICATION

On March 26, 2007, the South Feather Water and Power Agency (South Feather; formerly the Oroville-Wyandotte Irrigation District) filed an application to relicense its 117.3-megawatt (MW) South Feather Power Project (P-2088-068) with the Federal Energy Regulatory Commission (FERC or Commission). The South Feather Power Project is a water supply/power project located on the South Fork Feather River (SFFR), Lost Creek, and Slate Creek in Butte, Yuba, and Plumas counties, California (figure 1-1). The project occupies 1,977.12 acres of federal lands administered by the Plumas National Forest and 10.57 acres of federal lands administered by the U.S. Bureau of Land Management (BLM). The project generates an average of about 498,972 megawatt-hours (MWh) of energy annually. In addition, using project facilities for water storage and delivery, South Feather is able to provide irrigation water to a service area of more than 49,000 acres and domestic water to about 6,500 households. South Feather proposes no new capacity and no new construction.

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 South Feather 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, and enhancement 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 South Feather Power Project would allow South Feather to continue to generate electricity at the project for the term of a new license, making electric power from a renewable resource available to its customers. Relicensing the project also would allow South Feather to continue to provide irrigation and domestic water to the local community.

This final environmental impact statement (EIS) assesses the effects associated with operation of the proposed 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.

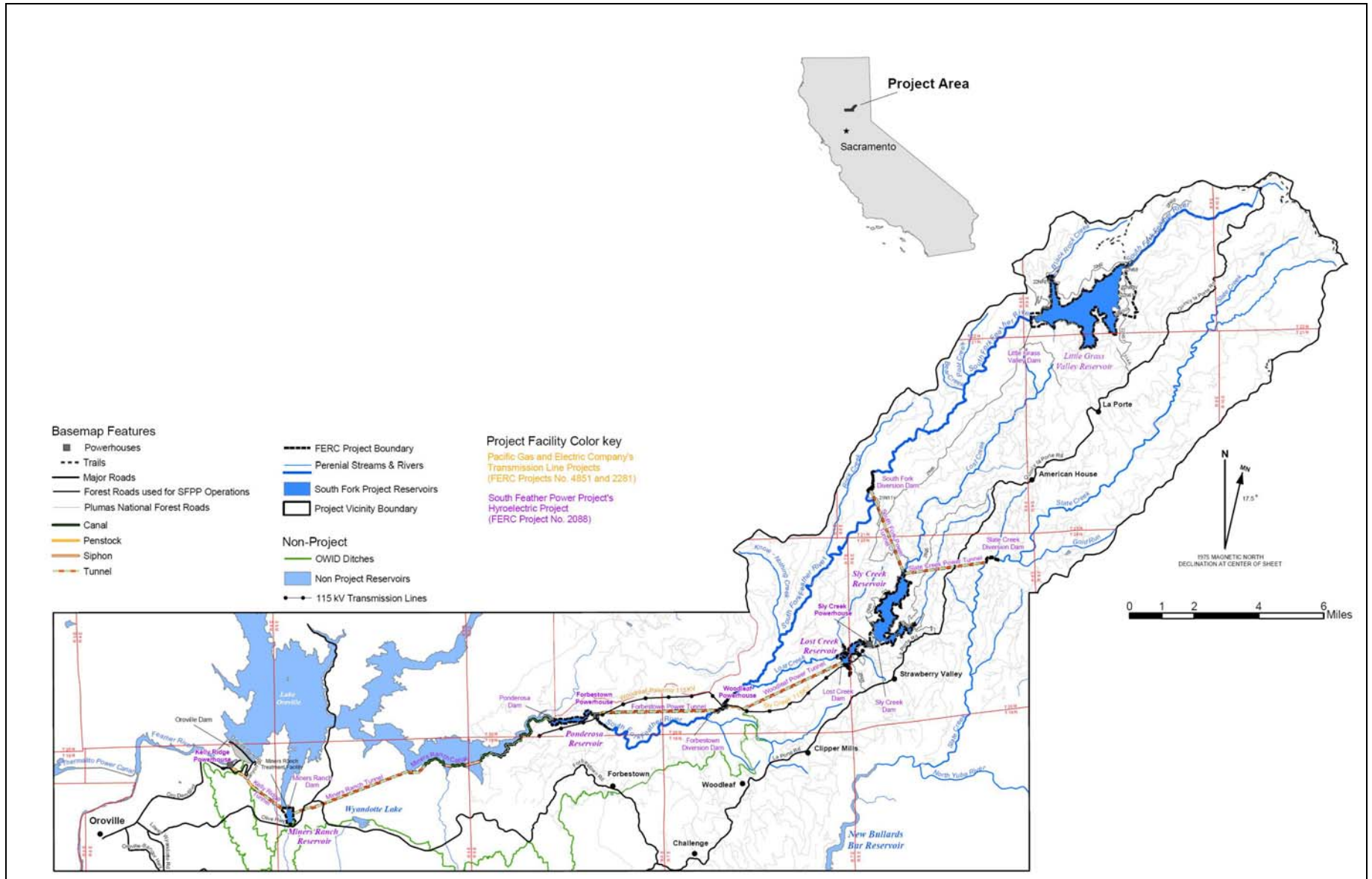


Figure 1-1. South Feather Power Project, location map. (Source: South Feather, 2007)

In this final EIS we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by South Feather; (2) as proposed by South Feather with our recommended measures (the staff alternative); and (3) under the staff alternative with mandatory conditions. We also consider the effects of the no-action alternative. Important issues that are addressed include minimum flows in the bypassed reaches, effects of project operation on water temperatures downstream of the project, effects of flow ramping on sensitive amphibian populations, including foothill yellow-legged frog (FYLF), recreational flows, water levels in Little Grass Valley reservoir, and the maintenance and renovation of recreational facilities.

1.2.2 Need for Power

The project is located in the California-Mexico Power area of the Western Electricity Coordinating Council. According to the North American Electricity Reliability Corporation (NERC, 2007) which forecasts electrical supply and demand nationally and regionally, peak demands and annual energy requirements for the California-Mexico Area are projected to grow at annual compound rates of 2.2 percent and 2.4 percent, respectively, from 2004 to 2013. The North American Electricity Reliability Corporation forecasts that resources capacity margins will range between 22.8 and 39.4 percent of firm peak demand during the 10-year forecast period, including estimated new capacity additions. The project could continue to meet part of existing load requirements within a system in need of resources.

We conclude that power from the South Feather Power Project could help meet a need for power in the Western Electricity Coordinating Council region in both the short- and long-term. The project provides low-cost power that may displace non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities avoids some power plant emissions and creates an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

The license for the South Feather Power Project is subject to numerous requirements under the Federal Power Act (FPA) and other applicable statutes. Major regulatory and statutory requirements are summarized in table 1-1 and described below.

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 construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the secretaries of Commerce or the Interior. By letter filed April 14, 2008, the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) requested that a reservation of authority to prescribe fishways be included in any project license for the South Feather Power Project.

Table 1-1. Major statutory and regulatory requirements for the South Feather Power Project.

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	NMFS	On April 14, 2008, NMFS stated it reserved its authority to prescribe fishways
Section 4(e) of the FPA (land management conditions)	Forest Service	The Forest Service provided preliminary conditions on April 14, 2008, several revised conditions on May 13, 2008, and final conditions on March 6, 2009
Section 10(j) of the FPA	Cal Fish & Game and NMFS	On April 14, 2008, Cal Fish & Game and NMFS provided section 10(j) recommendations
Clean Water Act—water quality certification	State Water Resources Control Board	Application for certification filed with Water Board on May 16, 2008. South Feather withdrew and refilled its application on May 5, 2009.
Endangered Species Act Consultation	FWS	The draft EIS was sent to the FWS as our Biological Assessment of the proposed licensing on listed species under its jurisdiction. On December 12, 2008, FWS filed a letter concurring with our conclusions presented in the EIS. On June 5, 2009, we sent the final EIS to NMFS as our Biological Assessment of the proposed licensing on listed anadromous fish species.
Coastal Zone Management Act Consistency	California Coastal Commission	Relicensing the project would not influence resources in the designated coastal zone and we will seek concurrence from the California Coastal Commission

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. The U.S. Department of Agriculture, Forest Service (Forest Service) provided 28 preliminary conditions on April 14, 2008, for the South Feather Power Project. The Forest Service revised three of its preliminary conditions (Condition 3; Condition No. 18 parts 2, 3, 5 and 6; and Condition No. 19, parts 1 and 4) on May 13, 2008. The Forest Service filed its final 4(e) conditions on March 6, 2009. These conditions are described under section 2.3.1, *Modifications to Applicant's Proposal—Mandatory Conditions*, summarized in table 5-2, analyzed in the appropriate resource sections of section 3, and discussed in section 5, *Staff Conclusions*.

1.3.1.3 Alternative Conditions under the Energy Policy Act of 2005

The Energy Policy Act of 2005 provides parties to this licensing proceeding the opportunity to propose alternatives to preliminary conditions and to request trial-type hearings regarding issues of material fact that support the preliminary conditions developed under FPA section 4(e). South Feather provided two alternative 4(e) conditions to the Forest Service's Condition No. 18 parts 1 and 5 (minimum flows), and Condition No. 19 part 2 (amphibian monitoring) on May 14, 2008, which we discuss in the appropriate resource analysis sections of this EIS and in section 2.2.5.4. The Forest Service filed its analysis of South Feather's alternative 4(e) conditions with its final 4(e) conditions on March 6, 2009. The Forest Service determined that South Feather's alternative conditions would not be sufficiently protective of the Forest Service resources, but did modify these two conditions as a result of its analysis of the alternative conditions. No party to this proceeding has requested trial-type hearings.

1.3.1.4 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, 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.

On April 14, 2008, the California Department of Fish and Game (Cal Fish & Game) and the National Marine Fisheries Service (NMFS) filed recommendations under section 10(j) for the South Feather Power Project. These recommendations are summarized in table 5-1, analyzed in the appropriate resource sections in section 3, and discussed in section 5.4.1. Interior filed a letter on April 14, 2008, stating that it had no comments to offer in response to the REA notice.

In the draft EIS, we made a preliminary determination that the NMFS 10(j) condition and six of Cal Fish & Game's 10(j) conditions may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision

of section 4(e) of the FPA. Commission staff held a 10(j) meeting with Cal Fish & Game and NMFS in Sacramento, California, on March 25, 2009, in an attempt to resolve these preliminary inconsistencies. Although none of the inconsistencies were resolved during the meeting, we incorporated additional analysis in the final EIS based on discussion of agency objectives and concerns, and of alternative approaches to resolving resource issues that were discussed during the meeting.

1.3.2 Clean Water Act

Under Section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. South Feather filed its application for water quality certification with the State Water Resources Control Board (Water Board) on May 16, 2008. By letter dated June 10, 2008, the Water Board acknowledged receipt of the application on May 16, 2008. On May 5, 2009, South Feather withdrew and refilled its application. Consequently, action on the application is due by May 5, 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. Two federally listed as threatened species have the potential to occur in the project vicinity, the valley elderberry longhorn beetle, and the California red-legged frog. Two additional species, the Central Valley spring-run Chinook salmon and the California Central Valley steelhead occur downstream of the Oroville fish barrier dam. Our analyses of project effects 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*.

In the draft EIS, we concluded that relicensing of the South Feather Power Project, as described under the staff alternative with mandatory conditions, may affect, but would be unlikely to adversely affect, the valley elderberry longhorn beetle and the California red-legged frog. On November 7, 2008, we issued a letter seeking concurrence from FWS on this determination, indicating that the draft EIS would serve as our Biological Assessment of the proposed licensing on listed species. On December 12, 2008, FWS filed a letter concurring with our determination.

In the draft EIS, we did not provide a determination for Central Valley spring-run Chinook salmon and California Central Valley steelhead, because effects on these species were not identified as an issue during scoping, and NMFS did not respond to our request to identify species that may be affected by the project. Based on comments received on the draft EIS, discussion of NMFS concerns during the 10(j) meeting held in Oroville, California, on March 25, 2009, and additional information on temperature effects

provided by DWR,⁷ we conclude that operation of Kelly Ridge powerhouse has the potential to incrementally increase water temperatures in the upper portion of the Thermalito diversion pool, downstream of Oroville dam to a greater degree than we originally thought. However, we conclude that the proposed project may affect, but is not likely to adversely affect, Central Valley spring-run Chinook salmon and California Central Valley steelhead, or their critical habitat, because it is unlikely that the small temperature increases noted in the vicinity of the Kelly Ridge powerhouse would be significant 5 miles downstream where the listed species and their critical habitat occur. We also note that the Oroville Settlement Agreement, executed by, among others, DWR and NMFS, identifies protective temperature objectives and measures to be implemented by DWR to ensure that the temperature objectives are met. We are filing the final EIS with NMFS as our Biological Assessment of the proposed licensing on Central Valley spring-run Chinook salmon and California Central Valley steelhead, and will seek concurrence from NMFS on our determination

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 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 CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA 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 South Feather Power Project is not located within the state-designated CZMA, 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 every federal agency "take into account" how each of its 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 has issued a Programmatic Agreement for the South Feather Power Project for the protection of historic properties from the effects of project O&M. The terms of the Programmatic Agreement ensure that South Feather addresses and treats all historic properties identified

⁷ DWR letter to the Commission dated March 24, 2009.

within the project's area of potential effects (APE) through implementation of the final Heritage (Historic) Properties Management Plan (HPMP).

1.3.6 California Environmental Quality Act

The California Environmental Quality Act (CEQA) is the California counterpart to the National Environmental Policy Act. 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. As a local governmental agency, South Feather is the lead agency for CEQA and the Water Board, which must act on South Feather's request for a water quality certificate for the project (see section 1.3.2, *Clean Water Act*), is a responsible state permitting agency under CEQA.

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 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 EIS/EIR. While this document is not a joint EIS/EIR, South Feather has the opportunity to use this document, as appropriate, to satisfy its responsibilities under CEQA, as does the Water Board. As such, we invite South Feather's and the Water Board's comments on this EIS as they may pertain to the agencies' use of the final EIS for CEQA purposes.

One element needed in an EIR, but not required by the National Environmental Policy Act, 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 environmental impact report or, in some cases, after project approval, it is often included in the draft environmental impact report to obtain public review and comment.

In section 3 of this EIS, *Environmental Analysis*, 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 South Feather Power Project. Additionally, any

conditions of a water quality certificate 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 A, *South Feather Power Project Mitigation and Monitoring Summary*, identifies each potentially significant impact of relicensing the South Feather Power Project, 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 South Feather would undertake to ensure the project changes and mitigation measures are implemented as intended.

Another analysis required under CEQA but not required in an EIS is a description of any growth-inducing effects caused by the project. For this relicensing, the higher minimum instream flows 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. There are no changes proposed for the water supply aspect of the project, therefore, the water supply component of the proposed project would not facilitate population growth or remove an obstacle to growth.

1.4 PUBLIC REVIEW AND CONSULTATION

The Commission's regulations (18 CFR §16.8) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Under the Commission's regulations, issuing a licensing decision for any project first requires preparation of either an environmental assessment or an EIS, in accordance with the National Environmental Policy Act of 1969. The preparation of an environmental assessment or EIS is supported by a scoping process to ensure the identification and analysis of all pertinent issues. We issued a notice of intent to prepare an EIS on May 17, 2007.

On May 17, 2007, the Commission issued Scoping Document 1 to enable resource agencies, Native American tribes, and other interested parties to more effectively participate in and contribute to the scoping process. In Scoping Document 1, we requested clarification of preliminary issues concerning the South Feather Power Project and identification of any new issues that needed to be addressed in the environmental document.

We held two public scoping meetings regarding the project, on June 13 and 14, 2007, in Oroville, California. The scoping meetings and site visit were noticed in a local newspaper and the Federal Register. Based on completion of sign-in sheets at the

scoping meetings, 9 individuals (exclusive of Commission staff), attended the June 13 evening scoping meeting and 11 individuals (exclusive of Commission staff), attended the June 14 morning scoping meeting. In addition, a site visit of the project area was conducted on June 12 and 13, 2007, and was attended by several of the individuals who also attended one or both of the scoping meetings.

We requested that written comments regarding the project be filed with the Commission by July 16, 2007. In addition to the oral comments received during the scoping meetings, we received written scoping comments from the following entities:

Commenting Entities	Date Filed
California State Water Resources Control Board	July 16, 2007
California Department of Fish and Game and the U.S. Forest Service (jointly)	July 16, 2007
California Department of Water Resources	July 16, 2007
O'Rourke's Outdoor Adventures	July 16, 2007
Roger and Nancy Bailey	January 31, 2008

Based on our review of the application and of comments from agencies, interested parties, and the public, on February 14, 2008, we issued Scoping Document 2, which addressed comments received on Scoping Document 1.

1.4.2 Interventions

On May 16, 2007, the Commission issued a public notice accepting the application and soliciting motions to intervene. This notice set a 60-day period during which interventions could be filed, ending July 16, 2007. Interventions were also solicited in the Commission's November 7, 2008 public notice of the availability of the draft EIS. This notice set a 60-day period during which interventions could be filed, ending January 6, 2009. In response to these notices, the following entities filed motions to intervene in this proceeding.

Entity	Date of Filing
California State Water Resources Control Board	July 3, 2007
State Water Contractors and Metropolitan Water District of Southern California	July 3, 2007

Entity	Date of Filing
California Department of Fish and Game	July 13, 2007
County of Plumas and Plumas County Flood Control and Conservation District	July 14, 2007
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service	July 16, 2007
U.S. Department of Agriculture, Forest Service	July 16, 2007
California Department of Water Resources	July 16, 2007
Yuba County Water Agency	September 29, 2007 ^a
Dominic & Robin Dominguez	December 31, 2008
Donald and Michele Frost	January 2, 2009
Andrew Knutsen	January 6, 2009
Dennis and Sally Serger	January 13, 2009

^a Late intervention granted by Commission notice issued September 9, 2008.

1.4.3 Comments on License Application

On February 14, 2008, the Commission issued a Ready for Environmental Analysis Notice and requested comments, recommendations, and terms and conditions (subject to sections 4(e), 10(a), 10(j) and 18 of the FPA) with a filing deadline of April 14, 2008. The following entities filed comments, terms, conditions, prescriptions, or recommendations.

Entity	Date of Filing
Dennis D. Diver Associates et al.	March 31, 2008
California Department of Water Resources	April 11, 2008
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service	April 14, 2008

Entity	Date of Filing
U.S. Department of Agriculture, Forest Service	April 14, 2008 May 13, 2008 – filed three revised 4(e) conditions (revised in whole or in part) March 6, 2009 – filed final 4(e) conditions, which modified parts of two conditions
California Department of Fish and Game	April 14, 2008
Yuba County Water Agency	April 14, 2008
U.S. Department of the Interior	April 14, 2008
State Water Contractors and Metropolitan Water District	April 14, 2008

1.4.4 Comments on the Draft Environmental Impact Statement

The Commission issued its draft EIS for the proposed relicensing of the South Feather Power Project on November 7, 2008. The Commission also held public meetings in Oroville, California, on December 9 and 10, 2008, to receive public comment on the draft EIS. In appendix B, we summarize the written and oral comments received, provide responses to those comments; and indicate, where appropriate, how we have modified the text of the final EIS.



**Federal Energy
Regulatory
Commission**

**Office of
Energy
Projects**

June 2009

FERC/EIS-0225F

Final Environmental Impact Statement

SECTION 2 - PROPOSED ACTION AND ALTERNATIVES



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the South Feather Power Project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

2.1.1 Existing Project Facilities

The South Feather Power Project is a water supply/power project constructed in the late 1950s/early 1960s. The project is composed of four developments: Sly Creek, Woodleaf, Forbestown, and Kelly Ridge, each of which is described below. The project can store about 172,000 acre-feet of water (gross storage) and has generated an average of about 514.1 gigawatt-hours of power annually for the past 20 years, since the addition of Sly Creek powerhouse. The locations of the various facilities are presented in figure 2-1.

Sly Creek Development

Sly Creek development generation facilities include:

- *Little Grass Valley dam* - a 210-foot-high, 840-foot-long, rock-filled dam on the SFFR with a crest elevation of 5,052 feet msl and with a 180-foot-long spillway controlled by two, 14-foot-high by 40-foot-long steel radial gates that forms a 89,804 acre-feet storage reservoir covering 1,650 acres at a maximum water surface (flood level) elevation of 5,047 feet msl. Little Grass Valley dam reduces flows in the 9.1-mile-long Little Grass Valley dam reach, which terminates at the normal high water line of the South Fork diversion impoundment;
- *South Fork diversion dam* - a 60-foot-high, 167-foot-long, concrete overflow arch dam on the SFFR with a crest elevation of 3,557 to 3,559 feet msl and with four uncontrolled overflow spillway sections that forms an 87 acre-feet diversion impoundment covering about 9 acres at a normal maximum water surface elevation of 3,557 feet msl;
- *South Fork diversion tunnel* - a 2.7-mile-long, 11-foot-diameter concrete lined and unlined horseshoe unpressurized tunnel controlled by two, 6-foot-high by 4-foot-long electric hoist slide gates that diverts up to 600 cubic feet per second (cfs) of water from the South Fork diversion dam to Sly Creek reservoir. This diversion reduces flows in the 9.4-mile-long South Fork diversion dam reach, which ends at its confluence with Lost Creek;

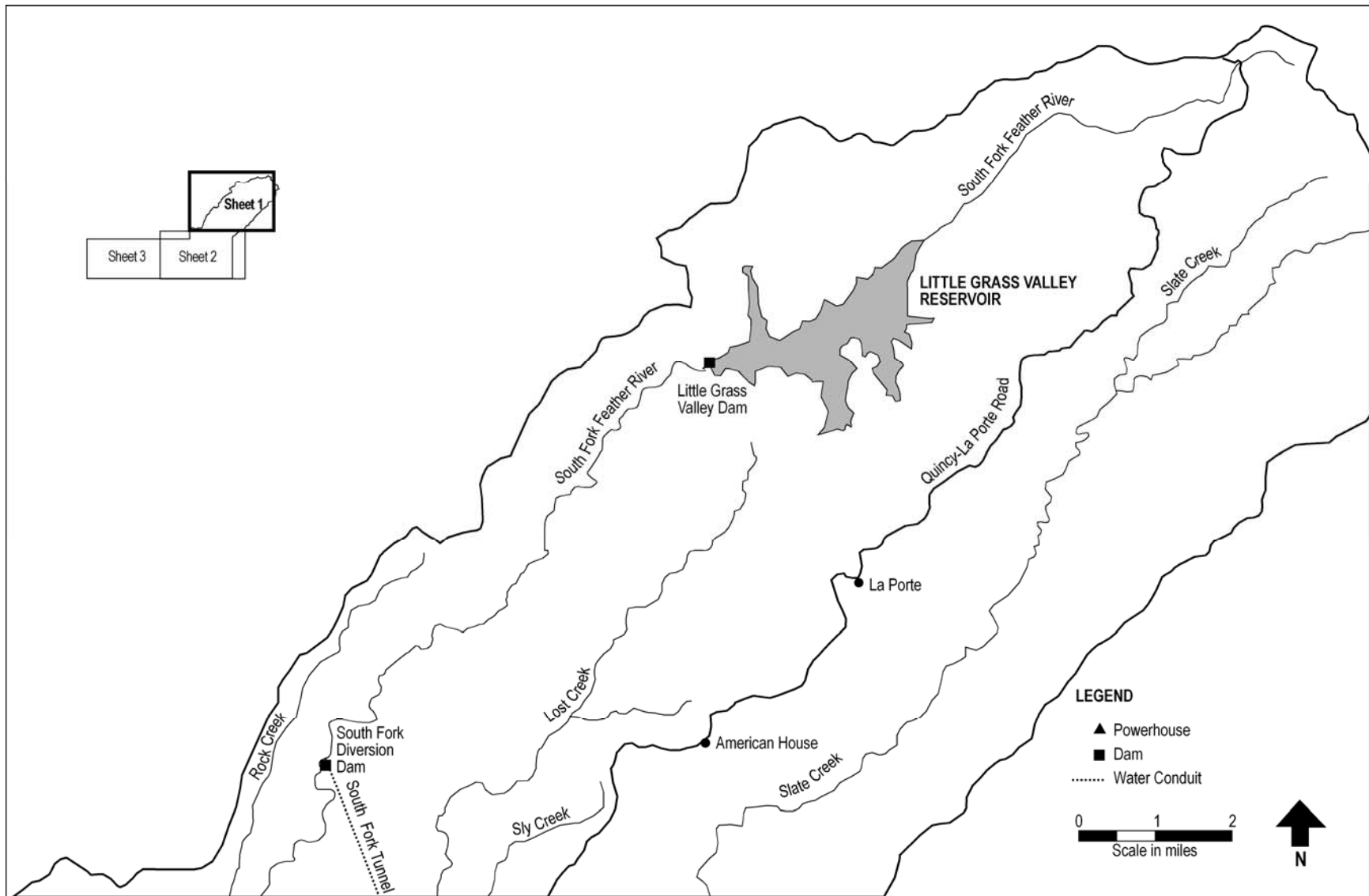


Figure 2-1. South Feather Power Project, system map (sheet 1 of 3). (Source: South Feather, 2007, as modified by staff)

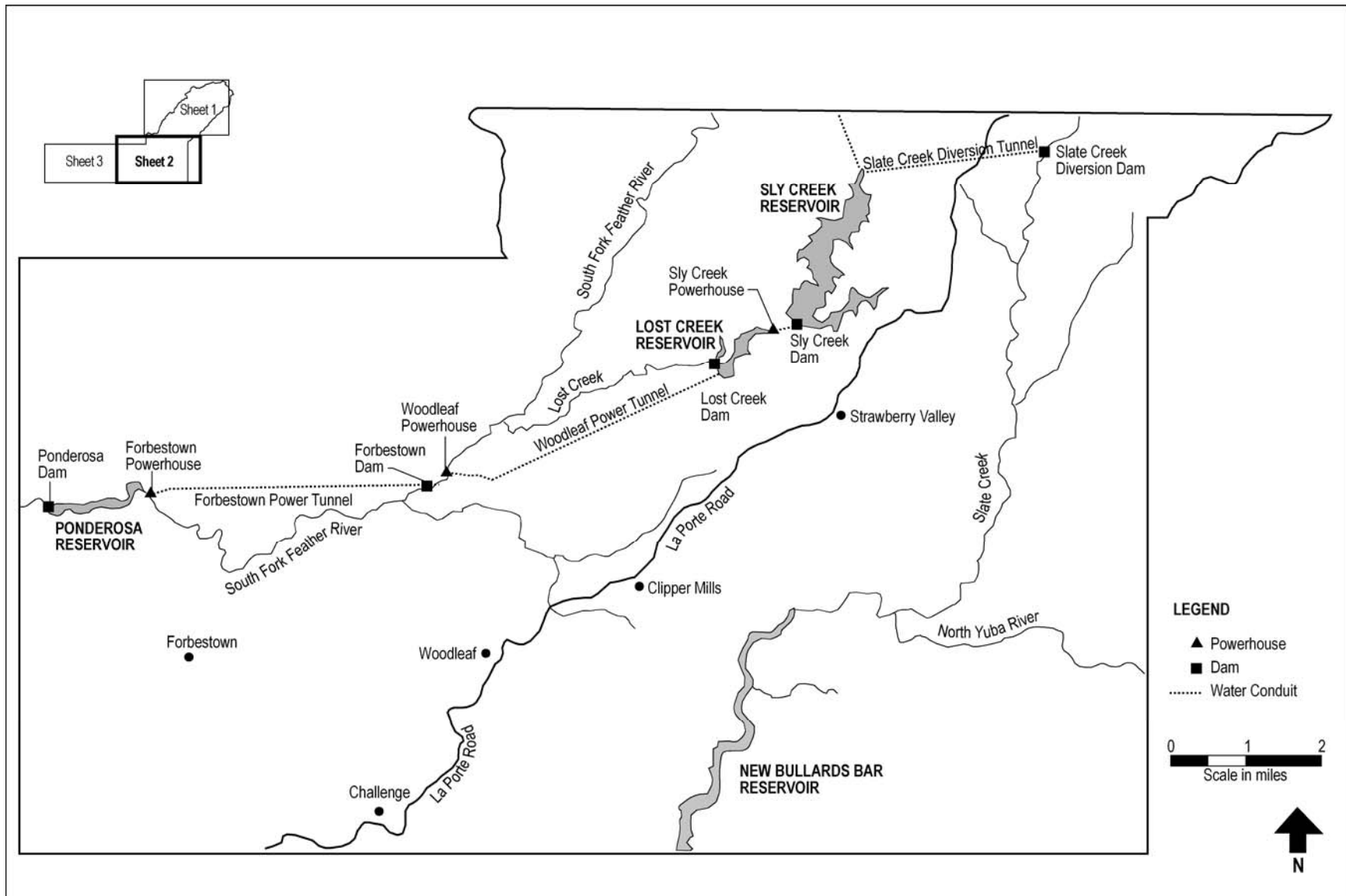


Figure 2-1. South Feather Power Project, system map (sheet 2 of 3). (Source: South Feather, 2007, as modified by staff)

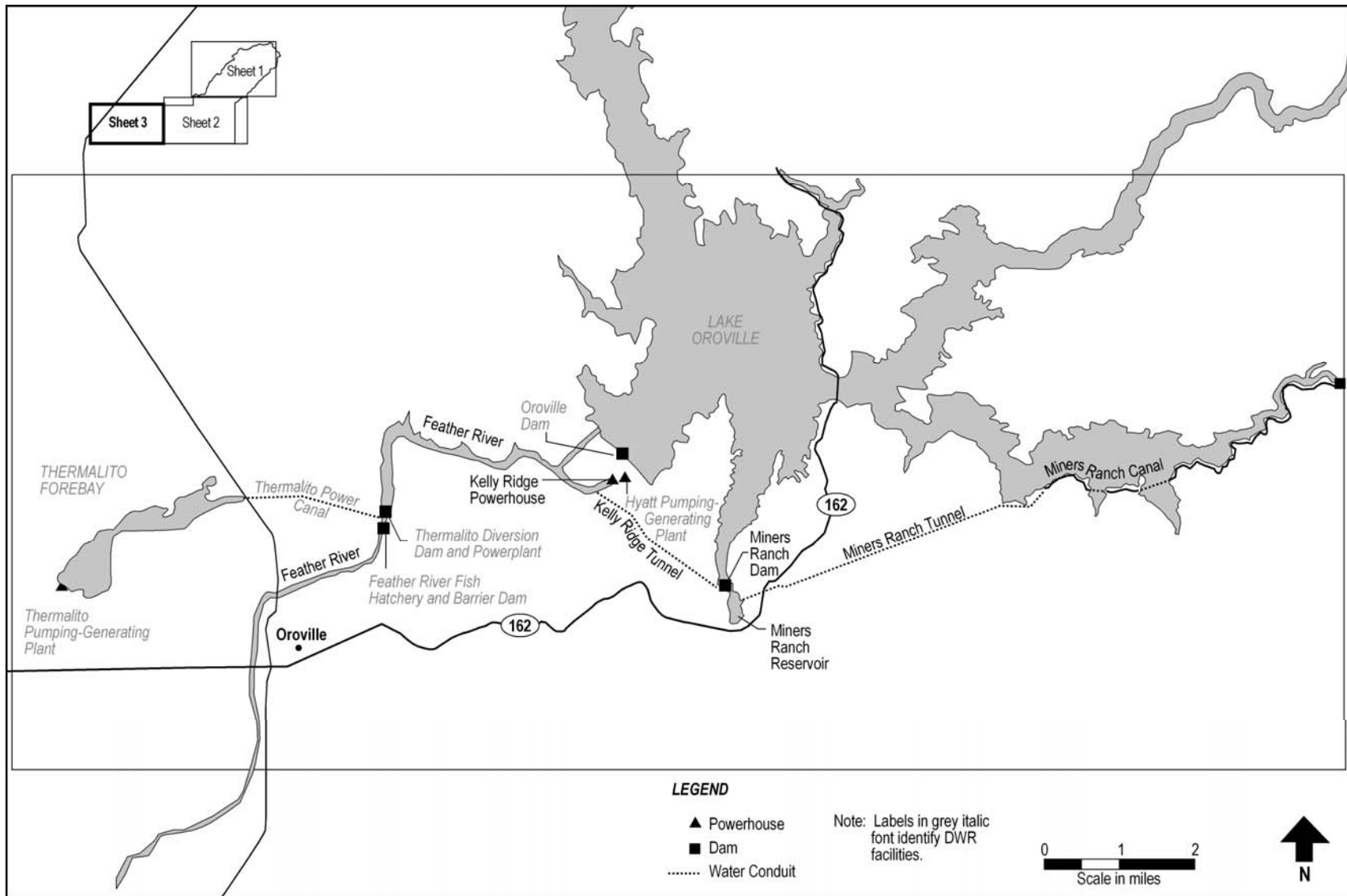


Figure 2-1. South Feather Power Project, system map (sheet 3 of 3). (Source: South Feather, 2007, as modified by staff)

- *Slate Creek diversion dam* - a 62-foot-high, 223.5-foot-long, concrete overflow arch dam on Slate Creek (a tributary of the North Yuba River) with a crest elevation of 3,552 to 3,554 feet msl and with three uncontrolled overflow spillway sections that forms a negligible diversion impoundment due to sediment accumulation;
- *Slate Creek diversion tunnel* - a 2.5-mile-long, 11-foot-diameter, concrete lined and unlined horseshoe unpressurized tunnel controlled by two, 8-foot-high by 6-foot-long manual slide gates that diverts up to a maximum flow capacity of 848 cfs of water (though water rights limit flows to 600 cfs and at times flows are limited to 500 cfs due to high water elevation in the receiving reservoir) from the Slate Creek diversion dam (Yuba River basin) to Sly Creek reservoir (Feather River basin);
- *Sly Creek dam* - a 289-foot-high, 1,200-foot-long, zoned earth-filled dam on Lost Creek with a crest elevation of 3,536 feet msl and with a 649-foot-long spillway controlled by one, 16-foot-high by 54-foot-long steel radial gate that forms a 64,338 acre-feet storage reservoir covering 619 acres at a maximum water surface (flood level) elevation of 3,531 feet msl with the spill gates closed;
- *Sly Creek penstock* - a 1,100-foot-long, 90-inch-inside-diameter, steel penstock enclosed in the former outlet tunnel that delivers water to Sly Creek powerhouse;
- *Sly Creek powerhouse* - a semi-outdoor, reinforced concrete, above ground powerhouse that releases water to Lost Creek reservoir and that contains one reaction turbine rated at 13.2 MW directly connected to a 13,500-kilovolt-ampere (kVA) generator;
- *Sly Creek powerhouse switchyard* - a switchyard adjacent to the Sly Creek powerhouse that contains one 16,000-kVA transformer;

Power generated at Sly Creek powerhouse is delivered from the switchyard to the grid via Pacific Gas and Electric Company's 115-kV Sly Creek Tap and Woodleaf-Kanaka Junction transmission line (FERC Project No. 2281).

Sly Creek development recreation facilities (for location, see figure 3-13 in section 3.3.5, *Recreation Resources*) include:

- *Little Grass Valley reservoir recreation facility* - the Little Grass Valley reservoir recreation facility includes Little Beaver, Red Feather, Running Deer, Horse Cam campground p, Wyandotte, Peninsula Tent, Black Rock Tent, Black Rock RV, and Tooms RV campgrounds; Black Rock, Tooms, and Maidu boat launch areas; Pancake Beach and Blue Water Beach day-use areas; Maidu Amphitheater; and Little Grass Valley dam ADA-accessible fishing trail at Little Grass Valley reservoir; and

- *Sly Creek reservoir recreation facility* - the Sly Creek recreation facility includes two campgrounds (Strawberry and Sly Creek), Strawberry car-top boat launch, Mooreville boat ramp and Mooreville day-use area on Sly Creek reservoir.

The Sly Creek development does not include any roads except for the portions of the roads within the project boundary that cross Little Grass Valley dam (FS Road 22N94) and Sly Creek dam (FS Road 21N16).

Woodleaf Development

The Woodleaf development includes:

- *Lost Creek dam* - a 122-foot-high, 486-foot-long, concrete overflow arch dam on the Lost Creek with a crest elevation of 3,279.05 feet msl and with a 251-foot-wide spillway controlled by 4-foot-high by 8-foot-long flashboards that forms a 5,361 acre-feet storage reservoir covering 137 acres at a normal maximum water surface elevation of 3,283 feet msl with the flashboards installed;
- *Woodleaf power tunnel* - a 3.5-mile-long, 12-foot-diameter, concrete lined and unlined horseshoe pressurized tunnel controlled by one 6-foot-high by 12-foot-long electric hoist slide gate that diverts up to 620 cfs of water from Lost Creek reservoir to the Woodleaf penstock. This diversion reduces flows in the 3.9-mile-long Lost Creek dam reach, which terminates at Lost Creek's confluence with the SFFR;
- *Woodleaf penstock* - a 3,519-foot-long, 97-inch reducing to 78-inch-inside-diameter, exposed steel penstock that delivers water to Woodleaf powerhouse;
- *Woodleaf powerhouse* - a semi-outdoor, reinforced concrete, above ground powerhouse that releases water to the Forbestown diversion dam impoundment on the SFFR and that contains one 6-jet vertical shaft impulse Pelton turbine rated at 60 MW directly connected to a 65,500-kVA generator; and
- *Woodleaf powerhouse switchyard* - a switchyard adjacent to the Woodleaf powerhouse that contains one 70,000-kVA transformer.

Power generated at Woodleaf powerhouse is delivered from the switchyard to the grid via Pacific Gas and Electric Company's 115-kilovolt (kV) Woodleaf-Kanaka Junction transmission line. The Woodleaf development does not include any recreation facilities or roads.

Forbestown Development

The Forbestown development includes:

- *Forbestown diversion dam* - a 80-foot-high, 256-foot-long, concrete overflow arch dam on the SFFR with a crest elevation of 1,783 feet msl and with five 46-foot-wide uncontrolled overflow spillway sections with a combined width of approximately 240 feet that forms a 352 acre-foot diversion impoundment covering about 12 acres at a normal maximum water surface elevation of 1,783 feet msl;
- *Forbestown power tunnel* - a 18,388-foot-long, 12.5-foot by 11-foot-diameter, concrete lined and unlined horseshoe pressurized tunnel that diverts up to 660 cfs of water from the Forbestown diversion impoundment to the Forbestown penstock. The tunnel reduces flows in the 5.5-mile-long Forbestown diversion dam reach of the SFFR;
- *Forbestown penstock* - a 1,487-foot-long, 97-inch reducing to 83-inch-inside-diameter exposed steel penstock that delivers water to Forbestown powerhouse;
- *Forbestown powerhouse* - a semi-outdoor reinforced concrete above-ground powerhouse that releases water to Ponderosa reservoir on the SFFR and that contains one vertical reaction Francis turbine rated at 41 MW directly connected to a 40,500-kVA generator; and
- *Forbestown powerhouse switchyard* - a switchyard adjacent to the Forbestown powerhouse that contains one 35,200-kVA transformer.

Power generated at Forbestown powerhouse is delivered from the switchyard to the grid via Pacific Gas and Electric Company's 115-kV Woodleaf-Kanaka Junction transmission line.

The Forbestown development does not include any recreation facilities or roads.

Kelly Ridge Development

The Kelly Ridge development includes:

- *Ponderosa dam* - a 160-foot-high, 650-foot-long, earth-filled dam with a crest elevation of 985 feet msl and with a 352-foot-long spillway⁸ controlled by two 7 foot 7.5-inch-high by 51 feet-long steel gates that forms a 4,178 acre-feet storage reservoir covering 103 acres at a normal maximum water surface elevation of 960 feet msl;
- *Ponderosa diversion tunnel* - a 516-foot-long, 10-foot by 9-foot-diameter concrete lined and unlined horseshoe unpressurized tunnel controlled by

⁸ Spill flows from Ponderosa dam discharge into the 3.6 million acre-foot Lake Oroville, part of DWR's Feather River Project (also known as the Oroville Project), FERC Project No. 2100.

one 6-foot-high by 8-foot-long hydraulic gate that diverts up to 285 cfs of water from Ponderosa reservoir to Miners Ranch conduit;

- *Miners Ranch canal (also known as Miners Ranch conduit)* - a 6.1-mile-long, 10-foot-wide concrete or gunite-lined canal and concrete or bench flume that includes two siphon sections across the McCabe and Powell creek sections of Lake Oroville and that diverts water from the Ponderosa diversion tunnel to the Miners Ranch tunnel;
- *Miners Ranch tunnel* - a 4.5-mile-long, 10-foot by 9-foot-diameter, concrete lined horseshoe un-pressurized tunnel that diverts up to 285 cfs of water from the Miners Ranch conduit to Miners Ranch reservoir;
- *Miners Ranch dam* - a 55-foot-high, 1,650-foot-long, earth-filled off-stream dam with a crest elevation of 895 feet msl and with an 1,175-foot-long uncontrolled spillway that forms a 896 acre-foot storage reservoir covering 48 acres at a normal maximum water surface elevation of 890 feet msl;
- *Kelly Ridge power tunnel* - a 1.3-mile-long, 9-foot by 8-foot-diameter, pressurized tunnel controlled by one 4-foot-high by 8-foot-long fixed wheel gate that diverts up to 261.8 cfs⁹ of water from Miners Ranch reservoir to Kelly Ridge penstock;
- *Kelly Ridge penstock* - a 1.1-mile-long 69-inch reducing to 57-inch-inside-diameter, exposed steel penstock that delivers water to Kelly Ridge powerhouse;
- *Kelly Ridge powerhouse* - a semi-outdoor reinforced concrete above ground powerhouse that releases water to DWR's Thermalito diversion pool just downstream of Oroville dam and its Hyatt powerhouse (FERC No. 2100) and that contains one vertical reaction Francis turbine rated at 13 MW directly connected to a 11,000-kVA generator; and
- *Kelly Ridge powerhouse switchyard* - a switchyard adjacent to the Kelly Ridge powerhouse that contains one 11,000-kVA transformer.

Power generated at the Kelly Ridge powerhouse is delivered from the switchyard to the grid via Pacific Gas and Electric Company's 60-kV Kelly Ridge-Elgin Junction transmission line.

The Kelly Ridge development does not include any recreation facilities or roads.

⁹ Based on turbine efficiency tests conducted on November 5, 1991, reported on page B-132 of South Feather's license application.

Existing Project Boundary

The existing project boundary, consisting of lands necessary for the safe operation and maintenance of the project and other purposes, such as recreation, shoreline control, and protection of environmental resources, encompasses approximately 3,838.8 acres of land in Plumas, Butte and Yuba counties, California.

The current project boundary encloses the project facilities associated with the four developments (Sly Creek, Woodleaf, Forbestown, and Kelly Ridge) along the SFFR and Slate Creek, a tributary to the North Yuba River, and lands within the Plumas National Forest. The project boundary generally only encompasses project facilities including dams and diversions, impoundments, water conveyances and associated structures, access roads and trails, transmission, communication and control lines, powerhouses, gaging stations, and helicopter landing sites used for access to project structures. The project boundary includes land adjacent to project features; the width of these zones varies depending on the feature.

Approximately 51.2 percent of the land (1,977.12 acres) within the project boundary is owned by the United States and is managed by the Forest Service as part of the Plumas National Forest and another 10.57 acres is United States-owned land managed by the BLM. About 2.2 percent of the land in the project boundary is state-owned land adjoining Lake Oroville. The licensee owns 38.9 percent of the land within the project boundary, and does not propose any modifications to the current project boundary.

2.1.2 Existing Project Operation

Little Grass Valley and Sly Creek reservoirs are large storage reservoirs that are operated to capture rain and snowmelt during the spring, and are slowly drawn down through summer and fall releasing water for power generation, irrigation, and consumptive purposes. The Lost Creek, Forbestown, Ponderosa, and Miners Ranch reservoirs contain less storage capacity and are operated as re-regulating reservoirs: these reservoirs do not have an annual refill or draw down cycle. Due to the small size of Slate Creek and the South Fork diversion dam impoundments, storage-capacity curve data do not exist for these two minor impoundments and South Feather maintains only periodic water surface records at these locations.

The Kelly Ridge powerhouse is operated as a base loaded plant. The Woodleaf and Forbestown powerhouses are operated in tandem with one another as base loaded plants with some peaking capacity. Sly Creek powerhouse is operated in tandem with Woodleaf and Forbestown, but due to its relatively small output does not provide peaking capacity.

South Feather is permitted under California Division of Safety of Dams to store 171,986 acre-feet of runoff from the watersheds of the SFFR and the North Yuba River in six reservoirs: Little Grass Valley, Sly Creek, Lost Creek, Forbestown, Ponderosa, and Miners Ranch. Prior to the South Feather Power Project, South Feather's average

annual diversion for irrigation and domestic purposes was 29,000 acre-feet. South Feather has the contractual rights to 3,720 acre-feet of water through the Forbestown ditch and 29,439 acre-feet through Miners Ranch reservoir for consumptive purposes. However, South Feather's contract with Pacific Gas and Electric Company requires payment by South Feather for water diverted in excess of these quantities for consumptive purposes. The current contract with Pacific Gas and Electric Company also provides North Yuba Water District with 3,700 acre-feet (April 15 to October 15) from the Forbestown ditch, 4,500 acre-feet (April 15 to November 1) from Miners Ranch reservoir, and 10,500 acre-feet (November 1 to April 15) at Miners Ranch reservoir. However, a May 2005 contract, which supplants and supersedes previous contracts between South Feather and North Yuba Water District, allows North Yuba Water District to consume up to 23,700 acre-feet from the project, subject to compensation for lost power value.

2.1.3 Existing Environmental Measures

The current license for the project includes the following minimum flow requirements:

- Little Grass Valley dam reach: 10 cfs from May 1 to October 31; 5 cfs November 1 to April 30 in Normal and Wet water years; and 5 cfs at all times in Dry years.¹⁰
- South Fork diversion dam reach: 10 cfs from May 1 to October 31; 5 cfs November 1 to April 30 in Normal and Wet water years; and 5 cfs at all times in Dry years.
- Slate Creek diversion dam reach: 10 cfs year-round or natural inflow, whichever is less.
- Forbestown diversion dam reach: 10 cfs from May 1 through October 31; 5 cfs November through April 30; and 5 cfs at all times in Dry water years.
- Lost Creek dam reach: 8 cfs from April 1 through October 31 and 5 cfs from November 1 through March 31.

The current license for the project also provides that a flow of at least 390 cfs be provided for a period of 24 hours or longer in Lost Creek at least once every 4 years to minimize fine sediment accumulation in Lost Creek downstream of Lost Creek dam.

South Feather maintains bridges and escape ramps to allow wildlife to cross and minimize wildlife mortality at the Miners Reach canal.

¹⁰ Dry years are defined as 50 percent or less of average annual discharge of the SFFR (117,000 acre-feet).

South Feather maintains two developed recreation areas. The Little Grass Valley reservoir recreation area has nine campgrounds, three boat ramps, two day-use areas, and three trails. The Sly Creek reservoir recreation area includes two campgrounds, two boat ramps/launches, and a day-use area.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

South Feather does not propose any changes to generation facilities or other major project features, or to the project boundary. South Feather does propose to construct a multi-use trail below Little Grass Valley dam, to replace or rehabilitate all existing recreational facilities, and provide for new facilities as user demand increases.

2.2.2 Project Safety

The South Feather Power Project has been operating for more than 49 years under the existing license during which time Commission staff have conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operation, compliance with the terms of the license, and proper maintenance. In addition, the project has been inspected and evaluated every 5 years by an independent consultant, and a consultant's safety report has been filed for Commission review. As part of the relicensing process, the Commission staff would evaluate the adequacy of the proposed project facilities under a new license.

2.2.3 Proposed Project Operation

Future operation will be generally consistent with existing operation. A significant change in future operation is related to minimum flow releases, as described below (Measure 39). South Feather proposes to maintain water levels in Little Grass Valley reservoir to no lower than elevation 5,022 feet msl through September 15 to facilitate the use of boat launch facilities (Measure 49), release recreational flows below Little Grass Valley dam, South Fork diversion dam, and the Forbestown diversion dam (measures 50, 51 and 52), and to provide supplemental stream flows in Lost Creek to minimize sediment accumulation in Lost Creek (Measure 57).

2.2.4 Proposed Environmental Measures

In its new license application, South Feather proposed the following additional protection and enhancement measures:

General

- Conduct annual employee awareness training to familiarize staff with special-status, aquatic, wildlife, and plant species, including noxious weeds/non-native invasive plants, as well as sensitive locations including

protected activity centers (PACs), potential erosion areas, and cultural sites to allow avoidance/minimization of impacts. (Measure 33)

- Consult with the Forest Service annually to coordinate Project and Forest Service activities. (Measure 34)

Geology and Soils

- Return large woody debris (LWD) to the stream below Little Grass Valley and Lost Creek dams. (Measure 56)
- Provide supplemental streamflows in Lost Creek for geomorphic purposes. Where facility modifications are needed to release the proposed flows, complete such modifications as soon as reasonably practicable, but within 3 years. In the interim, make a good faith effort to release the proposed flows within the capabilities of the existing facilities. (Measure 57)
- Continue Slate Creek sediment pass-through program. File report, including recommendations, with Commission within 2 years of license issuance. (Measure 58)

Aquatic Resources

- Determine water year type annually and apply to appropriate minimum flow release schedule and other measures that are dependent on water year type. (Measure 36)
- Install and maintain a gaging station, monitor water temperature, and cease diversions at Slate Creek diversion dam when mean daily water temperature reaches 20 degrees Celsius (°C) to protect downstream cold freshwater habitat. (Measure 37)
- Implement a minimum flow release schedule for the Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam reaches. Where facility modifications are needed to release the proposed flows, complete such modifications as soon as reasonably practicable, but within 3 years. In the interim, make a good faith effort to release the proposed flows within the capabilities of the existing facilities. (Measure 39)

Terrestrial Resources

- Annually review with the Forest Service the list of species within the project area that are formally proposed for listing or are listed under federal or state endangered species acts or are Forest Service Sensitive, Watch List, or Management Indicator Species. If an added species has the potential to be adversely affected by the project, prepare a study plan to

reasonably assess the effects of the project on the species, recommend reasonable resource management measures, and provide an implementation schedule, where appropriate. Annually consult with Forest Service regarding planned O&M projects on National Forest System lands and Forest Service activities that might affect the project. (Measure 35)

- Except for the Little Grass Valley dam reach, as part of normal O&M activities, avoid high flow releases from project dams associated with sediment pass-through, valve exercises, or supplemental flow releases for channel maintenance or recreational purposes during critical periods for foothill yellow-legged frog (roughly April 15 - October 31, annually). (Measure 40)
- Prepare, file, and implement a vegetation and invasive weed management plan. (Measure 41)
- Retain a qualified bat exclusion contractor when replacing or retrofitting any bat exclusion devices. Maintain all bat exclusion devices in proper functioning condition. (Measure 42)
- Consult with Cal Fish & Game prior to replacing or retrofitting Miners Ranch conduit wildlife bridge crossings and deer escape facilities. (Measure 43)

Recreational Resources

- Develop and implement a master plan to replace/rehabilitate existing recreational facilities, including modification and adaptation to meet the changing needs of the recreating public and physical environment. For the Little River Grass Valley reservoir recreation area, the facility master plan would be filed with the Commission within 1 year of license issuance. For the Sly Creek reservoir recreation area, the facility site master plan would be filed with the Commission within 3 years of license issuance. Obtain Forest Service approval of all plans before filing these plans with the Commission. The plan would include a description of the pertinent management objectives for the site, existing conditions survey, a schedule for completion, a statement of responsibility, and a statement of O&M. (Measure 45, as modified October 8 and October 12, 2007)
- Develop a Little Grass Valley and Sly Creek reservoir recreation area routine maintenance and operating plan. Provide a draft of the plan to the Forest Service for a 60-day review period, and file the final plan, including evidence of consultation, with the Commission within 6 months of license issuance. Implement the plan following Commission approval. (Measure 46, as modified October 8, 2007)

- Monitor recreation, file 6-year recreation report and provide for additional in-kind recreation facilities when demand exceeds supply. (Measure 47)
- Survey users, prepare user survey report, and provide out-of-kind recreation facilities if warranted by increased demand. (Measure 48)
- Maintain Little Grass Valley reservoir at a usable elevation for boat launches through September 15. (Measure 49)
- Provide supplemental streamflow in Little Grass Valley dam reach for recreational boating after September 15 of each year. Where facility modifications are needed to release the proposed flows, complete such modifications as soon as reasonably practicable, but within 3 years. In the interim, make a good faith effort to release the proposed flows within the capabilities of the existing facilities. (Measure 50)
- Provide supplemental streamflow in South Fork diversion dam reach in spring in Above Normal and Wet water years (see Measure 36) for recreational boating. Make a good faith effort to provide public notification of the flow. Where facility modifications are needed to release the proposed flows, complete such modifications as soon as reasonably practicable, but within 3 years. In the interim, make a good faith effort to release the proposed flows within the capabilities of the existing facilities. (Measure 51)
- Provide supplemental flow in Forbestown diversion dam reach in spring in Above Normal and Wet water years (see Measure 36) for recreational boating. Make a good faith effort to provide public notification of the flow. Where facility modifications are needed to release the proposed flows, complete such modifications as soon as reasonably practicable, but within 3 years. In the interim, make a good faith effort to release the proposed flows within the capabilities of the existing facilities. (Measure 52)
- Make streamflow information available to the public. (Measure 53)
- Seasonally install and maintain public safety buoys. (Measure 54)

Cultural Resources

- Upon issuance of license, implement the Historic Properties Management Plan included in the license application. (Measure 44)

Land Use

- Develop and implement a hazardous materials management plan to reduce the potential effects of hazardous materials spills. (Measure 38)

- Prepare, file and implement a fire prevention and response plan, including fuels treatment/vegetation management, prevention, emergency response preparedness, reporting, fire control/extinguishing. (Measure 55)

2.2.5 Modifications to the Applicant’s Proposal—Mandatory Conditions

The following mandatory conditions have been provided or will be provided and, if provided, are evaluated in this document.

2.2.5.1 Water Quality Certification

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. On May 16, 2008, South Feather filed an application for water quality certification with the Water Board. South Feather withdrew and refiled its request for water quality certification on May 5, 2009, and agency action is due by May 5, 2010.

2.2.5.2 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, maintenance, and operation by a licensee of such fishways as the secretaries of Commerce and Interior may prescribe. In its April 14, 2008, filing, the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) reserved its authority to prescribe fishways project for the South Feather Power Project.

2.2.5.3 Section 4(e) Federal Land Management 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 adequate protection and use of the reservation. The South Feather Power Project occupies 1,977.1 acres of federal lands administered by the Plumas National Forest and 10.6 acres of federal lands administered by the U.S. Bureau of Land Management.

In an April 14, 2008, filing with the Commission, the Forest Service submitted preliminary terms and conditions pursuant to section 4(e) of the FPA, including 17 standard Forest Service conditions and 11 project-specific resource protection conditions. On May 13, 2008, the Forest Service revised Condition No. 3; Condition No. 18 parts 2, 3, 5, and 6; and Condition No. 19, parts 1 and 4.¹¹ The Forest Service

¹¹ In its May 29, 2008, reply comments, South Feather stated that it fully supports the revised 4(e) conditions, and we consider them as part of the applicant’s proposal.

modified Condition No. 18, parts 1 and 5, and Condition No. 19, part 2, with its filing of final 4(e) conditions on March 6, 2009.

Of the Forest Service's 28 conditions, we consider the 17 standard conditions (Condition Nos. 1 through 17) to be administrative or legal in nature and not specific environmental measures. With the exception of Condition No. 3, *Consultation*, we do not analyze these conditions in this EIS. We analyze conditions that we consider to be environmental measures in section 3, and we summarize our analysis of these measures in section 5.4.2, *Forest Service 4(e) Conditions*.

The final 4(e) conditions filed by the Forest Service that we analyze in this document are:

- Consult with the Forest Service on measures needed to ensure protection and utilization of the National Forest resources affected by the project. [Condition No. 3]
- Maintain minimum streamflows in project reaches specified in tables A-1 through A-5 of their final 4(e) filing. The minimum instantaneous 15-minute streamflow must be at least 80 percent of the prescribed mean daily flow for those minimum streamflows less than or equal to 10 cfs and at least 90 percent of the prescribed mean daily flow for those minimum streamflows required to be greater than 10 cfs. [Condition No. 18, part 1]
- Determine the water year type for minimum flow compliance based on the DWR Bulletin 120 water year forecast except for the months of October through January, which should be based on the Department of Water Resources' Full Natural Flow record for the Feather River at Oroville. The water year types are defined as follows: Wet = greater than or equal to 7.1 million acre feet (MAF); Above Normal = greater than or equal to 4.0 MAF but less than 7.1 MAF; Below Normal = greater than 2.4 MAF or equal to but less than 4.0 MAF; and Dry = less than or equal to 2.4 MAF. [Condition No. 18, part 2]
- Develop an operating plan to manage drought conditions when they occur. [Condition No. 18, part 3]
- Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflows. [Condition No. 18, part 4]
- Develop and implement ramping rates that meet Forest Service targets for water velocity and stage changes to protect amphibian egg masses and tadpoles. [Condition No. 18, part 5]
- Develop and implement a wild fish supplementation program to enhance fisheries in the SFFR, Slate Creek, and in Sly Creek and Lost Creek reservoirs. [Condition No. 18, part 6]

- Develop and implement a fish population monitoring plan at eight of the locations previously established during the relicensing. [Condition No. 19, part 1]
- Develop an amphibian monitoring plan including: (1) full reach surveys in year 1 and every 10 years thereafter; (2) representative surveys in years 2-6, every 4 years thereafter, and annually for the last 3 years of the license period; and (3) four consecutive years of demographic data collection to be applied to an existing population model. [Condition No. 19, part 2.1]
- Develop a temperature and growth rate monitoring protocol, a habitat monitoring protocol to include habitat measurements in year one and every 10 years thereafter, and riparian encroachment monitoring protocol. [Condition No. 19, part 2.2 and 2.4]
- Treat and monitor selected areas between the South Fork diversion dam and Ponderosa reservoir to reduce riparian encroachment. [Condition No. 19, part 3]
- Develop and implement a benthic macroinvertebrate monitoring plan for affected bypassed reaches to be conducted in the same years as fish population monitoring, unless an alternative monitoring schedule is agreed upon with the agencies. [Condition No. 19, part 4]
- Prepare a recreation facility master plan and site plans to include provisions to hold annual coordination meetings, to ensure consistency with other management plans, for revegetation measures for disturbed vegetation, for improvement of interpretive signage and kiosks, and to explore opportunities to extend paved or native trails to increase pedestrian connectivity. [Condition No. 20, part 1 and 2]
- Prepare, file and implement a fire prevention, response and investigation plan, including fuels treatment/vegetation management, prevention, emergency response preparedness, reporting, fire control/extinguishing. [Condition No. 21]
- Develop and implement a fuel treatment/vegetation management plan. [Condition No. 22]
- Develop and implement an HPMP, approved by the Forest Service, for the purpose of protecting and interpreting heritage resources. [Condition No. 23]
- Annually review the current list of special status plant and wildlife species and implement a study on effects of the project on any newly added species if suitable habitat for the species is likely to occur on National

Forest System lands and identify and implement resource measures where appropriate. [Condition No. 24]

- Prepare a Biological Evaluation before taking actions that may affect Forest Service special status species on National Forest System lands, update and implement the Bald Eagle Management Plan, and develop and implement a bat management plan. [Condition No. 25]
- Prepare and implement an invasive weed management plan to address both aquatic and terrestrial invasive weeds within the project boundary and adjacent to project features directly affecting National Forest System lands including, roads, and distribution and transmission lines. [Condition No. 26]
- Develop and implement a visual management plan within 60 days prior to any ground-disturbing activity on National Forest System lands. [Condition No. 27]
- Develop and implement a road management plan after Forest Service approval of the plan. [Condition No. 28]

2.2.5.4 Alternative 4(e) Conditions Pursuant to 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 mandatory conditions. On May 14, 2008, South Feather filed alternatives to two of the Forest Service's 4(e) conditions:

- Condition No. 18, part 1 (minimum streamflows); and
- Condition No. 19, part 2 (FYLF monitoring plan).

The Forest Service filed its analysis of South Feather's alternative 4(e) conditions with its final 4(e) conditions on March 6, 2009. The Forest Service determined that South Feather's alternative conditions would not be sufficiently protective of Forest Service resources, but did modify these two conditions as a result of its analysis of the alternative conditions. We evaluate both the alternative 4(e) and final 4(e) conditions in sections 3 and 5 of this EIS.

2.3 STAFF ALTERNATIVE

After evaluating South Feather's proposal and recommendations from resource agencies and other interested parties, we compiled a set of environmental measures that we consider appropriate for addressing the resource issues raised in this proceeding, calling this the staff alternative. The staff alternative includes some measures included in South Feather's proposal as well as NMFS' reservation of authority to prescribe fishways under section 18 and some of the Forest Service's section 4(e) and South

Feather's alternative section 4(e) conditions, section 10(j) recommendations, section 10(a) recommendations, and measures developed by the staff.

The staff alternative incorporates South Feather's proposed environmental measures (see section 2.2.3), as modified by staff:

General

- Measure 34 – modified to include annual consultation regarding the status of measure implementation, the results of monitoring studies, discussion of both routine and non-routine maintenance, foreseeable changes in project facilities, review of any necessary revisions or modification of plans included in the project license, and discussion of any measures needed to protect sensitive species or changes to existing management plans. Also modified to require that FWS, Cal Fish & Game, and the Water Board be afforded the opportunity to participate in the consultation meeting and included in the distribution of all monitoring reports and correspondence relating to the meeting, and that recommendations by these agencies be included in the record of the meeting.

Aquatic Resources

- Measure 36 – water year type to be determined using the methodology described in Forest Service's revised Condition No. 18, part 2.
- Measure 39 – replaced by the minimum flow regime described in tables C-1 to C-20 (see appendix C) under South Feather's alternative to Forest Service Condition No. 18, part 1.

Terrestrial Resources

- Measure 41 – the invasive weed management plan is modified to: (1) address both aquatic and terrestrial invasive weeds; (2) include protocols for locating, monitoring, and controlling weed populations; (3) include a public education program and facilities for public use to reduce the spread of aquatic weed species; and (4) provide information on noxious weed populations in a data format compatible with the Forest Service GIS database (per Forest Service Condition No. 26).
- Measure 43 - modified to include maintenance and operation of all devices and measures necessary for the protection of wildlife along the Miners Ranch conduit deemed necessary by Cal Fish & Game and FWS (per Cal Fish & Game Condition No. 9).

Recreational Resources

- Measure 47 – modified to require filing of the recreational use survey report every 12 years.
- Measure 49 – modified to specify that the restriction to maintain water levels in Little Grass Valley reservoir above elevation 5,022 feet msl applies only from May 21 through September 15, and does not apply in drought years if the reservoir does not fill to elevation 5,022 feet msl.
- Measure 51 – modified to discontinue supplemental streamflows in the South Fork diversion dam reach if water temperature rises to 12.0°C or higher.
- Measure 52 – modified to discontinue supplemental streamflows in the Forbestown diversion dam reach if water temperature rises to 12.0°C or higher.

Cultural Resources

- Measure 44 – modified the HPMP to include Commission staff measures in addition to implementation in consultation with the SHPO, Forest Service, participating Tribes, and the Commission. [Forest Service Condition No. 23]

In addition to the foregoing measures proposed by South Feather, the staff alternative also includes the following additional measures identified by staff based on agency, tribal, and non-governmental organization recommendations and our analysis:

Aquatic Resources

- Implement a maximum ramping rate of 0.5 foot per hour when making any controlled increases or decreases in flow releases into the Little Grass Valley dam, South Fork diversion dam, Lost Creek dam, and the Forbestown diversion dam reaches.
- Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflows downstream of Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam reaches. [Forest Service Condition No. 18, part 4 and Cal Fish & Game recommendation No. 7, part 6]
- Develop an operating plan to manage drought conditions when they occur. [Forest Service Condition No. 18, part 3]
- Develop and implement a plan, in consultation with Cal Fish & Game, NMFS and DWR to monitor the effects of flow releases on water temperatures in the Little Grass Valley dam, South Fork diversion dam, Lost Creek dam, and the Forbestown diversion dam reaches, and to

provide real-time information on the quantity and temperature of water discharged from the Kelly Ridge powerhouse. [Staff-developed measure]

- Develop and implement a wild fish supplementation program to augment fish populations, when warranted, in the SFFR, Slate Creek, and in Sly Creek and Lost Creek reservoirs. [Forest Service Condition No. 18, part 6]
- Develop and implement a fish population monitoring plan in affected project reaches to monitor fish species composition and relative abundance, including data on species size/age distributions and condition factors at eight of the locations previously established during the relicensing. Surveys would be conducted in two successive years and begin in the fifth full year after implementation of new license streamflows or at a frequency jointly agreed to by the agencies. [Forest Service Condition No. 19, part 1]
- Develop and implement a benthic macroinvertebrate monitoring plan affected project to be conducted in the same years as fish population monitoring, unless an alternative monitoring schedule is agreed upon with the agencies. [Forest Service Condition No. 19, part 3]
- Reserve NMFS authority to prescribe fishways. [NMFS section 18]

Terrestrial Resources

- Monitor selected areas between the South Fork diversion dam and Ponderosa reservoir for riparian encroachment, and treat if warranted based on FYLF monitoring results. [Forest Service Condition No. 19, part 3, and Cal Fish & Game Condition No. 7, part 3]
- Prepare a Biological Evaluation before taking actions that may affect Forest Service special status species on National Forest System lands, update and implement the Bald Eagle Management Plan, and develop and implement a bat management plan. [Forest Service Condition No. 25]
- Conduct surveys for Forest Service sensitive amphibian species over the full length of the Little Grass Valley dam, South Fork diversion dam, SF Feather River/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam reaches in year 1 and every 10 years thereafter, supplemented by representative surveys in years 2-6, every 4 years thereafter, and during the final 3 years of the license to assess effectiveness of measures implemented to protect amphibians. [Forest Service Condition No. 19, part 2.1]
- Develop a temperature and growth rate monitoring protocol, a habitat monitoring protocol to include habitat measurements in year one and

every 10 years thereafter, and a protocol to determine appropriate ramping rates suitable for amphibians. [Forest Service Condition No. 19, part 2.2 - 2.4]

Recreational Resources

- Incorporate several additional measures specified by the Forest Service for the facility master plans, including:
 - provisions in the master plan for the annual coordination meeting to review the status of the implementation of the master plan;
 - provisions to ensure consistency with other management plans, including measures associated with potential effects of the proposed recreation rehabilitation on cultural resources within the project;
 - provisions to revegetate disturbed vegetation associated with the proposed rehabilitation and enhancement measures at the recreation sites as part of the facility master plans; and
 - provisions to improve interpretive signage and kiosks, if needed, as part of the individual site plans. [Forest Service Condition No. 20, part 1 and 2]

Land Management and Aesthetics

- Develop and implement a fuel treatment/vegetation management plan as part of South Feather’s fire prevention and response plan, after consultation with the Forest Service. File the plan with the Commission within 1 year of license. [Forest Service Condition No. 22]
- Develop and implement a road management plan for roads needed for project purposes and access. File with the Commission within 1 year of license issuance a road management plan after Forest Service approval of the plan. [Forest Service Condition No. 28]
- Develop and implement a visual management plan within 60 days prior to any ground-disturbing activity on National Forest System lands. [Forest Service Condition No. 27]

2.4 STAFF ALTERNATIVE WITH MANDATORY CONDITIONS

The Forest Service specified one final 4(e) condition (described in section 2.2.5, *Modifications to Applicant’s Proposal—Mandatory Conditions*) which we do not include in the staff alternative: Condition No. 18, part 1 - maintain minimum streamflows in project reaches specified for each reach by the Forest Service.

We recognize that the Commission is required to include valid section 4(e) conditions in any license issued for the project. The staff alternative with mandatory conditions includes staff-recommended measures along with the mandatory streamflow condition that we did not include in the staff alternative.

Incorporation of the mandatory condition into a new license would cause us to modify or eliminate some of the environmental measures that we include in the staff alternative. The minimum flows specified by the Forest Service would replace the minimum flows that we recommend (South Feather's alternative 4[e] flows).

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

2.5.1 Issuing a Non-Power License

A non-power license is a temporary license that the Commission terminates when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider a non-power 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. Although that fact alone would not 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 Project Retirement

Retiring the project would require denying South Feather's license application and require the surrender and termination of the existing license with any necessary conditions. The project would no longer be authorized to generate power. Retiring the project would involve significant cost, would forego an average annual production of 498,472 MWh of clean, renewable energy, and would foreclose any opportunity to add environmental enhancements to the existing South Feather Power Project. For these reasons, we do not consider project retirement to be a reasonable alternative.

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**Federal Energy
Regulatory
Commission**

**Office of
Energy
Projects**

June 2009

FERC/EIS-0225F

Final Environmental Impact Statement

SECTION 3 - ENVIRONMENTAL ANALYSIS



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

3.0 ENVIRONMENTAL ANALYSIS

In this section, we first describe the general environmental setting in the project vicinity and any environmental resources that could be cumulatively affected by relicensing the South Feather Power Project. Then, we address each affected environmental resource. For each resource, we first describe the affected environment—the existing condition and the baseline against which to measure the effects of the proposed project and any alternative actions—and then the environmental effects of the proposed project, including the proposed measures discussed in section 2.2.3. Unless otherwise identified, the source of our information is the license application for the project (South Feather, 2007). We provide citations for information obtained from other sources, including subsequent filings related to the project.

3.1 GENERAL SETTING

The project is located in the Sierra Nevada Mountain Range in northern California within Butte, Plumas, and Yuba counties and the Plumas National Forest. The project area originates at Little Grass Valley reservoir and occupies the SFFR canyon to its confluence with Lake Oroville. The project area also includes Lost Creek from Sly Creek reservoir to the confluence with the SFFR, and Slate Creek, a tributary to the North Yuba River, from Slate Creek diversion dam to the confluence with the North Yuba River. The maximum elevation of the project area is about 5,047 feet msl, the normal maximum water surface elevation of Little Grass Valley reservoir. In general, the area surrounding the project can be characterized as primitive, except at the lowest elevations, which is rural.

The project area experiences mild, dry summers and cool winters with significant snowfall in the higher elevations (above 4,000 feet msl) and extensive rain in the lower elevations. Since January 1935, the National Weather Service has maintained a monitoring station (Number 048606) about 0.5 mile southeast of the community of Strawberry Valley, just south of Sly Creek and Lost Creek reservoirs. The station is at an elevation of 3,808 feet msl, which is above the mid elevation of the project area. July air temperatures at Strawberry Valley range from an average maximum high of 84.3 degrees Fahrenheit (°F) to an average minimum low of 52.1°F. The average maximum temperature for January is 48.5°F while the average minimum temperature is 29.5°F. The annual average maximum and minimum temperatures for Strawberry Valley are 64.7°F and 39.3°F, respectively. Annual mean total precipitation at Strawberry Valley is 82.25 inches, most (67.5 percent) of which falls as snow from December through March.

The summer months only produce three percent of the total annual average precipitation. Spring and fall bring the remaining 29.5 percent of the precipitation to the area. Wind flow is generally moderate and from the west, causing air to rise as it passes over the Sierra Nevada.

The project lies in the northern portion of the Sierra Nevada Mountain Range. The Sierra Nevada lies almost entirely within California, extending into Nevada only

along the eastern shore of Lake Tahoe. More than 400 miles long and 60 to 80 miles wide, the Sierra Nevada is the longest continuous mountain range in the contiguous United States. The northernmost point is located a few miles south of Mt. Lassen, the southernmost peak of the Cascade Range. The southern terminus of the Sierra Nevada is Tehachapi Pass. The Sierra Nevada is a massive, northwesterly trending tilted fault block with asymmetric flanks.

Drainage of the western slope is predominantly westward by numerous rivers. The western slope of the Plumas National Forest drains southwesterly almost entirely into the Feather River. To the north of the Feather River drainage, on which the project is located, is the Lassen National Forest, which contains numerous smaller watersheds that drain directly into the Sacramento River. The Yuba River is the first major drainage to the south. The headwaters of these rivers, like those of the Feather River, are from snowpack in the glacially carved terrain.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (50 CFR §1508.7), an action may cause cumulative impacts on the environment if its impacts overlap in space or time with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time, including hydropower and other land and water development activities.

Based on information in the license applications, agency comments, other filings related to the project, and preliminary staff analysis, we identified the following resources that have the potential to be cumulatively affected by the continued operation of the South Feather Power Project, in combination with other activities: water quality, water quantity, and aquatic resources.

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. Because the proposed action would affect resources differently, the geographic scope for each resource may vary. For most fisheries and water resources, the geographic scope would extend from the headwaters of the SFFR, Lost Creek, and Slate Creek to the point downstream where the SFFR flows into Lake Oroville.

3.2.2 Temporal Scope

The temporal scope of our cumulative analysis in the EIS will include past, present, and future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope will look 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions.

The historical discussion will, by necessity, be limited to the amount of available information for each resource.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

Geologic Setting

The South Feather Power Project is located on the western slopes of the Sierra Nevada Mountain Range in northern California. The entire Sierra Nevada Mountain Range is about 400 miles long and runs south-southeast to north-northwest in the eastern portion of the state. Following a tilted fault block, the mountain range is experiencing uplifting along its eastern slopes; the average angle of the eastern slopes is about 25 degrees. This steep angle and uplift comes from sporadic seismic activity that has been building the mountain peaks to as high as 14,000 feet for the past 200 million years. Low levels of seismic activity currently continue in the watershed region along the main fault block and various smaller faults throughout the mountain range, and recent notable earthquakes have been centered in the Oroville area near the western portion of the SFFR watershed.

In contrast, the western slopes have an average angle of only 2 degrees, due to erosion and sediment transport from runoff traveling away from the fault block during the same period of time. Pleistocene-age glaciers carved deep canyons in the slopes, creating paths for waterways to travel westward. Multiple rivers and watersheds stem from snowpack in the higher mountain areas all along the western side of the mountain range, including the SFFR watershed. In this watershed, the average depth of the canyons that carry snowpack runoff is 1,000 feet.

Before uplifting in the area began, sedimentary depositions were the primary type of rock in the area. These rocks now exist as roof pendants in the region, consisting of quartzite, schist, marble, and other metamorphic rocks. The dominant underlying types of rock now include quartz monzonite, granite, and granodiorite. In the SFFR watershed, exfoliating massive granite exists as bedrock and is frequently exposed in the canyons and reservoir basins. The deep canyons and streambeds are also characterized by weathered bedrock as rock fragments, boulders, and cobble. Outside of the canyons and reservoir shorelines, terrain is generally broad and gently sloping with mostly tree vegetation. As flow travels westward through the project area, the terrain flattens significantly after passing Lake Oroville, where the watershed enters the relatively wide open Sacramento Valley.

Reservoir Shorelines

The majority of reservoir shorelines in the watershed are composed of bedrock, sand, and rock fragments up to the high-water surface elevations of the reservoirs. Water lines are visible along bedrock shorelines in many of the reservoirs when water levels are lowered, reflecting the various stages of operation in the reservoirs. Above the high-water line, tree vegetation dominates the shorelines and the landscape, much of which is evergreen. Similar vegetation also exists on rock outcroppings that form small islands in some of the reservoirs.

Miners Ranch reservoir differs in character from the other reservoirs; it is located closer to the wide open Sacramento Valley. Its shorelines are flatter and are characterized above the high-water surface elevation by shrub or grassy vegetation in an arid landscape. Substrate within the reservoir includes silt deposition and algae, in contrast to the rocky substrate generally found elsewhere in the watershed.

Reservoirs throughout the watershed are generally not considered to be at risk of shoreline erosion, because they are made up of bedrock and/or have gently sloping shorelines. A shoreline erosion study was conducted in 2004, because South Feather and the Forest Service identified sensitive reservoir resources that might be affected by shoreline erosion in Little Grass Valley and Sly Creek reservoirs. At the conclusion of the shoreline erosion study, all parties agreed that shoreline erosion was negligible, the potential for future erosion was small, and the specific resources of concern were not at risk due to shoreline stability and/or setback from the high-water shoreline. In a few isolated areas throughout the project, trees have fallen into the reservoirs to indicate that root structures may have been undermined, but these occurrences are infrequent. Shorelines are considered stable on all of the operating reservoirs. Residences exist along some of the shorelines, particularly in more gently-sloping areas, and unpaved roads and trails also run alongside the reservoirs in some areas. These unprotected areas have the potential to contribute sediment from surface erosion, although their surface area is negligible in comparison to the size of the watershed.

Alluvial deposits have accumulated in the reservoirs since operation began. These deposits are limited to deeper areas of the pools and are particularly concentrated near the dams and occasionally at inflow areas. South Feather studies show that all project reservoirs trap sediment at a denudation rate of less than 1 millimeter per year. Little Grass Valley reservoir accumulates the most sediment volume since it is the farthest upstream reservoir in the watershed, has one of the largest drainage areas, and has no upstream dams.

Mass wasting has occurred in limited areas associated with the project, such as areas where fill was placed or project features altered the path of runoff. For example, concentrated flow at the base of Lost Creek dam has caused a gully to develop and contribute sediment to the channels and reservoirs within the watershed. Mass wasting areas are also apparent that are not a result of project features. Some of the activity of

these features is suspended and some is active; however, mass wasting generally contributes more sediment to project waterways than surface erosion.

Project Reaches

Upstream of Ponderosa reservoir, stream channels in the project are generally carved into steep canyons that reach average depths of 1,000 feet and are frequently characterized by exposed bedrock. Peak streamflows, which typically occur from snowfall runoff, continue to carve the streambeds into bedrock, and channel substrate generally consists of gravel, boulders, bedrock, and various sizes of rock fragments. Channel gradients are also relatively steep, up to 10 percent in some localized areas. The steep gradients create fast-moving flow with waterfalls occurring in places, especially in tributaries that enter the reaches within the canyons or groundwater that emanates from canyon walls. Pooling does occur in some areas where boulders or fallen rocks have altered the course of the waterway, or where average gradient in a local area is as low as 1 percent.

The reaches upstream of Ponderosa reservoir are virtually all transport reaches, as channel substrate and gradient generally do not facilitate sediment deposition. Alluvial deposition does occur in the few areas where pools are present, and although sandbars are rare, vegetation encroaches where sandbars form or where streambanks are not as steep and sediment has accumulated. This is particularly true at diversion dams, where deposition and the resulting vegetative growth significantly change channel characteristics immediately upstream of the dams. Woody debris is also present and collects where stream gradients become flatter or obstructions prevent it from being transported further down the reaches. South Feather has studied LWD and found that it only influences channel morphology in localized areas within the project.

Downstream of Ponderosa reservoir, channel gradients are flatter as streamflow enters the human-made Miners Ranch tunnel and canal. The concrete-lined canal does not generally exhibit natural geomorphic changes, but does sustain some variable sediment deposition in the channel area as water flow changes with operation.

3.3.1.2 Environmental Effects

Continued operation of the South Feather Power Project could affect geology and soils in the watershed by affecting streamflow, sediment transport, and geomorphic characteristics of the stream channel. Because South Feather does not propose any changes in project operation that would have a substantial effect on geology and soils in the watershed, the proposed license measures are limited to addressing issues that have been observed during project operation in the current term of the license. Observed issues include erosion from bare surfaces, rockfalls, and mass wasting; reservoir sedimentation, effects on sediment supply, yield, and trapping; transport and trapping of LWD; impacts of fine sediment deposition in Lost Creek; and the trapping and passage of accumulated sediment at the Slate Creek diversion dam.

Continued operation of the project may influence the rate of erosion in the watershed and the trapping of sediment in project reservoirs. However, studies have shown that the few areas undergoing various forms of erosion are not substantial, and are not considered at risk during the term of a proposed new license. The accumulation of sediment in reservoirs since operation began is also considered unsubstantial, and is not expected to accelerate during the term of a proposed new license. Therefore, South Feather has not proposed any measures with regard to effects of project operation on erosion or reservoir sedimentation. South Feather proposes measures to address LWD, the accumulation of fine sediment in Lost Creek, measures to pass sediment through the Slate Creek diversion, and erosion and sediment control measures that are needed during construction of proposed recreational facilities.

Large Woody Debris

Much of the steep and confined channel network in the project area offers limited opportunity for LWD retention and associated long-term sediment storage within the bankfull channel perimeter. However, LWD may be retained locally in relatively lower gradient channel reaches that have reduced wood and sediment transport capacities or where valley and/or channel width narrows. In these locations, LWD may play a relatively important role in creating and maintaining aquatic habitat diversity.

LWD accumulates in project reservoirs during high flow events, and South Feather generally removes and burns LWD after flood events or when it affects project resources. Because LWD can benefit fish habitat, South Feather proposes to make a reasonable effort to annually return LWD that collects in the Little Grass Valley and Sly Creek reservoirs to the river below those structures. South Feather would allow LWD to pass through the Little Grass Valley, Sly Creek, and Lost Creek dam spillways during spill periods. If spills are not adequate to pass the LWD and South Feather collects the LWD from Little Grass Valley, Sly Creek, and Lost Creek reservoirs, it would consult with the Forest Service concerning alternative means and a schedule to return the LWD to the river.

Our Analysis

LWD contributes to productive aquatic ecosystems, and is an important component in the formation of complex aquatic habitat units and channel maintenance. LWD creates high flow velocity breaks and provides cover from predators, including trout. The velocity breaks created by LWD also retain and sort substrate to create gravel bars and spawning habitat for salmonids.

Although much of the steep and confined channel network in the project area offers limited opportunity for LWD retention, LWD may be retained locally in relatively lower gradient channel reaches that have reduced wood and sediment transport capacities or where valley and/or channel width narrows. Compared to reference reaches upstream of the impoundments, the number of LWD pieces per mile was considerably lower in the reaches downstream of Little Grass Valley dam on the SFFR and below Sly Creek dam

on Lost Creek. Passing LWD that accumulates in the Little Grass Valley and Sly Creek reservoirs to downstream reaches would increase the abundance of LWD in these reaches and provide a substantial benefit to trout habitat in areas where LWD is retained within the active stream channel.

Several factors suggest that the Slate Creek diversion dam does not reduce the abundance of LWD downstream of the diversion, including similar LWD size distributions observed in the reservoir and downstream study sites, indicating that LWD is effectively transported over the diversion dam during high flows, and the existence of a relatively large downstream source area capable of supplying LWD to the channel.

Lost Creek Geomorphic Flows

Lack of seasonal high flow events may contribute to the accumulation of fine sediment in spawning gravels, which may adversely affect trout spawning and incubation success and contribute to the encroachment of riparian vegetation into the stream channel. Sediment that originates from upstream watershed surface erosion, rockfalls, and mass wasting is generally retained behind structures, and sediment that originates in areas between structures is typically transported downstream in the channel reaches. Lost Creek, however, is a response reach that retains fine sediment that originates below Lost Creek dam, and this sediment may affect aquatic habitat.

To address these resource issues, South Feather proposes to provide supplemental streamflows to Lost Creek of at least 390 cfs for a continuous period of 24 hours, at least once every 4 water years. Supplemental streamflows would consist of controlled or uncontrolled spill over Lost Creek dam that would flush the reach of fine sediment.

Our Analysis

South Feather commissioned a study of Lost Creek in 1991 to evaluate the presence of fine sediment deposits and the flow levels necessary to mobilize streambed materials. The Forest Service identified specific objectives for high flows in the reach, and the current FERC license stipulates that minimum flow requirements be determined by conducting an instream flow study. The Forest Service identified two key objectives: (1) providing high flows to cleanse accumulated fine sediment from spawning gravels and (2) reducing the encroachment of riparian vegetation resulting from the accumulation of fine sediment.

The study concluded that supplemental streamflows would benefit habitat conditions in the reach and satisfy the Forest Service's objectives, so the existing license was amended to include flow releases. As a result, the current project license stipulates that flushing flows be released from Lost Creek dam at least once every 4 years. The flushing flows would be between 390 and 740 cfs, so that sediment fines are removed but gravel and cobble, that serve as spawning habitat, are mobilized only so far as to help displace accumulated fines. Larger flows might displace streambed material used for spawning. Study of the reach indicated that the fines were mobilized when the dam

spilled at least 390 cfs for at least 15 hours. South Feather proposes to continue flushing flows in Lost Creek by spilling flows of at least 390 cfs for 24 hours at least once every 4 years. Continuing periodic flushing would serve to enhance geomorphic characteristics in Lost Creek and protect aquatic habitat.

Sediment Pass-Through at Slate Creek

Accumulation of sediment upstream of the Slate Creek diversion dam interferes with operation of the low-level outlet used to release minimum instream flows, affects the operation of the diversion tunnel, and impedes the transport of spawning gravel into the reach downstream of the diversion. There are no dams upstream of the Slate Creek diversion that would affect sediment transport, so this diversion is particularly susceptible to sediment accumulation. During the current license term, the Slate Creek diversion dam was identified as a project structure where sediment collected to such a degree that operations and environmental conditions were adversely affected. Allowing sediment to continue to collect here would exacerbate those effects during the next license term.

South Feather is currently testing alternative methods of operation to facilitate the passage of sediment past the dam, and within 2 years of license issuance, proposes to file a report with the Commission that would describe the results of ongoing testing. A draft of the report would be provided to the Forest Service, the Corps, the Water Board, Cal Fish & Game, and any other appropriate resource agencies. The report would describe the objectives and results of the testing and proposed measures that would be implemented as part of the license, following approval by the Commission.

Our Analysis

Until 1986, Slate Creek diversion dam was operated to allow sediment to pass through a low-level outlet during high flows. This manner of operation maintained sediment transport processes and prevented accumulated sediment from affecting the operation of the minimum flow release and diversion structures. Past hydraulic mining upstream of the dam, and the breach of the upstream St. Louis debris dam in the 1950s, contributed to high delivery rates of aggraded sediment from the upstream reaches. The St. Louis debris dam is located about 1 mile upstream of Slate Creek diversion on land owned by the Forest Service.

Sediment pass-through activities were suspended from 1986 to 2002 because of resource agency concerns about effects on water quality from toxins that may have collected in the accumulated sediment. To determine if toxins had collected, sediment samples were evaluated for hazardous material content in various studies from 1994 to 2005. None of the studies identified hazardous concentrations of heavy metals, including mercury. Water quality was also studied upstream and downstream of the diversion, and hazardous levels of heavy metals or inorganic contaminants were not found, nor did the studies find low levels of dissolved oxygen or high turbidity. After a water quality monitoring plan was approved by regulatory agencies, South Feather attempted to resume sediment pass-through activities in 2002 under specific flow conditions, but it was

unsuccessful because of the armored sediment pile that had built up against the outlet's trashrack during the years in which sediment pass-through activities were suspended.

In 2005, 500 cubic yards of the accumulated sediment pile was removed by manual excavation. South Feather again attempted to resume sediment pass-through in 2006. Sediment was successfully passed through the structure, but testing was suspended because of concerns about abrasion damage to the diversion's outlet works. South Feather is currently testing new procedures to allow accumulated sediment to pass through Slate Creek diversion dam more frequently and in smaller volumes, and to time sediment pass-through to occur on the ascending limb of the hydrograph during storm events, so that both coarse and fine materials can be carried into the downstream reaches and enhance aquatic habitat. The Water Board reviewed these procedures and authorized an amended 401 water quality certificate on January 4, 2007, so that South Feather could test the new approach.

South Feather's proposal to file a report 2 years after new license issuance would allow the Commission to review the results of the current sediment pass-through efforts resumed in 2007. By then, it is expected that the new procedures would have been tested and the results documented, and any modifications would be proposed to the Commission. Continuing sediment pass-through and refining successful procedures would enhance downstream habitat by restoring sediment transport processes, and would improve the reliability of minimum flow releases and diversion operations by preventing further accumulation upstream of the dam.

Erosion and Sediment Control

Surface erosion and sediment runoff associated with construction activities could release sediment into project waterways and adversely affect environmental resources. South Feather proposes construction, including replacement or rehabilitation of project recreational facilities, which could lead to stream sedimentation, increased turbidity, and geomorphic effects if proper erosion and sediment control measures are not implemented as part of construction.

To minimize soil erosion and dust, and to protect water quality and minimize turbidity in streams and reservoirs, the Forest Service's Condition No. 8 would require South Feather to implement a soil erosion control and revegetation plan during construction of any facilities. South Feather would develop the plan for approval by the Forest Service, and then file it with the Commission at least 60 days before any construction disturbance or non-routine maintenance begins.

A complete plan would include drawings and descriptions of site conditions, proposed erosion and sediment control measures, proposed revegetation with native species, and a proposed monitoring and maintenance schedule. Appropriate control measures could include silt fence, sedimentation ponds, straw bales, diversion dikes or swales, and energy-dissipation structures. Proper implementation would prevent soils from exiting the construction area and entering undisturbed areas. Each site would be

stabilized when construction is complete, and proper post-construction monitoring would ensure that native species revegetate disturbed areas and that sediment does not mobilize via rills, wasting, or other means.

Our Analysis

Designing and implementing an appropriate soil erosion control and revegetation plan for construction activities would prevent the release of disturbed sediment into waterways, and therefore would prevent effects on water quality. Proper revegetation and post-construction monitoring would ensure that disturbed areas are restored with native species, and that gullying or other forms of erosion do not occur as a result of construction disturbance.

Although no measures are proposed to address reservoir sedimentation and the few areas of surface erosion (including mass wasting and rockfalls), studies, site visits, and discussions conclude that these issues do not present significant risk during the term of the proposed license. Alluvial sediments are likely to continue to be deposited in project reservoirs, and some erosion is likely to continue in a small number of areas. However, we conclude that reservoir sedimentation and erosion throughout the project do not require measures to be taken to prevent adverse effects on environmental resources, and no unavoidable adverse effects would result from proposed project operation.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

3.3.2.1.1 Water Quantity

Water Storage and Hydrology

The South Feather Power Project includes two major storage reservoirs and six smaller reservoirs and diversion pools with little or no seasonal storage capacity. Key characteristics of the five project reservoirs, including surface area, length, width, depth, fluctuation, and releases, are described below.

Little Grass Valley reservoir has a maximum surface area of 1,650 acres at full pool, is 3.45 miles long, has a maximum width of 4,611 feet, and a maximum depth of about 179 feet near the dam. In a typical year the reservoir surface elevation fluctuates by about 31 feet. Water is normally released into the SFFR via three low-level outlets and the dam spillway.

Sly Creek reservoir has a surface area of 619 acres at full pool, is about 2.52 miles long, has a maximum width of about 1,918 feet, and a maximum depth of about 241 feet near the dam. The reservoir shoreline is about 12.2 miles long. In a typical year, the reservoir water surface elevation fluctuates by about 102.5 feet. Water is normally

released into Lost Creek reservoir through the Sly Creek powerhouse or via the pressure relief valve that bypasses the powerhouse.

Lost Creek reservoir has a maximum a surface area of 137 acres at full pool, is about 1.46 miles long, has a maximum width of about 1,118 feet, and a maximum depth of about 99.5 feet near the dam. The reservoir shoreline length is about 5.75 miles. In a normal year, the reservoir water surface elevation fluctuates by about 14.6 feet. Water is normally released into Lost Creek through three low-level outlets or to the Woodleaf powerhouse on the SFFR through the Woodleaf power tunnel.

Ponderosa reservoir has a surface area of 103 acres at full pool, is about 1.7 miles long, has a maximum width of about 727 feet, and a maximum depth of about 130 feet near the dam. The reservoir shoreline is about 4.1 miles long. In a typical year, the reservoir water surface elevation fluctuates by about 11.5 feet. Water is conveyed from Ponderosa dam to the Miners Ranch reservoir via the Miners Ranch conduit; spills at the dam, when they occur, pass into Lake Oroville. There is also one low-level outlet that can be used to make releases into Lake Oroville.

Miners Ranch reservoir, which is located off-stream, has a surface area of 48 acres at full pool, is about 0.5 mile long, has a maximum width of about 932 feet, and a maximum depth of about 50 feet near the dam. The reservoir shoreline is about 1.8 miles long. In a typical normal water year,¹² the reservoir water surface elevation fluctuates by about 9.0 feet. Water is normally released into Bangor canal through the Miners Ranch dam low-level outlet, to the Miners Ranch treatment plant through a set of pumps, and to Kelly Ridge powerhouse through the Kelly Ridge power canal and tunnel.

Table 3-1 shows physical characteristics of each reservoir and diversion pool, and figure 3-1 shows seasonal trends in water storage in the major storage reservoirs. Figures 3-2 and 3-3 show annual variations in water levels at the two storage reservoirs, Little Grass Valley and Sly Creek, respectively. Tables 3-2 through 3-7 provide regulated and unregulated flow statistics for each of the four bypassed reaches. By removing the effects of changes in storage within the reservoirs, the unregulated flow statistics show an approximation of the inflows to each reservoir.

¹² Water year types (from water year DWR estimate of total unimpaired runoff type in the Feather River at Oroville in acre-feet) are defined as: Dry: less than or equal to 2,400,000; Below Normal: greater than 2,400,000 and less than 4,000,000; Above Normal: greater than or equal to 4,000,000 and less than Normal 7,100,000; and Wet: greater than or equal to 7,100,000.

Table 3-1. Reservoir and diversion pool characteristics. (Source: South Feather, 2007)

Dam	Elevation (feet)			Storage capacity (acre-feet)		
	Normal Maximum (msl)	Normal Minimum (msl)	Difference	Normal Maximum	Normal Minimum	Difference
Little Grass Valley reservoir	5,046	4,935.6	110.4	89,800	90	89,710
South Fork diversion pool	3,557	3,540.5	16.5	87	0	87
Slate Creek diversion pool	3,552	3,535	17	0 ^a	0	0
Sly Creek reservoir	3,527	3,377	150	64,338	5,678	58,660
Lost Creek reservoir	3,283	3,270	13	5,361	3,692	1669
Forbestown diversion pool	1,783	1,763	20	352	239	113
Ponderosa reservoir	960	947	13	4,177	2,534	1643
Miners Ranch reservoir	890	878	12	896	417	479

^a The Slate Creek diversion pool originally had a storage capacity of 643 acre-feet, but the impoundment's current storage capacity is negligible due to sedimentation.

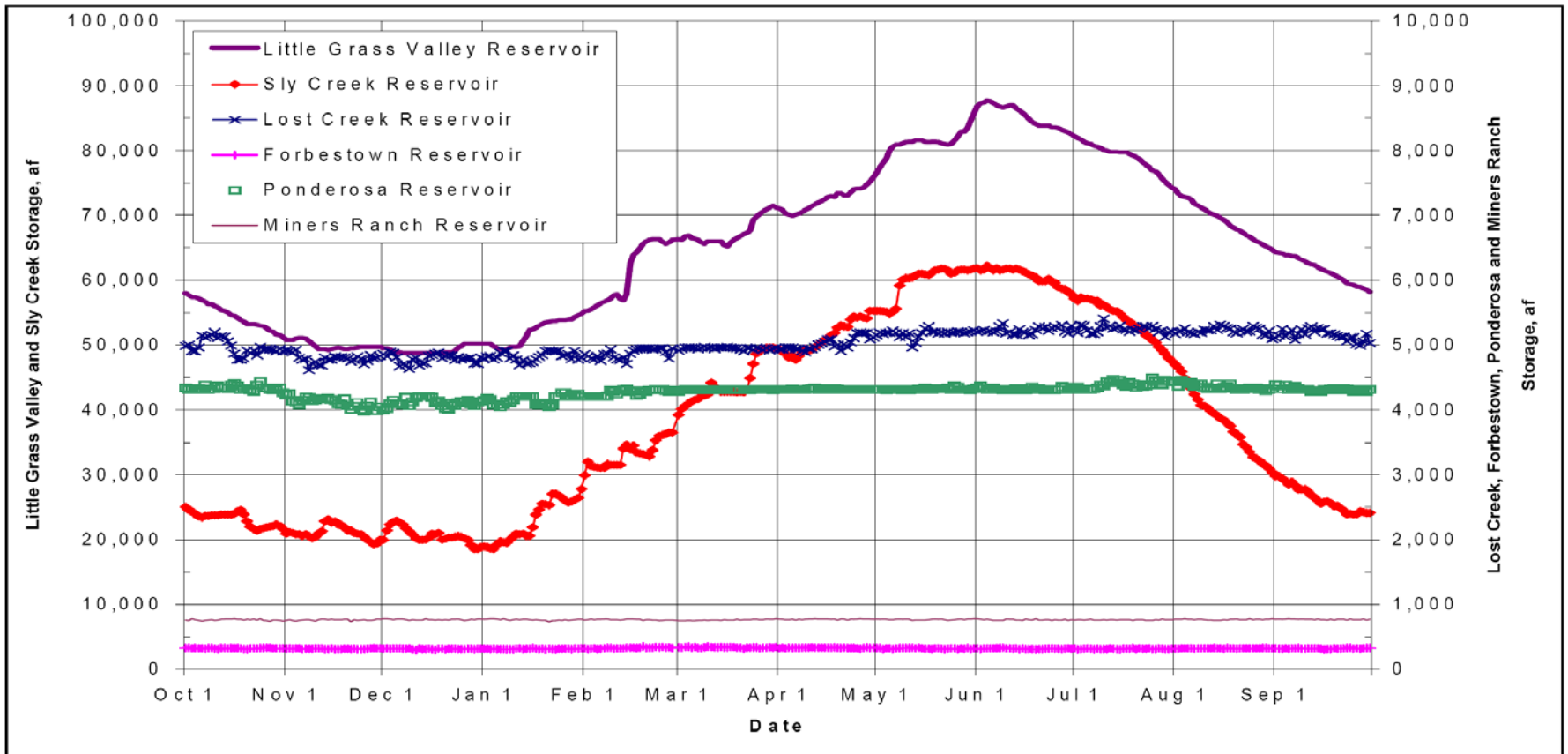


Figure 3-1. Median daily reservoir storage for South Fork Power Project reservoirs, 1973 through 2001. (Source: South Feather, 2007)

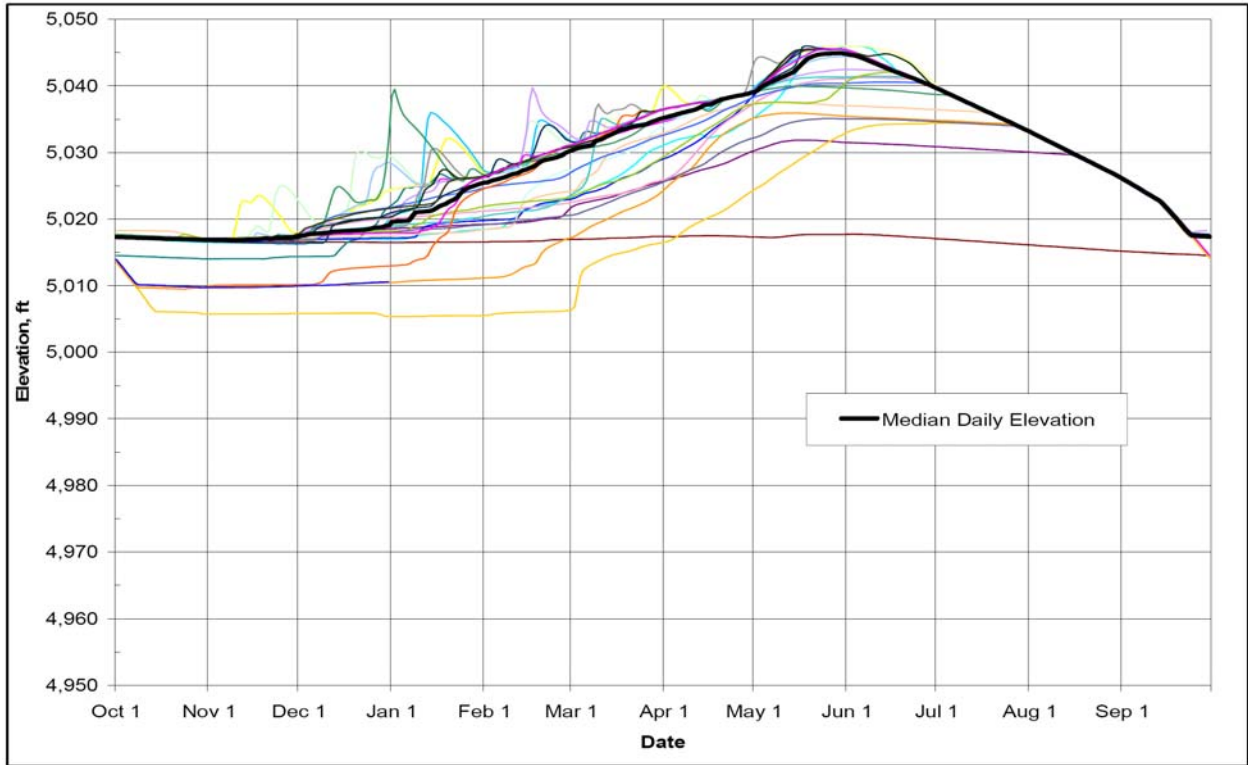


Figure 3-2. Little Grass Valley reservoir water surface elevations for 1973 through 2000. (Source: South Feather, 2007)

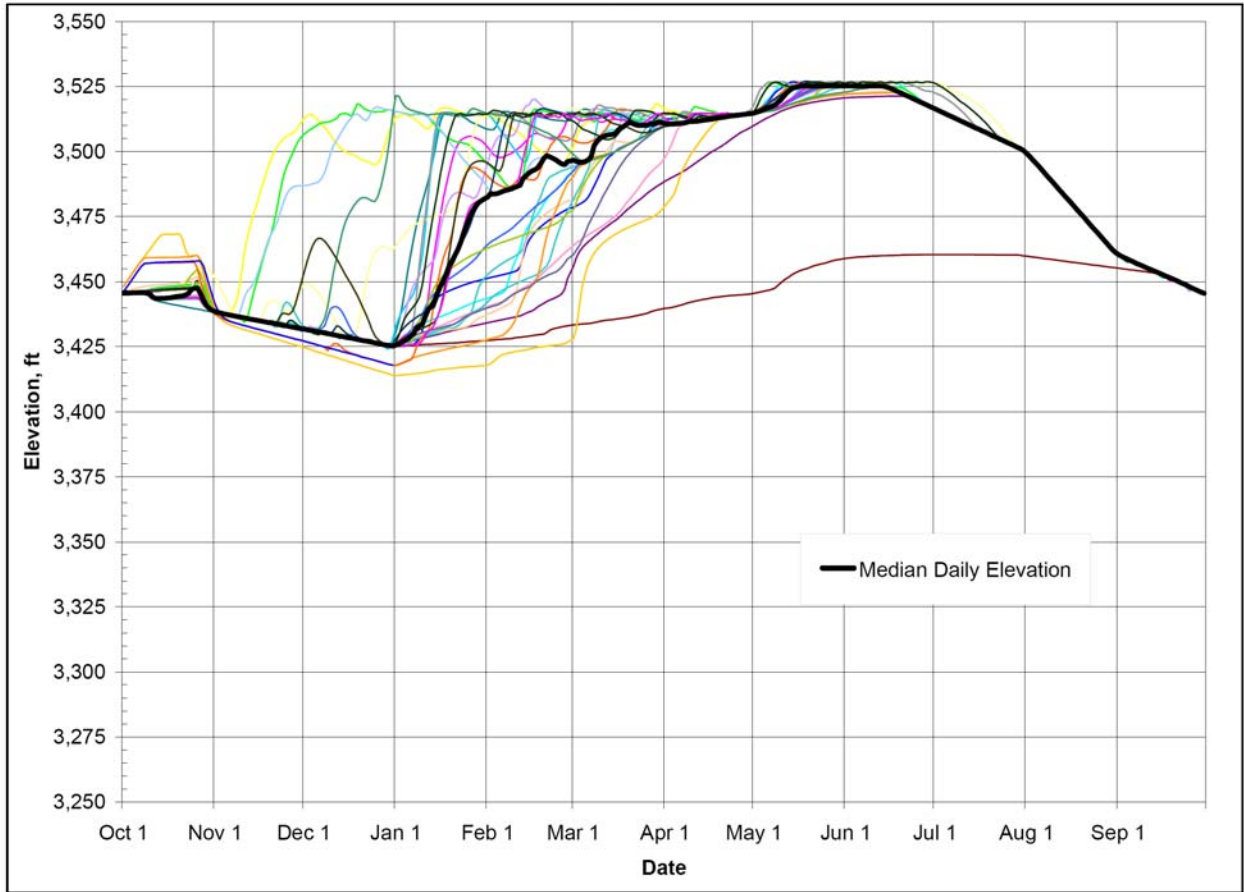


Figure 3-3. Sly Creek reservoir water surface elevations for 1973 through 2000.
 (Source: South Feather, 2007)

Table 3-2. Estimated unregulated streamflows below Little Grass Valley dam at USGS gage no. 11395030. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	13	65	109	168	182	220	224	251	107	20	7	7	114
Max.	524	2743	4319	7590	6680	3947	1593	2482	958	241	30	148	7590
Min.	3	2	2	4	6	7	9	15	3	2	2	2	2
90% Exc.	3	5	8	11	19	61	97	41	11	6	4	3	5
80% Exc.	4	6	11	17	31	84	130	65	15	7	4	4	6
50% Exc.	6	10	26	58	87	140	200	208	37	12	6	5	27
20% Exc.	11	49	116	205	218	261	308	410	156	23	9	7	177
10% Exc.	19	139	260	385	348	431	360	512	315	37	12	8	305

Table 3-3. Regulated streamflows below Little Grass Valley dam at USGS gage no. 11395030. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	100.1	89.2	71.3	86.3	103.6	114.7	91.1	133.8	103.9	109.0	124.9	151.9	106.6
Max.	484.0	1580.0	3510.0	5420.0	5200.0	1670.0	1040.0	2930.0	760.0	484.0	568.0	509.0	5420.0
Min.	4.2	2.2	2.2	1.9	1.9	1.8	3.2	2.5	3.9	3.2	3.2	5.7	1.8
90% Exc.	8.7	4.2	4.4	5.0	4.8	6.4	7.3	9.5	6.6	6.3	8.5	41.0	6.0
80% Exc.	13.0	5.3	6.4	7.6	7.2	9.2	8.5	12.0	9.3	11.0	13.0	55.0	9.3
50% Exc.	81.0	55.0	12.0	13.0	14.0	21.0	20.0	29.0	54.0	101.0	117.0	118.0	54.0
20% Exc.	175.0	167.0	129.0	164.0	182.0	199.0	208.0	230.0	167.0	199.0	205.0	238.0	193.0
10% Exc.	198.0	223.0	236.0	216.0	244.2	261.0	254.0	353.0	307.0	236.0	240.2	302.0	251.0

Table 3-4. Estimated unregulated streamflows below Slate Creek diversion dam at USGS gage no. 11443300. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	24	123	209	328	371	462	390	370	152	36	14	12	207
Max.	1000	5232	7720	12100	10583	5466	5486	4734	984	400	58	283	12100
Min.	5	5	5	7	11	18	18	28	6	4	3	3	3
90% Exc.	6	10	15	21	35	127	144	63	20	11	7	6	9
80% Exc.	8	11	22	33	61	175	192	100	28	13	8	7	12
50% Exc.	11	20	49	107	180	309	331	284	66	22	12	10	50
20% Exc.	20	93	221	396	442	553	543	601	226	43	18	14	314
10% Exc.	36	264	500	759	779	866	669	802	425	70	22	16	530

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Table 3-5. Regulated streamflows below Slate Creek diversion dam at USGS gage no. 11443300. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	15	62	132	196	220	245	183	165	42	12	11	10	107
Max.	668	4650	7710	12100	10500	5370	5350	3890	984	36	33	53	12100
Min.	5	5	1	6	1	4	7	6	6	3	3	3	1
90% Exc.	6	8	9	9	9	10	11	10	10	9	7	6	8
80% Exc.	8	10	10	11	11	11	11	11	11	10	8	7	10
50% Exc.	10	11	11	12	12	19	13	12	11	11	11	10	11
20% Exc.	13	15	19	169	236	362	410	341	16	12	13	12	25
10% Exc.	16	54	261	455	502	615	567	572	33	16	14	14	291

Table 3-6. Estimated unregulated streamflows below Lost Creek dam at gage no. 11396000. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	12	48	89	139	158	193	137	97	45	17	8	7	79
Max.	247	1271	3751	5879	3856	2259	1666	862	202	120	30	137	5879
Min.	3	3	3	4	6	9	9	9	4	2	2	2	2
90% Exc.	4	6	9	12	19	42	35	29	12	7	4	4	6
80% Exc.	5	7	12	18	30	73	53	37	16	8	5	4	7
50% Exc.	7	11	26	55	90	144	121	71	33	13	7	6	26
20% Exc.	11	49	100	190	203	250	196	150	70	24	11	8	119
10% Exc.	18	113	190	316	341	365	253	208	97	34	13	10	196

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Table 3-7. Regulated streamflows below Lost Creek dam at gage no. 11396000. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	4	3	48	52	96	103	57	43	45	4	4	5	38
Max.	100	44	2650	4490	3300	2250	1410	1530	954	170	15	218	4490
Min.	0	0	0	0	0	0	0	0	0	0	0	0	0
90% Exc.	1	0	0	1	1	1	1	1	1	1	1	1	1
80% Exc.	1	1	1	1	1	1	1	1	1	1	1	1	1
50% Exc.	2	3	3	4	4	4	6	5	5	5	5	5	4
20% Exc.	5	4	5	6	20	189	9	9	8	6	6	6	7
10% Exc.	8	6	6	74	316	351	293	86	10	9	9	9	11

Consumptive Use

South Feather's Miners Ranch water treatment plant, located on the northwest side of Miners Ranch reservoir, was constructed and placed into service in 1981. It draws water directly from the Miners Ranch reservoir immediately upstream from the inlet to the Kelly Ridge tunnel. Average annual withdrawals total 5,768 acre-feet, with the months of May through September constituting the peak delivery season. The Miners Ranch treatment plant has the capacity to deliver 14.5 million gallons per day (MGD), about 22.4 cfs. The average daily demand is 5.3 MGD (about 8.2 cfs).

South Feather's Bangor canal, a non-project feature receiving water from Miners Ranch reservoir, serves irrigation water along the canal and the Bangor water treatment plant. This facility has an average daily demand of 0.018 MGD (about 0.03 cfs). With the addition of water supplied to irrigators, annual consumptive use on the Bangor canal averages 8,813 acre-feet.

South Feather's Palermo canal, a non-project feature, distributes an average of 7,340 acre-feet to customers from Oroville dam at a maximum rate of 40 cfs. The canal uses inflows from Sucker Run Creek and spilled flows from Ponderosa dam.

North Yuba Water District operates the Forbestown water treatment plant, which receives water from the project's Woodleaf power tunnel, delivered via South Feather's Forbestown ditch, a non-project feature. North Yuba Water District has a contractual right to request delivery of up to 3,700 acre-feet of water annually into the Forbestown ditch for its irrigation customers and for the Forbestown water treatment plant, and additional quantities of water can be taken into the Forbestown ditch, up to 15,500 acre-feet per calendar year, subject to reimbursement to the project for foregone power generation revenues.

3.3.2.1.2 Water Quality

Like many other headwater streams of the Sierra Nevada, tributaries of the SFFR generally have excellent water quality. Below Little Grass Valley reservoir, the SFFR gains water as it flows downstream and is joined by Bear, Lost, and Oroleve creeks before flowing into Ponderosa reservoir. With the possible exception of legacy contamination from historic gold mining activities, contaminants responsible for lower water quality are generally associated with agricultural activities and residential areas that primarily occur outside the project area and in lower elevation areas.

Water Quality Standards

The Central Valley Regional Water Quality Control Board (CVRWQCB) adopted a basin plan in 1994, which was revised in 1998 and 2001, for the Sacramento River and its tributaries. The basin plan formally designates existing and potential beneficial uses and water quality objectives. No modification to the basin plan has been specifically developed for the SFFR within the project area.

The basin plan designates beneficial uses for Lake Oroville and the mainstem of the Feather River from the fish barrier dam to the Sacramento River. Because Lake Oroville is a large surface water impoundment and includes no riverine sections, the Water Board stated in its October 25, 2006, comments on South Feather's draft license application that it is more appropriate to apply to the SFFR the uses for the Feather River from the fish barrier dam to the Sacramento River. The beneficial uses of the Feather River from the fish barrier dam to the Sacramento River are municipal and domestic supply, irrigation, water contact recreation and canoeing and rafting, other non-contact water recreation, warm freshwater habitat, cold freshwater habitat, migration and spawning of coldwater aquatic organisms, and wildlife habitat. In addition, the Water Board indicates that hydropower generation is an existing beneficial use and should also apply to the SFFR. Table 3-8 lists water quality objectives specified in the basin plan to protect these beneficial uses.

No sections of the SFFR, Lost Creek, or Slate Creek in the vicinity of the project are included on the most recent California 303(d) list and Total Maximum Daily Load (TMDL) priority schedule.

Monitoring studies conducted by South Feather found minor exceedances of water quality objectives for several constituents, but no adverse effects on beneficial uses. The observed exceedances are summarized as follows.

Chemical Constituents. With the exception of one unexpectedly high arsenic value in the Slate Creek diversion dam reach, human health based criteria were not exceeded during 2004. Low levels of other inorganic and trace metal constituents in samples collected throughout the study area demonstrate generally high water quality typical of many snow-melt fed river systems of the Sierra Nevada.

Dissolved Oxygen. Periods of hypoxia occur seasonally in the deeper portions of Little Grass Valley, Ponderosa, and Lost Creek reservoirs. However, metalimnetic, epilimnetic and downstream dissolved oxygen levels remained above the 7 mg/L standard at all times, and the observed periods of anoxia in deeper portions of these reservoirs had no apparent effect on beneficial uses.

Tastes and Odor. Periods of anoxia in project reservoirs may be associated with releases of taste and odor compounds such as iron and manganese. Iron and manganese exceeded secondary maximum contaminant levels (MCLs) upstream of Ponderosa reservoir and downstream of the Slate Creek diversion dam in August 2004. Sampling showed iron concentrations up to three times higher in the hypolimnion than in the epilimnion of Ponderosa reservoir, suggesting that anoxic conditions in Ponderosa reservoir may alter oxidation/reduction conditions sufficiently to affect downstream levels of these constituents. However, given no history of taste and odor complaints from municipal water users, these effects appear to be minor.

Table 3-8. Water quality objectives to support designated uses in SFFR in the project area. (Source: CVRWQCB, 1998)

Water Quality Objective	Description
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.
Biostimulatory Substances	Water shall not contain biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Specific trace element levels are given for certain surface waters, none of which include the waters in the vicinity of the Project. Electrical conductivity (at 25°C) shall not exceed 150 micromhos/cm (90 percentile) in well-mixed waters of the Feather River from the Fish Barrier dam at Oroville to Sacramento River. 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.
Color	Water shall be free of discoloration that causes a nuisance or adversely affects beneficial uses.
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. Specific dissolved oxygen water quality objectives below Oroville dam are 8.0 mg/L from September 1 to May 31, for Feather River from Fish Barrier Dam at Oroville to Honcut Creek. When natural conditions lower dissolved oxygen below this level, the concentrations shall be maintained at or above 95 percent of saturation.
Floating Material	Water shall not contain floating material in amounts that cause a nuisance or adversely affect beneficial uses.

Water Quality Objective	Description
Oil and Grease	Water shall not contain oils, greases, waxes or other material in concentrations that cause a 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.
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.
Pesticides	Waters shall not contain pesticides or a combination of pesticides in concentrations that adversely affect beneficial uses. Other limits established as well.
Radioactivity	Radionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.
Sediment	The suspended sediment load and suspended-sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes a nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.
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.
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 temperature does not adversely affect beneficial uses. Increases in water temperatures must be less than 2.8°C above natural receiving-water temperature.

Water Quality Objective	Description
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analysis indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests as specified by the Regional Water Quality Control Board.
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.

Toxicity. In addition to an unexpectedly high arsenic level found in Slate Creek during an October 2004 storm event, the low levels of alkalinity and hardness found throughout the study area act to increase the toxicity of other trace metals, including lead; concentrations of which were slightly in excess of California Toxics Rule (CTR) criteria in Sly Creek and Little Grass Valley reservoirs. Lead was also found above the detection limit and Criterion Continuous Concentrations (CCC) criteria in Little Grass Valley reservoir following a storm event in October 2004, with measured levels at downstream locations in the Little Grass Valley dam, South Fork diversion dam, and SFFR/Lost Creek reaches above CCC criteria, but below the laboratory detection limit. With the exception of one additional sample in excess of CTR 1-hour criteria for silver at the Forbestown diversion dam in August 2004, low levels of other inorganic and trace metal constituents in samples collected throughout the study area do not exceed CTR criteria and are consistent with the generally high water quality typical of snow-melt fed river systems of the Sierra Nevada. Although results indicate that consistent low-level exceedances of lead criteria occur in Sly Creek reservoir and potential associations with stormwater runoff at other locations, no connection to project O&M is evident.

Water Temperature. Because the basin plan does not provide a numerical temperature water quality objective other than limitation of warming to less than 5°F (2.8°C) that is applicable to hydroelectric project relicensing, South Feather assumed that the cold freshwater habitat beneficial use was considered to be supported if the mean daily water temperature remained below 20°C, which is generally considered to be near the upper limit of the optimal temperature range for rainbow trout. Moyle (2002) states that the optimal temperatures for growth of rainbow trout are around 15 to 18°C, and Behnke (1992) reports that other fish species may gain a competitive advantage over trout as water temperatures approach 21°C. Although warmwater fish typical of

transition zone or Sierran foothill fish assemblages (e.g., Sacramento pikeminnow, sucker, and hardhead) can abide warmer waters (25 to >30°C), these species are fairly tolerant of a wide temperature range and can experience optimum growth temperatures that overlap with those of more typical coldwater fish (e.g., trout). Most streams in which hardhead occur have summer temperatures in excess of 20°C, and optimal temperatures appear to be between 17 and 28°C (Moyle, 2002). As the basin plan does not specify numerical limits for the warm freshwater habitat beneficial use, the presence of warmwater tolerant species (e.g., hardhead) was used to determine whether the basin plan's warmwater beneficial use designation could be appropriately applied to a given reach or subreach.

Cold supporting reaches. Daily mean water temperatures in the Little Grass Valley dam reach did not exceed 20°C at any time. Although the South Fork diversion dam reach did exceed the 20°C threshold at the most downstream site, exceedances were rare and the maximum daily mean water temperature was not far above the 20°C threshold. Similarly, although the two sites in the SFFR/Lost Creek reach had mean daily water temperatures that exceeded 20°C for a combined total of 6, 13, and 9 days in July 2004, 2005, and 2006, respectively, the maximum daily mean water temperature measured was only 21.5°C. In the Lost Creek dam reach, only one daily mean water temperature measured higher than 20°C over the 2004 to 2006 study period (20.3°C) in July 2005, just upstream of the confluence with the SFFR. Because of the short duration of temperatures in excess of 20°C, these reaches were considered supportive of basin plan designated beneficial uses related to cold freshwater habitat.

Warm supporting reaches. Exceedances of 20°C mean daily water temperature objectives occurred in June through August in each year of monitoring throughout the length of the Forbestown diversion dam reach below the migration barrier waterfall at SFFR RM 3. However, the observed temperature exceedances are not necessarily an indication of project-related impairments. The Forbestown diversion dam reach is located at elevations 981 to 1,703 feet msl, corresponding to the lower Sierra Nevada foothills transition zone. The typical historic (unregulated) hydrograph of the Sierra Nevada Range was snowmelt driven, with mid- to late summer months in the foothills transition zone supporting low flows and warmer water temperatures. Without the influence of cold hypolimnetic releases from Little Grass Valley, Sly Creek, and Lost Creek reservoirs, the Forbestown diversion dam reach most likely did not provide water temperatures at or below 20°C in this reach during the mid to late summer.

Non-supporting reaches. Over the entire Slate Creek diversion dam reach, exceedances of 20°C mean daily water temperatures occurred from June through September. Review of Slate Creek diversion flows over the 29 years of record indicate that diversions are typically discontinued by mid-June in Dry water year types, prior to increases in water temperatures above the 20°C threshold. However, in Normal and Wet water year types Slate Creek diversions can continue into July, when upstream water temperatures are higher. Although the Slate Creek diversions are typically discontinued or much reduced during time periods when water temperatures exceed the 20°C

threshold, project operation may have some effect on summer water temperatures immediately below the Slate Creek diversion dam and on support of designated cold freshwater habitat. In the lower portion of the reach, water temperatures in July are likely to exceed 20°C threshold regardless of project operation.

3.3.2.1.3 Aquatic Biota

Streams and reservoirs in the project area support fisheries for rainbow, brown, and brook trout, and a transitional warmwater fish assemblage in the lower elevation portions of the project area. In this section we describe the aquatic habitats and aquatic biota within project-area waters.

Important and Special Status Fish Species

Rainbow and brown trout support important recreational fisheries in the project area. Hardhead is both a California Species of Concern and a Forest Service Sensitive Species. Three federally listed salmonid species (winter-run Chinook salmon [endangered], Central Valley spring-run Chinook salmon [threatened], and California Central Valley steelhead [threatened]) may have occurred in the project area prior to the construction of the DWR's Oroville dam and the Oroville Project's fish barrier dam, located about 5 miles downstream of Oroville dam. NMFS has designated the Feather River downstream from the fish barrier dam as critical habitat for the Central Valley spring-run Chinook and California Central Valley steelhead ESUs.

Coastal rainbow trout are the trout species native to most west-side watersheds, and were historically found below an elevation of 4,900 feet, but have been introduced throughout the western Sierra Nevada including most of the project area. Rainbow trout spawn in the spring, although the specific spawning time is influenced by factors such as the genetic strain of the fish, water temperature, and period of daylight. Spawning usually occurs in gravel riffles or gravel pockets of small streams. Females excavate a nest, or "redd," in the gravel and, after spawning, cover the eggs with gravel. After hatching, the fry remain in the gravels until their yolk sacs are absorbed. The fry then venture into open water, feeding on plankton and aquatic macroinvertebrates. As they mature, they begin to feed on aquatic and terrestrial insects, and large trout also feed on fish and crayfish.

Brown trout are an introduced species in California, and occur mainly in low- to mid-elevation ranges. Brown trout spawn in the fall, although the specific spawning time is influenced by factors such as the genetic strain of the fish, water temperature, and period of daylight. Spawning usually occurs in gravel riffles or gravel pockets of small streams. Despite differences in timing, the spawning and rearing characteristics of brown trout are similar to rainbow trout. Brown trout can be found in tributaries, rivers, lakes, and reservoirs. Adults generally remain near the bottom of pools, while juveniles can be found in riffles as well as in pools. Brown trout prefer temperatures below 20°C, and have high growth rates at water temperatures between 12 and 20°C (Moyle, 2002). Brown trout compete with other trout species for resources.

Hardhead are a large, native minnow that is generally found in undisturbed areas of larger low- to middle-elevation streams (elevation between 30 to 4,760 feet in the Sacramento and San Joaquin watersheds). Its range extends from the Kern River in the south to the Pit River in the north. Hardhead inhabit areas that have clear, deep pools with sandy, gravel/boulder substrates and slow water velocities (less than 0.05 feet/second). Hardhead co-occur with Sacramento pikeminnow and usually with Sacramento suckers, and tend to be absent from streams where introduced species, especially centrarchids, predominate. Hardhead have been identified in Ponderosa reservoir through fish population surveys and in the SFFR immediately above Ponderosa reservoir. Adults spawn and juveniles rear in the Forbestown bypassed reach, but they have not been documented upstream of the fish migration barrier 1.8 miles upstream of Ponderosa reservoir.

Chinook salmon (both fall- and spring-run) were historically abundant in the Feather River watershed prior to the start of construction of Oroville dam in 1961. Fall-run Chinook salmon were less abundant and less widely distributed than the spring-run, and spawned primarily in the mainstem river. Spring-run Chinook salmon ascended all four branches of the Feather River (West Branch, North Fork, Middle Fork, and South Fork) above Oroville, with the longest migrations up the North Fork. Spring-run Chinook salmon migrations up the SFFR were limited by low summer flows caused by water diversions at the Forbestown and Palermo canals. Yoshiyama et al. (2001) states: “Before the diversions of the stream, spring-run salmon may have ascended to the vicinity of Forbestown, near the present upper limit of the South Fork arm of Lake Oroville.” However, the historic distribution of anadromous fish in the SFFR may have been extended by a fish ladder and impoundment at Enterprise dam (prior to filling of Lake Oroville), which could have provided access for anadromous fishes as far upstream as the natural barriers documented by Chandler (1952). This estimate is corroborated by observation of an anadromous fish (steelhead or salmon) in the SFFR about 1 mile downstream of Carlyle Mine, near the current Ponderosa dam (Chandler, 1952).

Prior to construction of Oroville dam, Cal Fish & Game surveyed the SFFR in connection with its recommendations regarding construction of the South Feather Power Project (Chandler, 1952). The purpose of the survey was to establish the upstream extent of anadromous fish use. A pedestrian survey of the reach identified two barriers: a low flow barrier (cascade with an 8 foot drop) about 1.1 miles upstream of Ponderosa reservoir’s current normal maximum water surface elevation, and a main barrier about 2.05 miles upstream of Ponderosa reservoir’s normal maximum water surface elevation. The main barrier was reported as “about 15 feet high” with a deep pool at the base. Chandler noted that heavy mining occurred throughout the SFFR and patches of gravel were uncommon, particularly between Ponderosa reservoir and the lower migration barrier. Based on available spawning habitat, Cal Fish & Game personnel estimated that approximately 26 spawning pairs of salmon could be accommodated below and 130 pairs could be accommodated above the lower barrier (Chandler, 1952).

Benthic Macroinvertebrates

Benthic macroinvertebrates are listed as Forest Service Management Indicator Species for aquatic species in the Plumas National Forest. During sampling conducted at three locations in SFFR during fall 1986, a total of 43 invertebrate groups and subgroups of six different taxa were identified (most often to genus). Insects comprised 39 of 43 groups, with typical mountain stream insects such as mayflies, stoneflies, caddisflies, and midges dominant. Other invertebrates included oligochaetes, nematodes, crustaceans, and gastropods. Invertebrate densities were 27 to 283 organisms per square-foot. The diversity and densities of invertebrates were similar in all SFFR sample sections and were slightly lower than in less developed streams, but are not atypical for a developed Sierra Nevada stream like the SFFR. South Feather did not find the two special-status aquatic macroinvertebrates that have a potential to occur in the project area (the amphibious and golden-horned caddisflies, both federal species of concern). Neither of these species has been documented to occur in the project area.

Reservoir Fish

In total, 16 different species (not including trout hybrids) have been documented in project reservoirs (table 3-9). During sampling conducted in the fall of 2004, South Feather observed 12 species in the reservoirs, including three species (California roach, carp, and speckled dace) that had not been previously documented. Four species (channel catfish, golden shiner, hitch, and tui chub) that were observed in project reservoirs historically were not observed during the 2004 surveys.

Table 3-9. Fish species documented in the South Feather Power Project reservoirs.^a
(Source: South Feather, 2007)

Species	Little Grass Valley Reservoir	Ponderosa Reservoir	Sly Creek Reservoir	Lost Creek Reservoir
brown bullhead	●○			
brown trout	●○	●○	●○	●○
California roach			○	○
carp				○
channel catfish		●	●	
golden shiner	●		●	
green sunfish			●○	
hardhead		●○		
hitch			●	
kokanee	○		●	

Species	Little Grass Valley Reservoir	Ponderosa Reservoir	Sly Creek Reservoir	Lost Creek Reservoir
rainbow trout	●○	●	●○	●○
Sacramento pikeminnow		●○		
Sacramento sucker		●○		
smallmouth bass	○	●○		
speckled dace			○	
trout hybrids	●		●	
tui chub			●	

- ^a
- Species documented during 2004 surveys.
 - Species documented historically.

Little Grass Valley Reservoir. Historically, brown trout, rainbow trout, brown bullhead, and golden shiner have been documented in Little Grass Valley reservoir. Species captured in 2004 that had not been previously documented included kokanee and smallmouth bass. Rainbow trout and brown trout were the more abundant species, representing 54 percent of the total catch. Both species were distributed evenly around the reservoir and were captured in both shallow and deeper waters (from near-surface, to 100-foot depth). Brown bullhead was captured almost entirely within two nets along the north shore of the reservoir and within approximately 1 mile of the SFFR inflow. Smallmouth bass were captured almost entirely along the north shore of the reservoir within 1 mile of the Black Rock Creek and the SFFR inflows. All trout, kokanee, and smallmouth bass captured were adults. Brown bullhead was the only species captured as both juveniles and adults.

Sly Creek Reservoir. Historically, brown trout, channel catfish, golden shiner, green sunfish, hitch, kokanee, rainbow trout, and tui chub have been documented in the reservoir. In 2004, brown trout, green sunfish, and rainbow trout were again captured. In addition, California roach and speckled dace were also documented in the reservoir. Historical reports of channel catfish, golden shiner, hitch, kokanee, and tui chub in Sly Creek reservoir were not confirmed by the capture of any of those species in the 2004 survey. California roach was the most abundant species, representing 72 percent of the total catch followed by brown trout which represented 12 percent of the captured fish. California roach and green sunfish were evenly distributed in shallow waters around the reservoir. Brown trout and rainbow trout were evenly distributed in both shallow and deeper waters around the reservoir (from near surface to 100-foot depths). Only a single speckled dace was captured in 2004. All brown trout and speckled dace captured and the

majority of rainbow trout captured were adults. California roach were captured as both juveniles and adults and green sunfish were captured only as juveniles.

Lost Creek Reservoir. Brown trout and rainbow trout were historically documented in the reservoir. In addition to those species, California roach and carp were captured in the reservoir during the 2004 surveys. California roach was the most abundant species, representing 79 percent of the fish captured, followed by brown trout. Rainbow trout and California roach were captured only in shallow water habitats. Brown trout were evenly distributed around the reservoir in both deep and shallow waters (from near-surface to 50-foot depths). Brown trout and carp were all captured as adults. Rainbow trout and California roach were captured as both juveniles and adults.

Ponderosa reservoir. Fish species that occur in Ponderosa reservoir include brown trout, rainbow trout, channel catfish, hardhead, Sacramento pikeminnow, Sacramento sucker, and smallmouth bass. During sampling in 1998 and 2001, Sacramento sucker was the dominant species captured followed by Sacramento pikeminnow, hardhead, brown trout, and smallmouth bass. In September 2004, Sacramento sucker was the dominant species, followed by hardhead. Hardhead, Sacramento pikeminnow, and smallmouth bass were distributed throughout the reservoir in both shallow and deeper waters. Only one brown trout was captured in the reservoir. With the exception of brown trout, both juveniles and adults of all species were captured.

Miners Ranch Reservoir. South Feather states that it is unaware of any aquatic surveys in this reservoir, but expects fish populations to be similar to those in Ponderosa reservoir because of the hydrologic connection between the two reservoirs via Miners Ranch conduit. Fish species expected to occur include rainbow trout, brown trout, channel catfish, hardhead, Sacramento pikeminnow, Sacramento sucker, and smallmouth bass. Because the reservoir provides domestic water supply, it is closed to fishing.

Stream Fish Populations

During 2004-2006 surveys, South Feather sampled all project reaches and reference reaches with similar habitat characteristics selected for comparison of fish populations. During the 2004 to 2006 surveys, nine species were identified, including three (kokanee, smallmouth bass, and hitch) that were not previously documented. Rainbow and brown trout were the dominant species throughout most of the study area, and many sites within the study area were composed exclusively of trout. Trout were the only species observed in the upper reaches of the SFFR and in Lost Creek. Between the rainbow and brown trout populations, the dominant species has fluctuated over time throughout the study area.

There is a natural upstream migration barrier about 1.8 miles upstream of Ponderosa reservoir that prevents many transitional and warmwater species from moving above this location. Below this barrier, the species composition expands to include more transitional zone species (including hardhead, Sacramento sucker, and Sacramento

pikeminnow), several of which are presumed to migrate upstream from Ponderosa reservoir. The species composition in Slate Creek follows a similar pattern, with the fish composition in the upper elevations of Slate Creek includes rainbow trout and speckled dace, whereas the lower section of Slate Creek includes transition zone species as well as one warmwater species (smallmouth bass). The lower section of Slate Creek also contains migratory species from New Bullards Bar reservoir (including transition zone species and kokanee) which could migrate up to a natural upstream migration barrier located approximately 4.6 miles upstream of the North Yuba River confluence.

The species distribution pattern observed in the project area follows the temperature regime of the study area. Trout generally dominated in most of the reaches, while transitional warmwater species dominated in the warmer downstream, lower elevation reaches. Water temperature at all sampling locations followed an overall seasonal pattern of generally rising temperatures from March through July, and generally decreasing temperatures from August through October. Between March and September 2004, mean daily water temperatures increased from a range of 5 to 8°C at upper elevation sites to a range of 17 to 21°C at lower elevations. The mean daily temperature in the Lost Creek dam reach also increased downstream with the maximum daily temperature of 19.0°C recorded near the SFFR confluence in July. The species composition in Lost Creek was exclusively trout, with historical records including speckled dace and California roach. Within the Forbestown diversion dam reach water temperatures as high as 24.5°C were recorded just above Ponderosa reservoir, and this section of stream was composed primarily of transitional zone species such as hardhead and Sacramento pikeminnow. The mean daily temperature in the Slate Creek diversion dam reach reached a maximum mean daily temperature of 22.1°C in July near the lower end of the reach, and this lower section supports transitional zone species as well as warm water fish.

SFFR – Trout Dominated Sites. The fish species composition in the SFFR was exclusively trout in the upper watershed, changing to transitional zone species (e.g., hardhead and Sacramento pikeminnow) in the lowermost portion of the river above Ponderosa reservoir. Trout-dominated reaches in the SFFR include the Little Grass Valley dam reach, the South Fork diversion dam reach, and the SFFR/Lost Creek reach.

The Little Grass Valley dam reach extends 9.1 miles from the base of Little Grass Valley dam at elevation 4,842 feet msl, to the maximum water surface elevation of the South Fork diversion dam impoundment at elevation 3,557 feet msl. The reach has an average gradient of 2.7 percent. Boulder and cobble are the dominant substrate types, and South Feather's habitat surveys indicated that spawning gravel is available in moderate amounts, occurring primarily in the middle portion of the reach. The abundance of LWD was estimated at 30 pieces per mile, with most of the larger pieces occurring in the lower and middle sections of the reach. One permanent fish migration barrier exists in the middle of the reach.

The South Fork diversion dam reach extends 9.4 miles from the base of the South Fork diversion dam at elevation 3,499 feet msl to the confluence with Lost Creek at elevation 1,952 feet msl. The reach has an average gradient of 3.1 percent, boulder and cobble were the dominant substrate, and South Feather found that spawning gravel was less available in this reach than in any other reach in the study area. Most of the gravel occurred within the lower half of the reach. The majority of fish cover was provided by boulders. Ground mapping indicated a LWD frequency of 24.5 pieces per mile, with the majority of the larger pieces observed in the middle portion of the reach. One potential barrier to fish migration was identified in the lower section of the reach

The SFFR/Lost Creek reach extends 1.0 mile from the Lost Creek confluence at an elevation of 1,952 feet msl to Forbestown reservoir at an elevation of 1,783 feet msl. The reach has an average gradient of 3.2 percent, is highly confined with boulder and bedrock bank substrate, and the majority of the reach was confined and shallow. Spawning gravel and fish cover analyses were not conducted for this short reach. LWD was observed at approximately two pieces per mile through aerial videography, although this method typically underestimates LWD frequency compared to ground mapping. No permanent fish barriers were observed during aerial videography mapping.

The average trout biomass from 1993 to 2006 in the SFFR at trout dominated sites ranged from 27 to 90 pounds per acre, and the average number of catchable trout per mile ranged from 55 to 1,536 trout per mile. All sites in the four project reaches in the SFFR (Little Grass Valley dam, South Fork diversion dam, SFFR/Lost Creek, and Forbestown diversion dam) supported trout populations with a higher average trout biomass and density of catchable trout than other populations found in stream sections of similar size in the Sierra Nevada Mountains (24 pounds per acre observed by Gerstung, 1973). Although Platts and McHenry (1988) reported higher levels of biomass in Sierran streams, most of the streams included in this reference were small streams less than 24 feet wide. South Feather used data from Gerstung (1973) for streams that were between 25 and 40 feet wide, which is closer to the average width of 39 feet for the project reaches, and would provide a better representation of potential trout biomass in streams that are comparable in size to the project bypassed reaches.

Forbestown Diversion Dam Reach. The Forbestown diversion dam reach is the 5.5-mile-long section of the SFFR from the base of the Forbestown diversion dam at elevation 1,703 feet msl to the normal high water line of Ponderosa reservoir at elevation 961 feet msl. The reach has an average gradient of 2.6 percent. More than half of the 114 pools surveyed in the reach were greater than 4 feet deep, and the dominant substrate types were boulder and bedrock. There was 190 square feet per mile of suitable spawning gravel, which was distributed throughout the reach in small patches. The majority of fish cover was provided by boulders; LWD was observed at a frequency of 12 pieces per mile during ground mapping. The larger pieces of LWD were evenly distributed with pieces observed throughout the reach. Cascades formed three permanent barriers to upstream fish migration in this reach. All three cascades occurred in the lower

half of the reach, with the lowermost barrier occurring 1.8 miles upstream from Ponderosa reservoir.

Fish populations in the Forbestown diversion dam reach included transitional zone species (Sacramento pikeminnow, hardhead, and Sacramento sucker), hitch, and both rainbow and brown trout. Sacramento pikeminnow, hardhead, and Sacramento sucker were typically the numerically dominant species, and composition varied between years.

Slate Creek Diversion Dam Reach. Slate Creek diversion dam reach extends 9.1 miles from the base of the Slate Creek diversion at elevation 3,492 feet msl to the confluence with the North Yuba River at an elevation of 1,975 feet msl. Slate Creek has an average gradient of 3.3 percent, and boulder is the dominant substrate type. South Feather estimated that this reach contained 316 square feet of spawning gravel per mile, occurring primarily in the lower end of the reach. Most of the reach was shallow and confined with bedrock and gravel bank substrates. Cover suitable for fish was absent from most of the reach, and no significant quantities of LWD were mapped via aerial or ground mapping. The larger pieces of LWD that were mapped using aerial video were distributed evenly throughout the reach. The aerial video mapping identified two cascades that are potential barriers to fish migration.

The fish species composition in Slate Creek consisted of rainbow trout and speckled dace in the upper watershed, changing to transitional zone (e.g., Sacramento pikeminnow) and warmwater species (e.g., smallmouth bass) in the lowest section of the river near the North Yuba River confluence. Average trout biomass from 1993 to 2005, at trout-dominated sites ranged from 24 to 28 pounds per acre, and the average number of catchable trout ranged from 248 to 304 trout per mile.

Lost Creek Dam Reach. The Lost Creek dam reach is the 3.9-mile-long section of Lost Creek extending from the base of Lost Creek dam at elevation 3,170 feet msl to its confluence with the SFFR at elevation 1,952 feet msl. The river has an average gradient of 5.8 percent, and boulder and bedrock were the dominant substrates. The abundance of spawning gravel was estimated at 255 square feet per mile. Fish cover was not present in most of the reach, and LWD was documented at 5.7 pieces per mile. Two barriers to upstream fish migration were identified from ground mapping, with a third barrier identified elsewhere in the reach from the aerial video.

Fish sampling indicated that the fish population in Lost Creek is exclusively trout. The average trout biomass from 1993 to 2005 ranged from 12 to 38 pounds per acre. Overall, the age class distribution of trout in the Lost Creek reference reach included moderate recruitment of YOY and a consistent low abundance of 1+ and 2+ age groups with few older age classes (3+ and older). Downstream of Lost Creek dam, there was a higher recruitment of YOY trout, yet still a low abundance of 1+ and 2+ age fish and fewer older age classes (3+ and older). The age class composition varied by year, showing lower recruitment in 1996 and 2005, and a high recruitment in 1999.

3.3.2.2 Environmental Effects

Minimum Flows

Flow regulation at Little Grass Valley and Sly Creek reservoirs and diversion of water to the project powerhouses affect aquatic biota and recreational opportunities in five riverine reaches. These reaches are the Little Grass Valley dam, South Fork diversion dam, and Forbestown diversion dam reaches of the SFFR, Slate Creek below the Slate Creek diversion, and Lost Creek below Lost Creek reservoir.

In its final license application, South Feather proposed a minimum flow regime for each of the project reaches that varies by month for four water year types. In all cases the proposed flows are equal to or greater than the flows that are required in the current project license.

Cal Fish & Game filed a 10(j) recommendation and the Forest Service filed a preliminary 4(e) condition specifying seasonal flow regimes for each water year type for each reach. South Feather also filed an alternative 4(e) condition specifying minimum flows that were in many cases consistent with the Forest Service's 4(e) flows, and in most other cases were intermediate between the flows proposed in the license application and the Forest Service's 4(e) flows. The Forest Service filed its final 4(e) conditions on March 6, 2009. The Forest Service adopted South Feather's alternative 4(e) flows for Above Normal, Below Normal, and Wet water year types in the Lost Creek reach, and reduced their flows to be more consistent with South Feather's alternative 4(e) condition in several other reaches.

South Feather proposes that the instantaneous flow releases be allowed to deviate below the specified minimum flow releases by up to 10 percent or 3 cfs, whichever is less. The Forest Service specifies that the instantaneous flow be at least 80 percent of the specified mean daily flow for minimum flows less than or equal to 10 cfs, and at least 90 percent of the specified mean daily flow for minimum flows greater than 10 cfs. The Forest Service also specifies that if mean daily flows fall below the specified flow release, that South Feather begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release, and that credit for additional releases not exceed 20 percent of the instantaneous amount. South Feather's alternative 4(e) condition is consistent with the Forest Service's 4(e) condition except that it does not include the 20 percent limit on credit for additional releases.

Cal Fish & Game also filed a 10(j) recommendation that water surface elevations at Little Grass Valley and Sly Creek reservoirs be maintained as high as possible to protect beneficial uses of the reservoirs, while recognizing the need for protection of ecological resources, power production, and consumptive water supply.

Our Analysis

In the draft EIS, we analyzed the effect of alternative flow regimes on habitat for adult rainbow trout (as represented by modeled weighted usable area [WUA]), water

temperature suitability for rainbow trout, hardhead, and amphibians, and effects on water levels in Little Grass Valley reservoir. Our analysis of effects on fish habitat included consideration of static WUA values associated with each minimum flows, as well as South Feather's habitat time series analysis, which included incorporation of accretion flows within each reach and comparison of habitat availability under each of the proposed flow regimes with monthly WUA availability under proposed flows with unimpaired flows for four water year types.

In their comments on the draft EIS, Cal Fish & Game provided additional information on the trout lifestages and other parameters (wetted perimeter, hydrology, and temperature), that were given priority in developing their recommended flow regime for different seasons and water year types in each reach. During the 10(j) meeting held on March 24, 2009, Commission staff agreed to expand our analysis to include consideration of the additional information that Cal Fish & Game filed in their comments on the draft EIS. We have revised our analysis in this section to include this new information, and also to reflect changes in the flows specified by the Forest Service in their final 4(e) condition.

One of the concerns raised by both Cal Fish & Game and Forest Service in their comments on the draft EIS was the methodology that South Feather used in its habitat time series analysis. Both agencies commented that integrating the hydrologic input over each reach to account for accretion flows did not allow effects on habitat close to the dams to be evaluated. They both also expressed concern that the analysis was based on monthly average flows determined for specific water year types from a 30-year record, since discretionary releases made to meet downstream water needs in portions of a month could mask the effects of lower flows that occurred in other portions of the month or in other years. We do not agree with the agencies' objection to integration of accretion flows, which is an appropriate method to determine the effect of a given flow release on habitat over the length of a reach. However, we do agree that averaging flows over time within and between years could obscure adverse effects associated with the lowest flows that occur during specific time period, because large changes in flow releases occur when South Feather adjusts flows to meet changes in consumptive demands in downstream portions of the project. As a result, we have refocused our analysis on the habitat conditions that would be provided under the minimum flows identified for each reach under each recommendation or condition.

To assess effects of alternative flow regimes on the habitat available to different lifestages of rainbow trout, we used WUA/flow and wetted area relationships provided by South Feather in Exhibit E for the Little Grass Valley, South Fork diversion, Forbestown and Slate Creek bypassed reaches, and WUA/flow relationships¹³ from the Lost Creek instream flow study that South Feather filed with its alternative 4(e) condition. These

¹³ The Lost Creek flow study did not provide information on the relationship between flow and wetted area.

relationships do not account for accretion flows that occur within each reach, and as a result they represent a conservative estimate of the habitat that would be provided under each flow regime. We converted the WUA values for each reach to determine the percentage of the maximum WUA that occurred under the full range of simulated flows. Appendix C contains tables that show the percent of maximum WUA and wetted area values determined for each lifestage, reach, flow regime, month, and water year type (tables C-1 through C-20). For all reaches except for Slate Creek, we then compiled summary tables that present average annual values of each parameter (table 3-10), the percentage change in each parameter compared to the flow regimes included in the current license (table 3-11), and the percentage change between South Feather's alternative 4(e) flow regime and Cal Fish & Game's 10(j) flows and the Forest Service's final 4(e) flows (table 3-12). We did not include Slate Creek in the summary tables, because the flows recommended by Cal Fish & Game and specified by the Forest Service for this reach are consistent with South Feather's alternative 4(e) flows. We also did not include fry habitat, because this lifestage is not likely to limit trout populations in the project area, and Cal Fish & Game and the Forest Service did not consider fry habitat to be limiting when they developed their flow regimes. The lifestages and ecological objectives that Cal Fish & Game and Forest Service placed priority on in developing their flow regimes are summarized in table 3-13.

Table 3-10. Average annual minimum flow, wetted area, and percent of maximum WUA for trout juvenile, adult, and spawning lifestages under five flow regimes.

Parameter	Flow regime	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Flow (cfs)	Current license	8	8	5	5	8	8	5	5	8	8	5	5	7	7	7	7	6
	SF FLA	10	16	16	9	20	18	16	9	13	12	12	5	7	7	7	7	11
	SF Alt 4(e)	32	17	13	11	36	22	16	14	36	22	16	14	16	16	14	12	19
	FS final 4(e)	36	26	17	14	36	26	17	17	36	26	17	14	18	16	14	12	21
	Cal F & G	36	27	22	19	42	30	25	21	43	37	24	22	21	21	18	15	26
Wetted area (1,000 sq ft)	Current license	23.8	23.8	22.6	22.6	19.0	19.0	17.9	17.9	28.4	27.6	26.8	26.8	NA	NA	NA	NA	23.0
	SF FLA	24.9	26.1	26.1	24.2	22.3	21.7	21.2	19.3	28.6	28.5	28.3	26.8	NA	NA	NA	NA	24.8
	SF Alt 4(e)	28.4	26.6	25.5	25.3	23.9	22.4	21.3	21.0	31.1	30.0	29.3	29.0	NA	NA	NA	NA	26.1
	FS final 4(e)	29.3	28.2	26.5	26.0	23.9	23.1	21.5	21.5	31.1	30.4	29.3	29.1	NA	NA	NA	NA	26.6
	Cal F & G	29.3	28.0	27.2	26.7	24.6	23.2	22.3	22.0	31.8	31.6	29.9	29.8	NA	NA	NA	NA	27.2
Juvenile trout WUA (% of maximum)	Current license	37%	37%	29%	29%	57%	57%	49%	49%	65%	65%	58%	58%	75%	47%	47%	47%	51%
	SF FLA	45%	54%	54%	41%	79%	74%	71%	59%	72%	72%	71%	58%	47%	47%	47%	47%	59%
	SF Alt 4(e)	66%	59%	50%	48%	86%	79%	73%	71%	86%	83%	78%	76%	68%	68%	66%	63%	70%
	FS final 4(e)	73%	69%	57%	54%	86%	82%	74%	74%	86%	86%	79%	77%	71%	68%	66%	63%	73%
	Cal F & G	73%	66%	60%	58%	90%	81%	76%	75%	90%	92%	81%	81%	63%	71%	70%	68%	75%
Adult trout WUA (% of maximum)	Current license	18%	18%	13%	13%	33%	33%	26%	26%	36%	36%	29%	29%	51%	22%	22%	22%	27%
	SF FLA	22%	31%	31%	21%	56%	52%	48%	35%	45%	45%	43%	29%	22%	22%	22%	22%	34%
	SF Alt 4(e)	44%	34%	26%	24%	67%	57%	49%	46%	67%	58%	51%	48%	43%	43%	40%	37%	46%
	FS final 4(e)	51%	45%	32%	29%	67%	62%	50%	50%	67%	63%	52%	49%	48%	43%	40%	37%	49%
	Cal F & G	51%	43%	38%	35%	73%	62%	55%	53%	74%	73%	58%	57%	67%	49%	46%	42%	55%

Parameter	Flow regime	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Spawning WUA (% of maximum)	Current license	39%	39%	33%	33%	44%	44%	36%	36%	41%	41%	36%	36%	96%	68%	68%	68%	47%
	SF FLA	51%	80%	80%	71%	87%	93%	85%	77%	41%	46%	53%	36%	84%	68%	68%	68%	68%
	SF Alt 4(e)	82%	80%	69%	63%	90%	92%	89%	85%	83%	89%	84%	81%	96%	96%	97%	94%	86%
	FS final 4(e)	86%	90%	85%	80%	90%	92%	89%	89%	83%	88%	85%	81%	95%	96%	97%	94%	89%
	Cal F&G	86%	89%	91%	91%	92%	94%	93%	95%	84%	90%	94%	94%	92%	92%	96%	98%	92%

Table 3-11. Percentage change from existing conditions for minimum flow, wetted area, and WUA for trout juvenile, adult, and spawning lifestages under five flow regimes.

Parameter	% change from current conditions	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Flow (cfs)	SF FLA	33%	109%	213%	83%	160%	144%	213%	78%	70%	63%	135%	0%	0%	0%	0%	0%	81%
	SF Alt 4(e)	326%	128%	152%	127%	384%	194%	213%	177%	384%	194%	213%	177%	131%	131%	109%	79%	195%
	FS final 4(e)	384%	251%	230%	183%	384%	251%	230%	230%	384%	251%	230%	183%	169%	131%	109%	79%	230%
	Cal F & G	384%	263%	338%	282%	461%	305%	395%	315%	469%	396%	380%	345%	212%	212%	168%	120%	315%
Wetted area (1,000 sq ft)	SF FLA	5%	10%	16%	7%	17%	14%	18%	8%	4%	3%	6%	0%	NA	NA	NA	NA	9%
	SF Alt 4(e)	20%	11%	13%	12%	26%	18%	19%	18%	13%	9%	9%	8%	NA	NA	NA	NA	15%
	FS final 4(e)	23%	18%	17%	15%	26%	22%	20%	20%	13%	10%	10%	9%	NA	NA	NA	NA	17%
	Cal F & G	23%	17%	20%	18%	30%	22%	25%	23%	15%	15%	12%	11%	NA	NA	NA	NA	19%
Juvenile trout WUA	SF FLA	21%	45%	85%	40%	39%	30%	43%	20%	12%	12%	21%	0%	-37%	0%	0%	0%	21%
	SF Alt 4(e)	77%	58%	70%	64%	50%	38%	48%	43%	34%	28%	34%	31%	-10%	42%	39%	33%	42%

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Parameter	% change from current conditions	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
	FS final 4(e)	96%	86%	95%	84%	50%	44%	49%	49%	34%	33%	35%	32%	-5%	42%	39%	33%	50%
	Cal F & G	96%	76%	106%	99%	57%	42%	53%	51%	40%	42%	40%	40%	-16%	49%	46%	42%	54%
Adult trout WUA	SF FLA	25%	73%	129%	55%	72%	58%	84%	36%	27%	26%	47%	0%	-56%	0%	0%	0%	36%
	SF Alt 4(e)	150%	90%	96%	83%	105%	75%	90%	79%	89%	64%	74%	65%	-15%	92%	80%	64%	80%
	FS final 4(e)	188%	153%	144%	119%	105%	89%	94%	94%	89%	76%	77%	67%	-5%	92%	80%	64%	95%
	Cal F & G	188%	145%	185%	163%	122%	90%	113%	104%	108%	106%	97%	94%	32%	118%	105%	89%	116%
Trout Spawning WUA	SF FLA	31%	108%	147%	118%	96%	110%	135%	112%	0%	13%	48%	0%	-13%	0%	0%	0%	57%
	SF Alt 4(e)	113%	108%	113%	92%	104%	107%	145%	136%	103%	116%	137%	128%	0%	41%	42%	37%	95%
	FS final 4(e)	122%	132%	162%	146%	104%	107%	147%	147%	103%	115%	139%	128%	-1%	41%	42%	37%	104%
	Cal F&G	122%	131%	180%	180%	108%	113%	157%	162%	105%	121%	164%	164%	-4%	35%	40%	43%	114%

Table 3-12. Percentage change from alternative 4(e) flow regime for minimum flow, wetted area, and WUA for trout juvenile, adult, and spawning lifestages under five flow regimes.

Parameter	% change	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Flow (cfs)	FS final 4(e)	14%	54%	31%	25%	0%	19%	5%	19%	0%	19%	5%	2%	17%	0%	0%	0%	13%
	Cal F & G	14%	59%	74%	68%	16%	38%	58%	50%	18%	68%	53%	61%	35%	35%	28%	23%	44%
Wetted	FS final 4(e)	3%	6%	4%	3%	0%	3%	1%	2%	0%	1%	0%	0%	NA	NA	NA	NA	2%

Parameter	% change	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
area (1,000 sq ft)	Cal F & G	3%	5%	7%	6%	3%	4%	5%	5%	2%	5%	2%	3%	NA	NA	NA	NA	4%
Juvenile trout WUA	FS final 4(e)	11%	18%	15%	12%	0%	5%	1%	4%	0%	4%	1%	1%	6%	0%	0%	0%	5%
	Cal F & G	11%	12%	21%	21%	5%	3%	4%	5%	4%	11%	5%	7%	-7%	4%	6%	7%	7%
Adult trout WUA	FS final 4(e)	15%	33%	24%	20%	0%	8%	2%	8%	0%	8%	2%	1%	12%	0%	0%	0%	8%
	Cal F & G	15%	29%	46%	44%	9%	9%	12%	14%	10%	26%	14%	18%	55%	14%	14%	15%	21%
Trout spawning WUA ^a	FS final 4(e)	4%	12%	23%	28%	0%	0%	1%	5%	0%	-1%	1%	0%	-1%	0%	0%	0%	4%
	Cal F&G	4%	11%	32%	46%	2%	3%	5%	11%	1%	2%	11%	16%	-4%	-4%	-1%	4%	9%

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^a Spawning WUA based on March through May to coincide with spawning period for rainbow trout.

Table 3-13. Summary of rainbow trout lifestages and ecological objectives used by Cal Fish & Game and Forest Service to develop minimum flow regimes for the South Feather Power Project. (Source: Staff)

Species/Lifestage or ecological objective	Time period/season	
	Cal Fish & Game	Forest Service
Macroinvertebrate production (wetted perimeter)	June through March	Late summer and early fall
Rainbow rearing	Adults: April through June Juveniles: June through March	Late spring through early fall
Rainbow trout spawning	April and May	Spring through early summer
Channel maintenance	Not specified	High flow period of spring
Retain natural hydrograph ecological cues, buffer flow changes	Year-round	Year-round, declining hydrograph in late spring to and early summer important to provide cues for trout and amphibian reproductive behavior
Water temperature control	July and August in the Forbestown reach	Late summer and early fall

Although Cal Fish & Game and the Forest Service identified different seasons in which they placed priority on macroinvertebrate production, as shown in table 3-13, this objective was given priority by one or both of the agencies in every month of the year. Although the agencies indicate that they used wetted perimeter relationships for riffles to identify “break-points” in the wetted area versus flow relationship, information to determine the area of riffle habitat under the full range of recommended flows was not available. To assess effects of each flow regime on macroinvertebrate production, we used the flow versus wetted area relationships for the entire reach that was provided in Exhibit E. Although we agree with the agencies that riffle habitats typically provide the highest rate of invertebrate production, some production occurs in all wetted areas and the relationship of flow to the total wetted area likely exhibits a similar relationship as the

relationship of flow to wetted riffle habitat. Based on the average annual wetted areas that we calculated, the amount of wetted area is relatively stable over the range of flows that we evaluated, which extended from the flows in the current license up to the highest flow regime that we evaluated. The average gains in wetted area (across all reaches and water year types) compared to the minimum flows in the current license were 9 percent for the flows proposed in the license application, 15 percent for the flows included in South Feather's alternative 4(e) condition, 17 percent for the Forest Service's final 4(e) flows, and 19 percent for Cal Fish & Game's 10(j) (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 2 percent increase in wetted area, and Cal Fish & Game's 10(j) flows provided an average 4 percent increase in wetted area (table 3-12). The average increase in flow compared to the existing license condition was 81 percent for the flows proposed in the license application, 195 percent for South Feather's alternative 4(e) flows, 230 percent for the Forest Service's 4(e) condition, and 315 percent for Cal Fish & Game's 10(j) recommendation (table 3-11).

For juvenile and adult rearing lifestages, Cal Fish & Game placed priority on one of these lifestages in every month of the year, while the Forest Service placed priority on these rearing lifestages from late spring through early fall. Seasonal changes in rearing habitat for each lifestage, reach, water year type and flow regime are provided in appendix C, tables C-1 through C-20. The average gains in rearing WUA for juvenile trout (across all reaches and water year types) compared to the minimum flows in the current license were 21 percent for the flows proposed in the license application, 42 percent for the flows included in South Feather's alternative 4(e) condition, 50 percent for the Forest Service's final 4(e) flows, and 54 percent for Cal Fish & Game's 10(j) (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 5 percent increase WUA for juvenile trout, and Cal Fish & Game's 10(j) flows provided an average 7 percent increase in WUA for this lifestage (table 3-12). For adult rearing WUA, the average gains compared to the minimum flows in the current license were 36 percent for the flows proposed in the license application, 80 percent for the flows included in South Feather's alternative 4(e) condition, 95 percent for the Forest Service's final 4(e) flows, and 116 percent for Cal Fish & Game's 10(j) flows (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 8 percent increase WUA for adult trout, and Cal Fish & Game's 10(j) flows provided an average 21 percent increase in WUA for this lifestage (table 3-12).

For trout spawning, Cal Fish & Game placed priority on this lifestage in April and May, and Forest Service placed priority on this lifestage in the spring through early summer. Based on the timing of trout spawning identified in Exhibit E, we assessed spawning habitat from March through May. Appendix C, tables C-1 through C-20 show spawning habitat WUA for each reach, water year type, and flow regime. The average gains in spawning WUA (across all reaches and water year types) compared to the minimum flows in the current license were 57 percent for the flows proposed in the

license application, 95 percent for the flows included in South Feather's alternative 4(e) condition, 104 percent for the Forest Service's final 4(e) flows, and 114 percent for Cal Fish & Game's 10(j) flows (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 4 percent increase in spawning WUA for trout, and Cal Fish & Game's 10(j) flows provided an average 9 percent increase in WUA for this lifestage (table 3-12).

The Forest Service identified channel maintenance functions including maintenance of spawning gravel quality and preventing riparian encroachment as one of its priorities in determining minimum flows in the spring high flow period. Although the flows proposed by South Feather in its license application did not provide for higher minimum flows during the high flow months of April and May, all three of the other flow regimes (South Feather's alternative 4(e), Forest Service's final 4(e), and Cal Fish & Game's 10(j)) all provide for substantial increases in minimum flow releases during this time period. Although minimum flows recommended or specified by the agencies are higher than those that are included in South Feather's alternative 4(e) condition in some reaches and water year types, these differences are small in relation to the magnitude of spill flows that occur in most years, and as a result we conclude that the higher minimum flow releases provided in the agency flow regimes would not provide a detectable improvement in channel maintenance functions.

Both agencies identified ecological objectives of retaining a natural hydrograph to provide ecological cues, and of buffering the effects of flow changes by providing higher minimum base flows. Although it is difficult to quantify the benefits that are associated with providing a more natural flow regime, we note that the flow regimes included in South Feather's alternative 4(e) condition reflect the natural flow regime much more closely than the flows that are included in the existing license and the flows that were proposed in the license application. We agree with the agencies that providing higher minimum flows serves to buffer adverse effects associated with sudden increases or decreases in river flow, and that the higher minimum flows provided in the agency flow regimes would provide some increase in buffering capacity by reducing the potential for biota being flushed downstream during flow increases or stranded during reductions in flow. We note, however, that the flows included in South Feather's alternative 4(e) condition are substantially higher than the minimum flows that are provided in the current license, and as a result would provide a substantial amount of protection compared to the existing flow regime.

Cal Fish & Game also identified an objective of maintaining water temperatures below the 20°C coldwater standard specified in the Basin Plan throughout the 3.5-mile-long section of the Forbestown reach that is upstream of a barrier to the upstream migration of transition species, which is located at RM 3.8, and the Forest Service identified controlling water temperatures as an objective that was considered in developing their flow recommendations for the late summer and early fall.

Modeling of water temperatures in the Forbestown reach conducted by South Feather indicates that increasing minimum flows during the summer month would help to maintain water temperatures in compliance with the 20°C standard throughout the length of the reach upstream of the migration barrier. South Feather's alternative 4(e) condition would increase the minimum flow in July from 5 to 10 cfs in dry years, from 10 to 15 cfs in below normal and above normal years, and from 10 to 19 cfs in wet years. South Feather's SNTemp modeling indicates that increasing minimum flow releases from 5 to 10 cfs in dry years would reduce water temperatures by approximately 2°C in July (figure 3-4), which should provide a substantial benefit to trout populations. Increasing minimum flow releases from 10 to 15 cfs in below normal and above normal years would also provide a benefit by reducing water temperatures by about 1°C.

Although the higher releases recommended by Cal Fish & Game would likely provide even more favorable summer water temperatures for trout, these flows may reduce maximum summer water temperatures to levels that are below the optimal range for hardhead, which prefer summer water temperatures in excess of 20°C (Moyle, 2002). Although these lower temperatures may not affect the length of the reach that is used by hardhead, they would reduce habitat suitability.

Higher summer flow releases that would occur downstream of each of the project's larger storage reservoirs under the flows recommended by Cal Fish & Game and specified by the Forest Service would likely extend the length of the reaches below each reservoir where invertebrate diversity and production is reduced by the influence of coldwater outflows and increased thermal stability. This would likely have an adverse effect on trout production in the reaches downstream of Little Grass Valley and Lost Creek reservoirs. Higher flow releases in the Little Grass Valley dam reach would likely also reduce trout production by reducing water temperatures to levels that are below optimal for rearing rainbow trout. Water temperatures in this reach are already below optimum ranges identified by the Forest Service (figure 3-5), and increased deepwater releases from the reservoir would likely depress water temperatures throughout the length of the reach. Reduced water temperatures associated with the higher flows recommended by Cal Fish & Game and specified by the Forest Service in the South Fork diversion dam and Forbestown reaches would likely reduce habitat suitability for FYLF by reducing water temperatures.

In its filing of its alternative 4(e) conditions, South Feather noted that the higher flows specified by the Forest Service during the spring months in Lost Creek would depress water temperatures below optimal levels for rainbow trout and for FYLF breeding. Temperature monitoring conducted by South Feather in 2004 and 2005 indicate that water temperatures directly below Lost Creek dam did not rise to levels within the 9 to 14°C range identified by the Forest Service as being optimal for rainbow trout spawning until May in both years (figures 3-6 and 3-7).

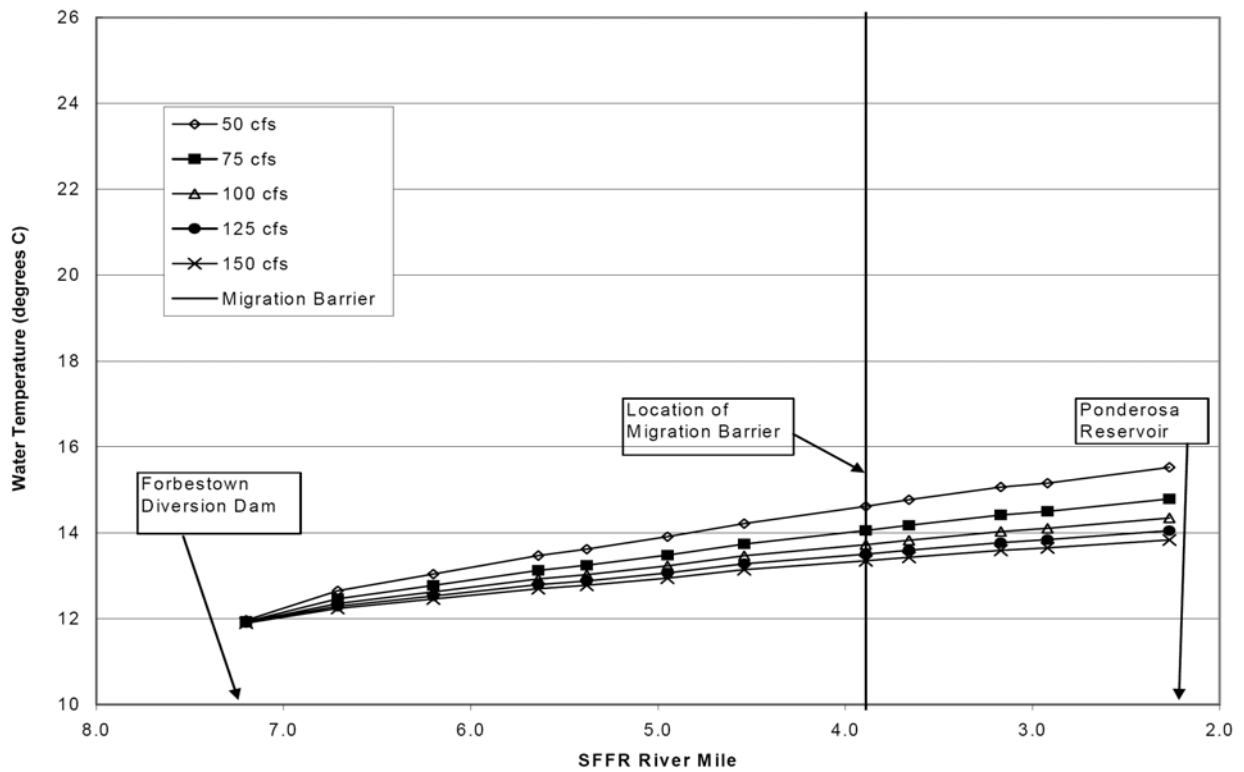
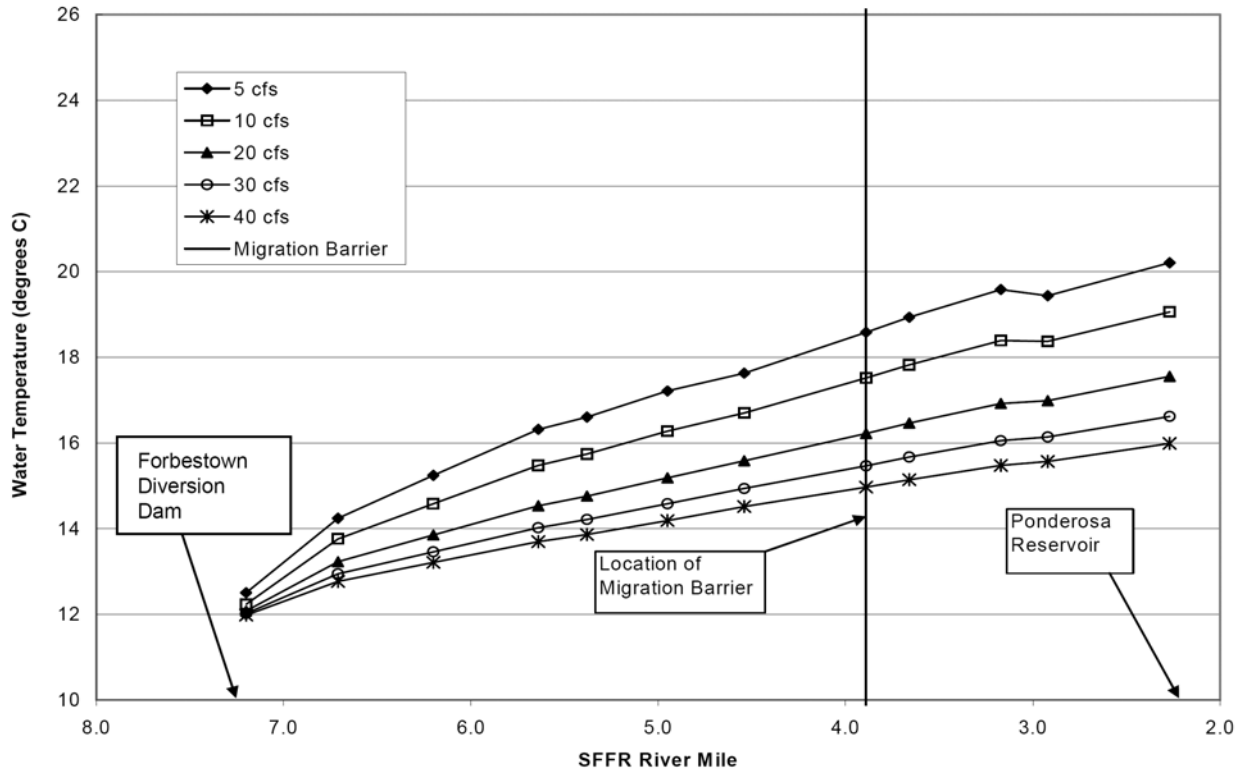


Figure 3-4. Modeled water temperatures in the Forbestown reach on June 25 under a range of release flows. (Source: South Feather, 2007)

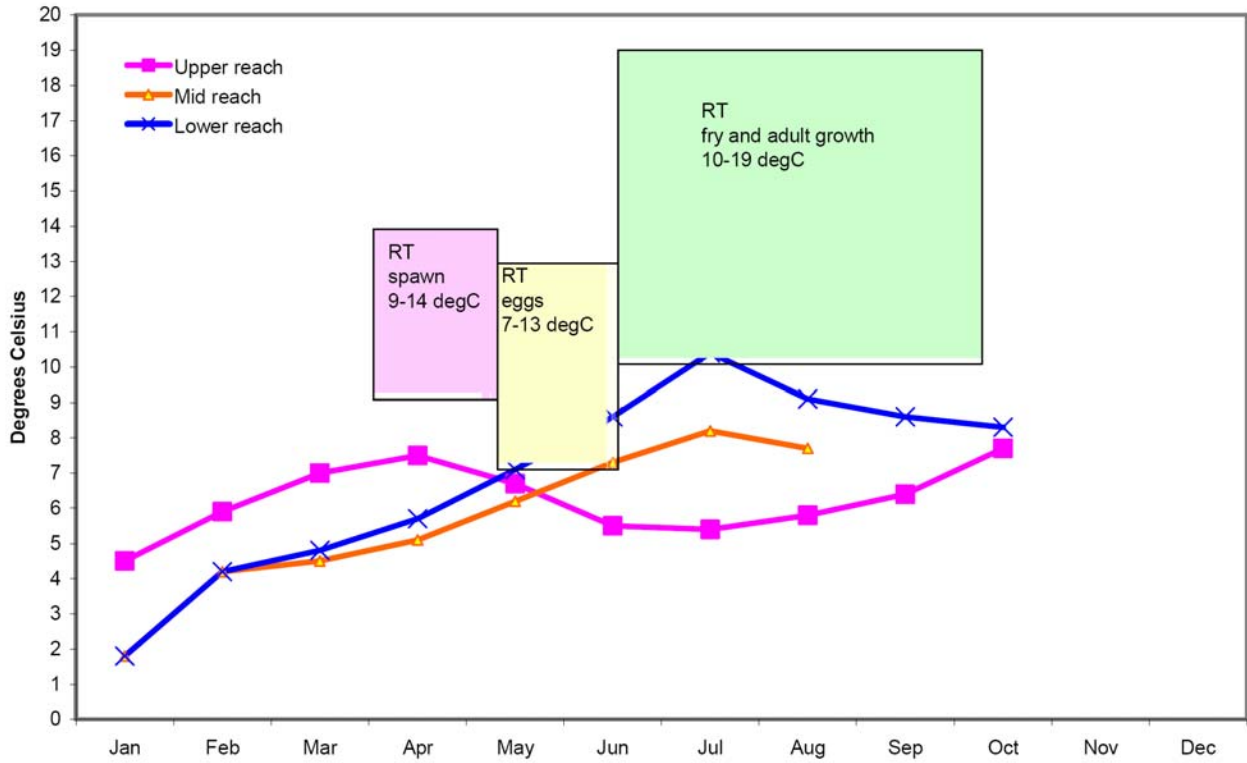


Figure 3-5. Mean daily water temperatures measured in 2005 in the Little Grass Valley dam reach and temperature preference ranges identified by Cal Fish & Game. (Source: Cal Fish & Game, 2008)

3-49

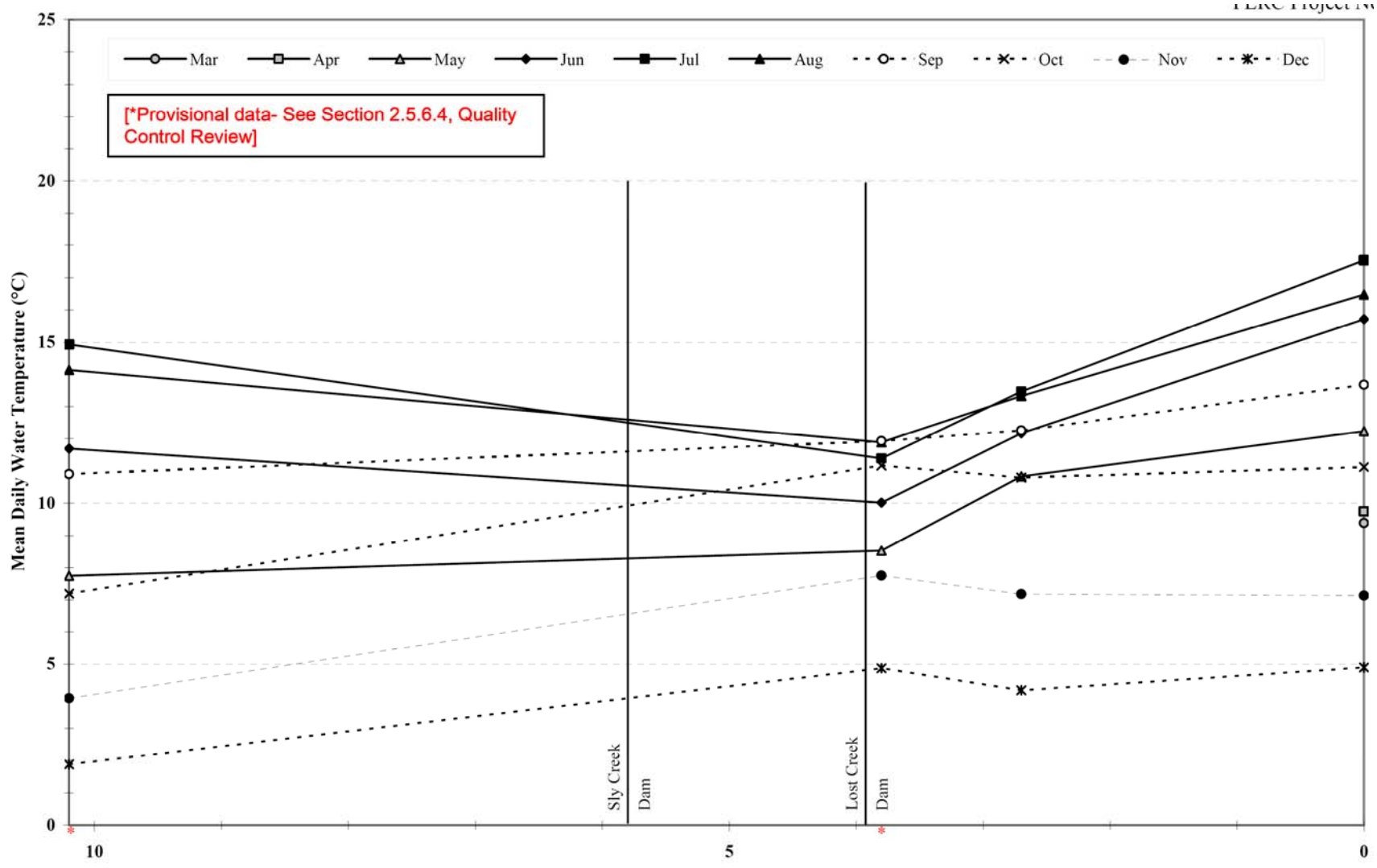


Figure 3-6. Seasonal temperature trends by river mile in Lost Creek in 2004. (Source: South Feather, 2007)

3-50

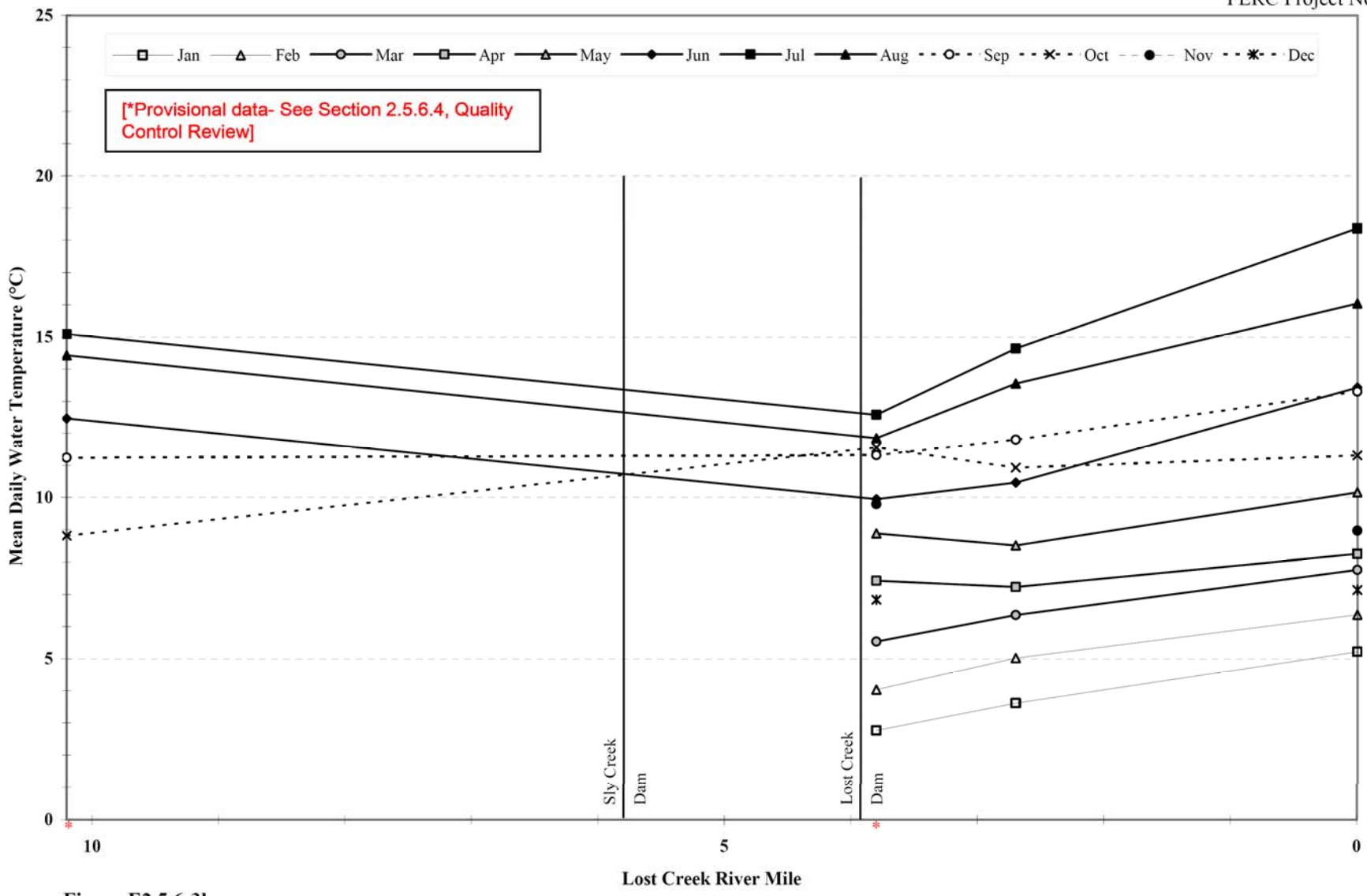


Figure 3-7. Seasonal temperature trends by river mile in Lost Creek in 2005. (Source: South Feather, 2007)

Similarly, water temperatures directly downstream of the dam did not rise above the 12°C threshold required for FYLF breeding in any month during 2004, and did not rise above 12°C until August in 2005, and never rose above this level at this location in 2004. Because higher flows would increase water depth and reduce travel time, they would reduce the rate that water warms as it moves through the reach in the spring and summer months. As a result, it is likely that the higher flows recommended by Cal Fish & Game and specified by the Forest Service would delay the attainment of water temperatures suitable for rainbow trout spawning and for FYLF breeding in downstream portions of the reach, where differences in water temperature under the two flow regimes would be the most substantial.

The higher minimum flows recommended by Cal Fish & Game and specified by the Forest Service for the reach below Little Grass Valley dam would cause Little Grass Valley reservoir to be drawn down to lower levels in the summer and to not fill to as high a level as currently occurs, particularly during Below Normal and Dry water years. Figure 3-8 shows simulated water levels that South Feather filed with its alternative 4(e) recommendation comparing water levels that would occur under current operation, Forest Service's preliminary 4(e) flows (which are the same as Cal Fish & Game's recommended flows for this reach) and South Feather's alternative 4(e) flows based on hydrology from 1973 through 2000. Similar effects on reservoir surface area are also apparent, as figure 3-9 shows. These reduced water levels and surface area could cause some adverse effects on bald eagle foraging and on reservoir aesthetics and recreation, as discussed in sections 3.3.3, *Terrestrial Resources*, and 3.3.6, *Recreation Resources*). The average drawdown from full pool in Below Normal and Dry water years under each of these flow regimes are summarized in tables 3-14 and 3-15, respectively. The flows specified by the Forest Service in their final 4(e) condition are lower than the flows that they prescribed in their preliminary 4(e) condition, and would have less effect on water levels, but would still have greater effects than South Feather's alternative 4(e) condition.

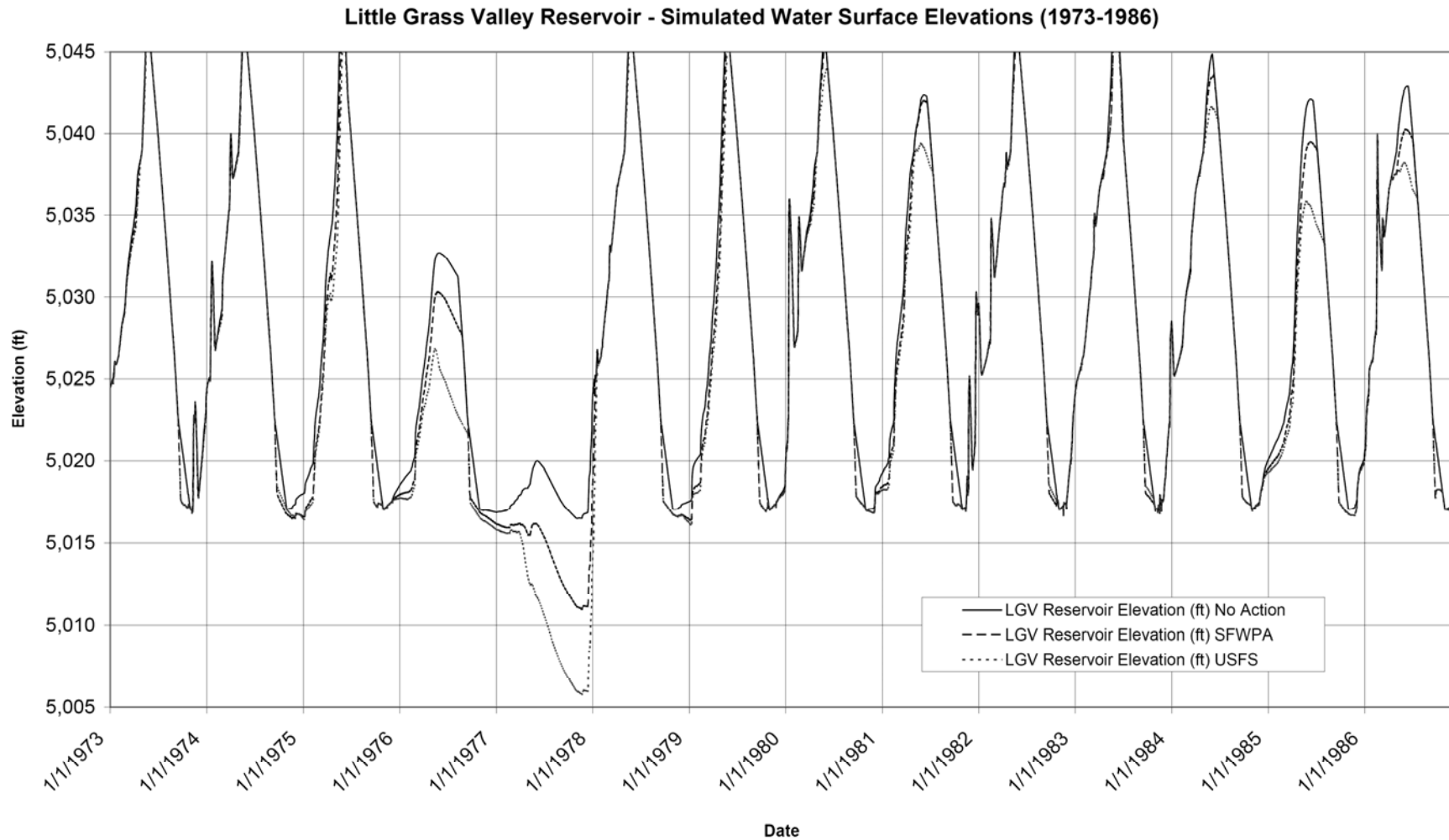


Figure 3-8. Simulated water surface elevations in Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service's preliminary 4(e) flows, and South Feather's alternative 4(e) proposed flows. (page 1 of 2) (Source: South Feather, 2008)

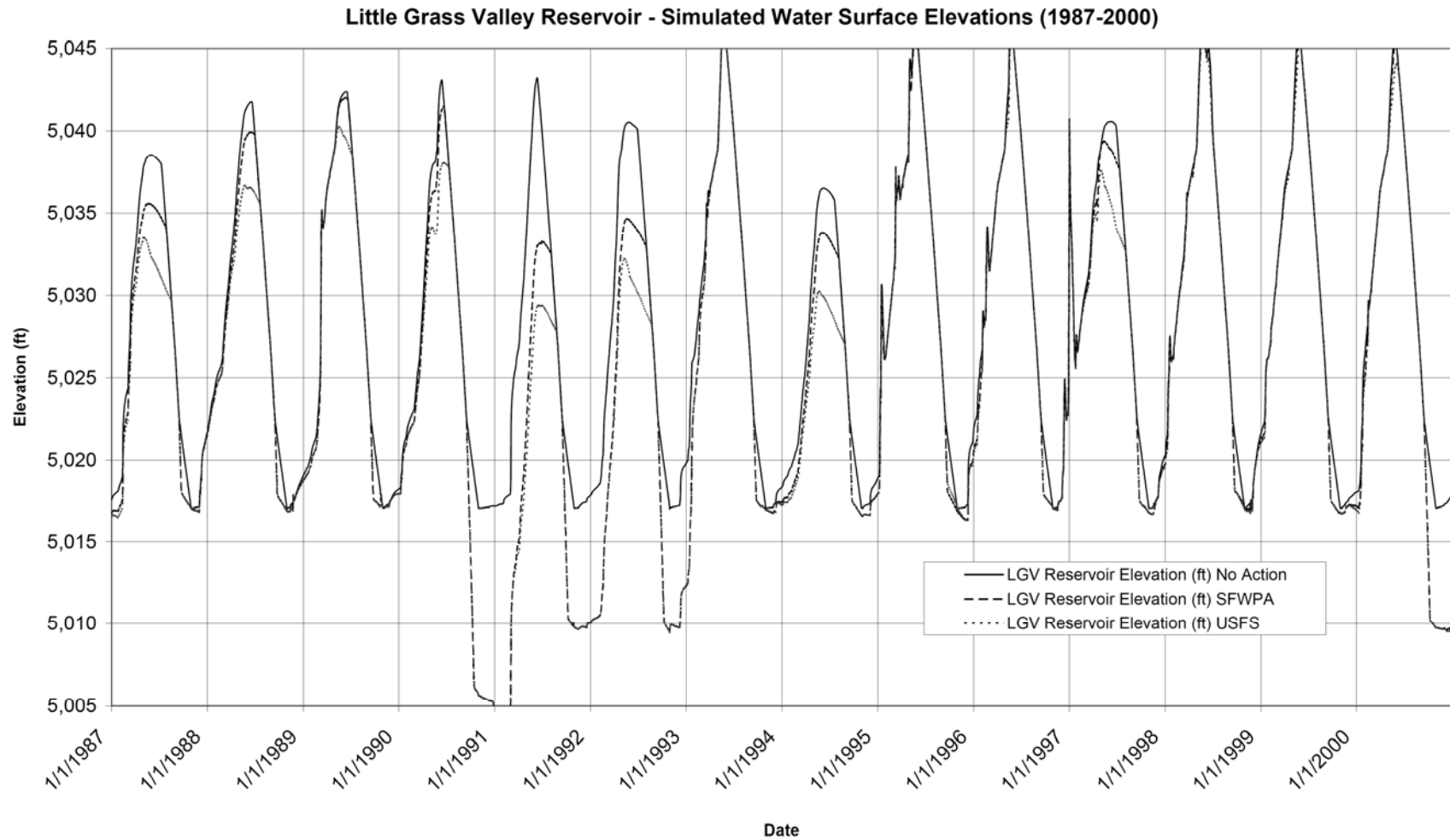


Figure 3-8. Simulated water surface elevations in Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service's preliminary 4(e) flows, and South Feather's alternative 4(e) proposed flows. (page 2 of 2) (Source: South Feather, 2008)

Little Grass Valley Reservoir - Simulated Water Surface Areas (1973-1986)

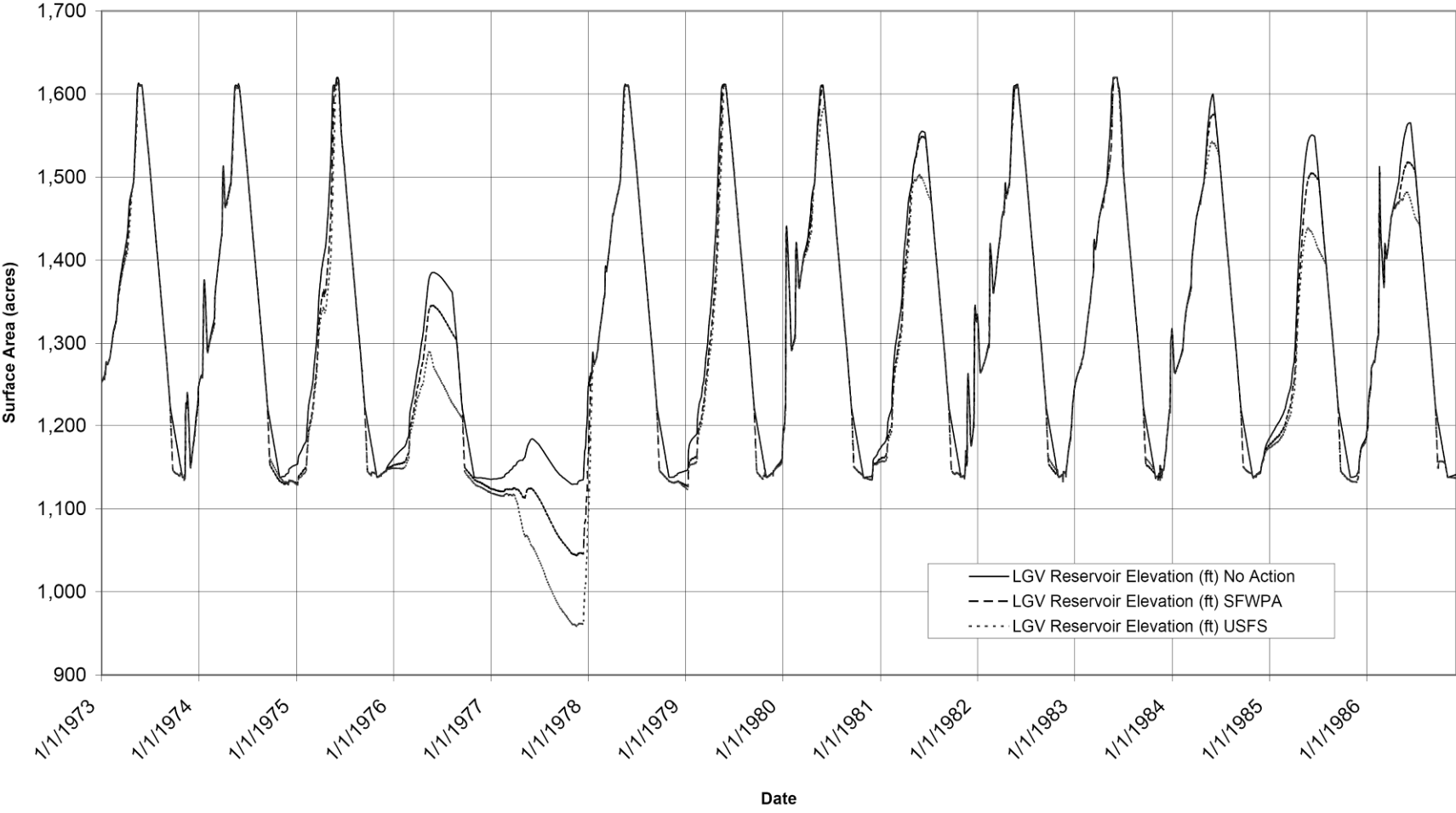


Figure 3-9. Simulated surface area of Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service’s preliminary 4(e) flows, and South Feather’s alternative 4(e) proposed flows. (page 1 of 2) (Source: South Feather, 2008)

Little Grass Valley Reservoir - Simulated Water Surface Areas (1987-2000)

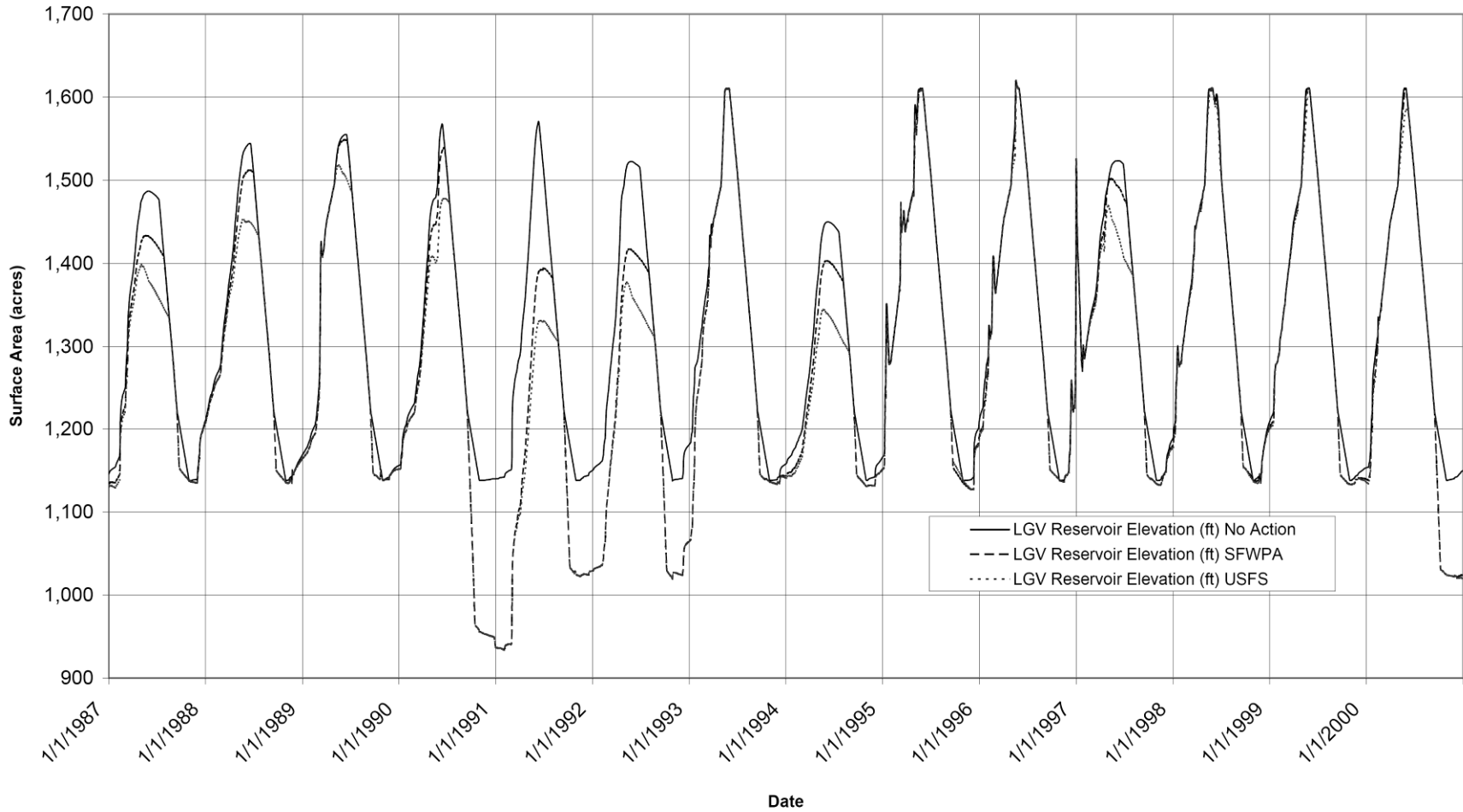


Figure 3-9. Simulated surface area of Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service’s preliminary 4(e) flows, and South Feather’s alternative 4(e) proposed flows. (page 2 of 2) (Source: South Feather, 2008, South Feather May 14, 2008, EPAAct filing)

Table 3-14. Comparison of Little Grass Valley drawdown from normal full pool (feet) for current operation, Cal Fish & Game’s 10(j) minimum flows, Forest Service’s 4(e) minimum flows, and South Feather’s alternative 4(e) minimum flows (adopted into staff alternative), in below normal water years. (Source: South Feather, 2008b, May 29, 2008, reply comments)

Month	No-action Alternative	South Feather’s Alternative Condition	Forest Service’s Preliminary 4(e) Condition No. 18, Part 1	Cal Fish & Game’s 10(j) Rec. 1
May 31 (Memorial Day)	-2.5	-3.3	-5.5	-5.5
July 4 (Independence Day)	-6.4	-6.4	-8.0	-8.0
August 1	-12.3	-12.3	-12.3	-12.3
September 1 (Labor Day)	-19.3	-19.3	-19.3	-19.3
September 15	-23.0	-23.2	-23.2	-23.2

Table 3-15. Comparison of Little Grass Valley drawdown from normal full pool (feet) for current operation, Cal Fish & Game’s 10(j) minimum flows, Forest Service’s 4(e) minimum flows, and South Feather’s alternative 4(e) minimum flows (adopted into staff alternative), in Dry water years. (Source: South Feather, 2008b, May 29, 2008, reply comments)

Month	No-action Alternative	South Feather’s Alternative Condition	Forest Service’s Preliminary 4(e) Condition No. 18, Part 1	Cal Fish & Game’s 10(j) Rec. 1
May 31 (Memorial Day)	-8.9	-12.9	-16.6	-16.8
July 4 (Independence Day)	-10.3	-13.3	-17.0	-17.2
August 1	-14.4	-15.5	-18.8	-18.9
September 1 (Labor Day)	-20.5	-21.1	-22.2	-12.3
September 15	-23.7	-24.5	-25.2	-25.2

Ramping Rates

Rapid changes in streamflow have the potential to strand and kill young fish and macroinvertebrates (Bradford et al., 1995; Hunter, 1992; Huntington, 2004), and may also cause adverse effects on amphibians including FYLF. Because each of the powerhouses discharge into reservoirs or diversion pools, peaking operation of the South Feather Power Project does not cause flows or water levels in riverine reaches to fluctuate. However, upramping and downramping would occur occasionally when spill flows end and when flow releases proposed for geomorphic purposes and to support whitewater recreation are implemented.

South Feather does not propose to implement any ramping rates except when geomorphic flow releases are made into Lost Creek (see section 3.3.1, *Geology and Soils*), when South Feather intends to make a good faith effort to ramp up to the supplemental streamflow at a rate of no more than 400 percent of the previous mean daily streamflow as measured at USGS gage no. 11396000, and to ramp down from the supplemental streamflow at a rate of no more than 50 percent of the previous mean daily streamflow as measured at USGS gage no. 11396000. These ramp rates are consistent with the 1997 license order that revised minimum flow requirements in Lost Creek.

Cal Fish & Game filed a 10(j) recommendation that would require ramping rates to be limited to 0.5 foot per hour during increase and decreases in flow to minimize the potential for causing stranding of fish.

Our Analysis

South Feather did not conduct any analyses of the potential for fish stranding to occur in the project reaches. However, because each of the powerhouses discharge into reservoirs or forebays, the riverine sections within the project area are not subject to daily flow fluctuations caused by load following operations. There is, however, some potential for fish stranding at times when flows are reduced when spill flows end and when proposed flow releases to provide whitewater boating opportunities or geomorphic flows come to an end. In these cases, implementing the 0.5 feet/hr ramping rate recommended by Cal Fish & Game would help to limit the potential for stranding of fish and macroinvertebrates. Although ramping rates as low as 0.2 feet/hour are frequently recommended in riverine reaches at many hydroelectric projects, the potential for fish stranding at the project is limited by the low frequency of flow changes in the riverine reaches affected by project operation and the relatively high gradient and confined channel present in many of the reaches.

Flow Monitoring, Determination of Water Year Type, and Water Management during Extended Drought Conditions

South Feather proposes to monitor compliance with minimum flows using existing USGS flow gages in each reach. On the SFFR, these are USGS flow gage no. 11395030 for the Little Grass Valley dam reach, USGS flow gage no. 11395200 for the South Fork

diversion dam reach, and USGS flow gage no. 11396200 for the Forbestown diversion dam reach. On Lost and Slate creeks, these are USGS flow gage no. 11396000 for the Lost Creek dam reach and USGS flow gage no. 11413300 for the Slate Creek diversion dam reach.

Cal Fish & Game filed a 10(j) recommendation and the Forest Service filed an identical 4(e) condition specifying that South Feather operate and maintain existing gages, under USGS supervision, that are needed to determine the river stage and minimum streamflow below Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam. The condition also specifies that any modification of these gage facilities that may be necessary to measure the new minimum streamflow releases be completed within 3 years after issuance of a new license, that flows be documented in publicly available and readily accessible formats, that flow data be subject to QA/QC review by South Feather before it is made available to USGS for review and publication on the internet. The condition further specifies that the flow values (generally 15-minute recordings) used to construct the 24-hour average flows be made available to the resource agencies upon request.

The Forest Service also filed preliminary 4(e) conditions specifying the methodology that would be followed to determine the water year type that would guide the implementation of minimum flows, and to consult with stakeholders to develop an operating plan to manage flows during drought conditions. Forest Service filed revised 4(e) conditions that superseded each of these measures, and South Feather indicated in its reply comments that it did not object to either of these revised measures, which we now consider to be part of South Feather's licensing proposal.

To determine water type, the revised 4(e) condition specifies that South Feather use the forecast of unimpaired runoff in the Feather River at Oroville that is provided in DWR Bulletin 120 report each month from February through May. A wet water year would be defined as having a forecast greater than or equal to 7.1 million acre feet (MAF), an Above Normal water year would be defined as having a forecast greater than or equal 4.0 MAF, but less than 7.1 MAF, a Below Normal water year would be defined as having a forecast greater than 2.4 MAF¹⁴ or equal to but less than 4.0 MAF, and a Dry water year would be defined as having a forecast less than or equal to 2.4 MAF.

¹⁴ The wording of the revised 4(e) condition as filed defines a Below Normal water year as "greater than 2.4 MAF or equal to but less than 4.0 MAF" and an Above Normal water year as "greater than or equal to 4.0 MAF but less than 7.1 MAF" which is unclear as to whether 4.0 MAF would be considered to be a Below Normal or an Above Normal water year. We have assumed that the intent was to define the Below Normal year as being "greater than 2.4 MAF but less than 4.0 MAF."

Each February through May, South Feather would determine the water year type based on the Bulletin 120 water year forecast and would operate for the month based on that forecast. The May forecast would be used to establish the final water year type for the remaining months of the water year. South Feather would provide notice to the Forest Service, the Commission, and other interested governmental agencies of the final water year type determination within 30 days of making the determination. The water year types from February through April would apply from the 15th day of the month in which DWR issues Bulletin 120 to the 14th day of the next month. From May 15 to October 14, the water year would be based on DWR's Bulletin 120 issued in May. From October 15 through February 14, the water year type would be based on DWR's Full Natural Flow record issued in October.

To address the potential need to modify operation during drought conditions, the revised Forest Service 4(e) condition specifies that by March 15 of the second or subsequent Dry water year, South Feather would notify the Forest Service and other interested governmental agencies of South Feather's drought concerns. By May 1 of the same year South Feather would consult with representatives from the Forest Service and other interested governmental agencies to discuss operational plans to manage the drought conditions. If the parties specified above agree on a revised operational plan, South Feather may begin implementing the revised operational plan as soon as it files documentation of the agreement with the Commission. If unanimous agreement is not reached, South Feather would submit the revised proposed plan that incorporates as many agency issues as possible to the Commission, as well as both assenting and dissenting comments, request expedited approval, and implement the proposed plan until directed otherwise by the Commission.

Our Analysis

Funding the continued O&M of the USGS gages in each of the affected reaches, including any modifications that may be required to accurately measure minimum flows or ramping rates that are included in a new license, would help to ensure that these gages remain functional and can be used to effectively monitor compliance with flow-related measures included in the license. Funding the operation of the gages also would help to ensure that flow data continues to be available to other water users in the basin and to the general public. Provision of flow data recorded at 15-minute intervals to the agencies upon request would help to verify compliance with any instantaneous flows and ramping rates that are included in the license.

Specifying the methodology for determining water year type would be an essential requirement for determining compliance with minimum flows under the new license, and the methodology specified by the Forest Service and agreed to by South Feather would fulfill this requirement.

Identifying the specific procedures that would be followed if deviation from license conditions is needed during drought conditions will expedite water management

decisions that may be needed to protect beneficial uses including water diversions for municipal and agricultural uses. The approach specified by the Forest Service provides an efficient approach to allow needed changes in project operation to occur in a manner that would allow the Commission to promptly address any agency concerns that were not fully addressed in the proposed temporary operating plan.

Yuba River Reopener

Diversion of water from Slate Creek reduces the volume of water that is contributed to the North Yuba River via Slate Creek. The Yuba County Water Agency operates the Yuba River Development Project (FERC No. 2246), which is associated with New Bullards Bar reservoir on the North Yuba River and Englebright Lake on the Yuba River. The Yuba County Water Agency recommends that the Commission reserve authority to require South Feather to make reasonable provisions for modifying project facilities or operation as necessary to mitigate or avoid cumulative effects identified in any environmental analysis of the Yuba River Development Project. They indicate that this reservation would be applicable in the context of any relicensing or license amendment proceeding involving the downstream Yuba River Development Project.¹⁵

Our Analysis

We include analysis in this document of the cumulative effects of relicensing the South Feather Power Project on water resources, including the effects of measures that would reduce the project's contribution to cumulative effects on water resources in the Yuba River basin. Under the National Environmental Policy Act, it would be appropriate to analyze and address any cumulative effects that may be associated with future changes in the operation of the Yuba River Development Project in the proceeding that addresses the effects of those changes in operation of the Yuba River Development Project

Water Temperatures Downstream of Kelly Ridge Powerhouse

The Kelly Ridge powerhouse discharges into the Thermalito diversion pool, part of the Oroville Project, just downstream of the tailrace of the Oroville Project's Hyatt pump-generating powerhouse. The combined flow from these powerhouses (up to 261.8 cfs from the Kelly Ridge powerhouse and up to about 16,000 cfs from the Hyatt powerhouse) proceeds downstream to the Oroville Project's Thermalito diversion dam, where DWR can either (1) pump the water back up into Lake Oroville, using the Hyatt powerhouse's reversible turbines; (2) pass the water through the Thermalito diversion dam powerhouse into the Oroville Project's low flow channel; (3) divert the water through the Oroville Project's Thermalito power canal into Thermalito forebay from where it flows through the Thermalito powerhouse and into the Thermalito afterbay, from where it can be (a) pumped back into Lake Oroville through the Thermalito and Hyatt

¹⁵ The license for the Yuba River Development Project expires on March 31, 2016.

powerhouses; (b) released into the Feather River downstream of the afterbay (known as the high flow channel); or (c) diverted directly into the Sutter Butte canal, Western lateral, Richvale canal, and Western canal. Cal Fish & Game withdraws about 110 cfs at the Thermalito diversion dam for use at the Feather River Fish Hatchery, located along the low flow channel (figure 3-10).

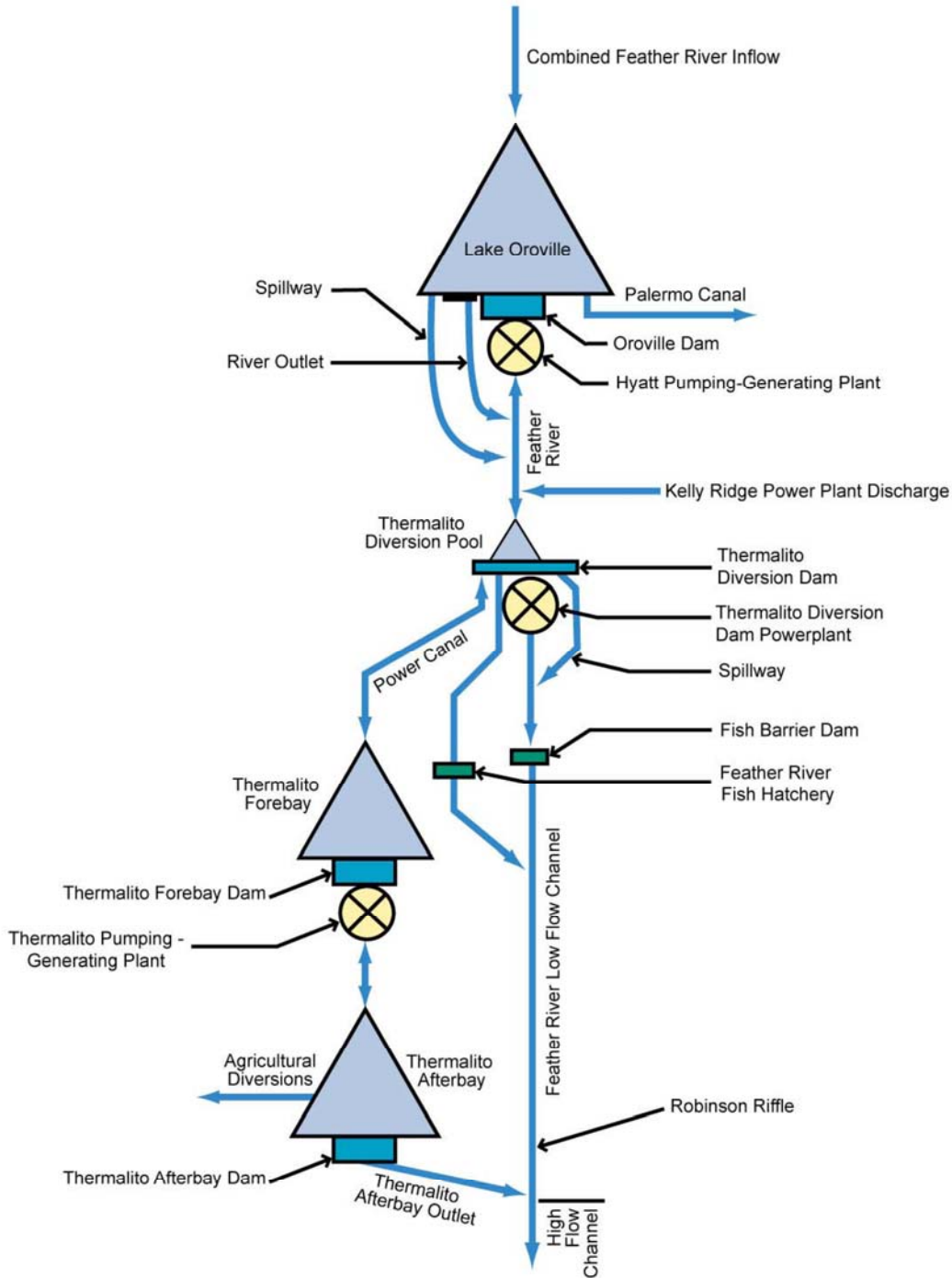


Figure 3-10. Oroville Facilities flow diagram. (Source: Reclamation, 2008)

The Feather River Fish Hatchery, a project facility of DWR's Oroville Project (FERC No. 2100) was built during construction of the Oroville Project as mitigation for Oroville dam's blocking of anadromous fishes to spawning areas upstream of the dam site and for the project's impacts on flow regime.¹⁶ Cal Fish & Game operates the hatchery in conjunction with DWR and spawns about 9,000 to 18,000 salmon and 2,000 steelhead annually, producing 8 million fall-run Chinook salmon, 5 million spring-run Chinook salmon, and 400,000 steelhead (NMFS, 2004, cited in FERC, 2007). The spring-run Chinook and steelhead stocks reared at the hatchery are considered by NMFS to be part of the Central Valley spring-run Chinook salmon and the California Central Valley steelhead ESUs, both of which are listed as threatened by NMFS. The spring-run Chinook stock is listed as endangered by the state of California.

Generation flows from the Kelly Ridge powerhouse can influence water temperatures in the upper portion of the Thermalito diversion pool and, to a lesser degree, points downstream, including potentially the Feather River Hatchery intake. This influence is greatest when the Hyatt powerhouse is shut down, intermediate at normal summer Hyatt powerhouse releases of 4,000 – 8,000 cfs, and likely negligible at flows of 10,000 cfs and above, as the proportion of total flow contributed by the Kelly Ridge powerhouse decreases. The difference in water temperature between Kelly Ridge powerhouse flows and Hyatt powerhouse flows is greatest during the summer and is due to the fact that Kelly Ridge flows originate as warm surface withdrawals from Miners Ranch reservoir, while Hyatt flows come from a deep, cool water intake in Lake Oroville. Although Hyatt summer releases are cool, the water subsequently warms as it resides in the Thermalito diversion pool, the Thermalito forebay, and the Thermalito afterbay.

Other aspects of Oroville Project operation besides Hyatt powerhouse flows can influence the effects that Kelly Ridge powerhouse generation flows have on downstream water temperatures. DWR can regulate the temperature of water released from Lake Oroville using the existing multi-level Hyatt intake structure, which is capable of withdrawing water from a wide range of depths. Cold water can also be released through the river outlet at the dam, which draws water at a depth between 90 and 350 feet, depending on the reservoir elevation. Pumpback operation at Hyatt and Thermalito powerhouses and the surface elevation of Lake Oroville can also affect downstream water temperatures. South Feather has limited capability to adjust the temperature of its releases at the Kelly Ridge powerhouse, although some reduction in water temperatures may be possible by drawing down Miners Ranch reservoir to its minimum operating pool

¹⁶ Mean monthly flows through the low flow channel are now 5 to 38 percent lower than pre-dam levels, and total flow is presently lower than historical levels during February through June, but higher July through January. Mean monthly water temperatures in the low flow channel are 2 to 14°F cooler during May through October and 2° to 7°F warmer during November through April (Sommer et al., 1983).

or by operating Kelly Ridge powerhouse at its maximum capacity, both of which would reduce residence time and warming that occurs in Miners Ranch reservoir.

Under the Oroville Relicensing Settlement Agreement, DWR committed to meet certain water temperature targets at Robinson Riffle in the low flow channel and at the Feather River Fish Hatchery. The temperature targets are designed to protect listed steelhead and Chinook salmon at the hatchery and in the Feather River downstream from the hatchery fish barrier dam. Meeting temperature requirements sometimes dictates the timing of pumping and generation operations at the DWR's Oroville facilities (DWR, 2005), both historically and under the Settlement Agreement.

To ensure the Oroville Project would consistently meet the proposed flow and temperature objectives contained in the Settlement Agreement, DWR proposed to study the feasibility of making structural modifications, which, at a minimum, would include one of the following: (1) Palermo canal improvements, (2) Hyatt intake extensions, (3) replacement of the river valves with valves specifically designed to incrementally control water releases, (4) construction of a diversion canal around or through the Thermalito afterbay, and (5) construction of an alternative outlet to the Thermalito afterbay. DWR has committed to implementing one or more facility modifications or other actions that the feasibility study suggests are most effective in terms of meeting low and high flow temperatures. Before physically modifying the facility, DWR would perform a comprehensive reconnaissance study, in consultation with resource agencies, and prepare both a feasibility report and an implementation plan for modifying the facility to improve temperature conditions in the low flow and high flow channels and allow DWR to meet other water resource obligations (e.g., anadromous fish needs, flood control, recreational needs, water deliveries). The study plan, feasibility report, and implementation plan as well as documentation of consultation would be filed with the Commission within 3 years of license issuance. During the interim period, DWR would attempt to meet the temperature objectives at the fish hatchery through either (or in combination) releases from the river outlet at the base of Oroville dam, eliminating pump-back operations, or removing stoplogs at the Hyatt intake structure (FERC, 1997).

Because, under some conditions, generation at the Kelly Ridge powerhouse can incrementally increase water temperatures in the upper portion of the Thermalito diversion pool and can potentially affect DWR's selection of an operational strategy for meeting the Settlement Agreement water temperature targets, several agencies proposed recommendations pertaining to downstream water temperatures in this proceeding.

DWR, NMFS, and the State Water Contractors and Metropolitan Water District (SWC/MWD) recommend requiring South Feather to curtail or cease power generation at the Kelly Ridge powerhouse when the temperature of water released from the powerhouse exceed specified values (table 3-16). SWC/MWD recommends limiting discharges to 100 cfs when these temperatures are exceeded, while DWR and NMFS recommend that no water be discharged from the powerhouse. Cal Fish & Game recommends that South Feather take all reasonable actions including curtailing releases

from the powerhouse to conform with temperatures specified in the Oroville Settlement Agreement, which includes the Cal Fish & Game temperatures in table 3-16 and also attainment of the following maximum temperatures in the low flow channel downstream of the Hyatt powerhouse: 56°F from January through April, 56 to 63°F for May 1-15, 63°F from May 16 through August 31, 63 to 58°F from September 1-8, 58°F from September 9-30, and 56°F from October 1 to December 31.

Table 3-16. Maximum temperature criteria¹⁷ recommended by DWR, Cal Fish & Game, NMFS, and SWC/MWD for guiding Kelly Ridge powerhouse operations. (Source: Staff)

Date	DWR, Cal Fish & Game	NMFS	SWC/MWD
September 1 – 30	56°F (13.3°C)	58°F (14.4°C)	59°F (15.0°C)
October 1 – May 15	55°F (12.8°C)	56°F (13.3°C)	58°F (14.4°C)
May 16 – 31	59°F (15.0°C)	63°F (17.2°C)	62°F (16.7°C)
June 1 – 15	60°F (15.6°C)	63°F (17.2°C)	63°F (17.2°C)
June 16 – August 15	64°F (17.8°C)	63°F (17.2°C)	67°F (19.4°C)
August 16 - 31	62°F (16.7°C)	63°F (17.2°C)	65°F (18.3°C)

Our Analysis

South Feather monitored water temperature at several locations in the summers of 2005 – 2007. During 2007, water temperature was monitored at the following locations in the flow path leading to Kelly Ridge powerhouse (listed upstream to downstream): (1) Miners Ranch conduit inlet below Ponderosa dam (MRC 6.2); (2) Miners Ranch tunnel inlet (MRC 0.0); (3) Miners Ranch reservoir inlet (MRR); 4) Miners Ranch water treatment plant laboratory; and (5) Kelly Ridge powerhouse. Mean daily water temperature at Kelly Ridge powerhouse ranged from 13.0°C on April 22 to about 22.3°C on August 31 (sampling dates April 1 – September 16, 2007) (figure 3-11). The monitoring also showed that water temperature increases from the inlet to Miners Ranch reservoir to Kelly Ridge powerhouse ranged from about 1.0° to about 3.0°C (figure 3-12). The greatest differences occurred in July and August, suggesting that these increases are likely due to seasonal heating of water as it resides in Miners Ranch reservoir.

¹⁷ DWR, NMFS, and SWC/MWD recommend that these temperature criteria be applied to outflows from the Kelly Ridge powerhouse, while Cal Fish & Game’s criteria would be applied at the intake to the Feather River Hatchery.

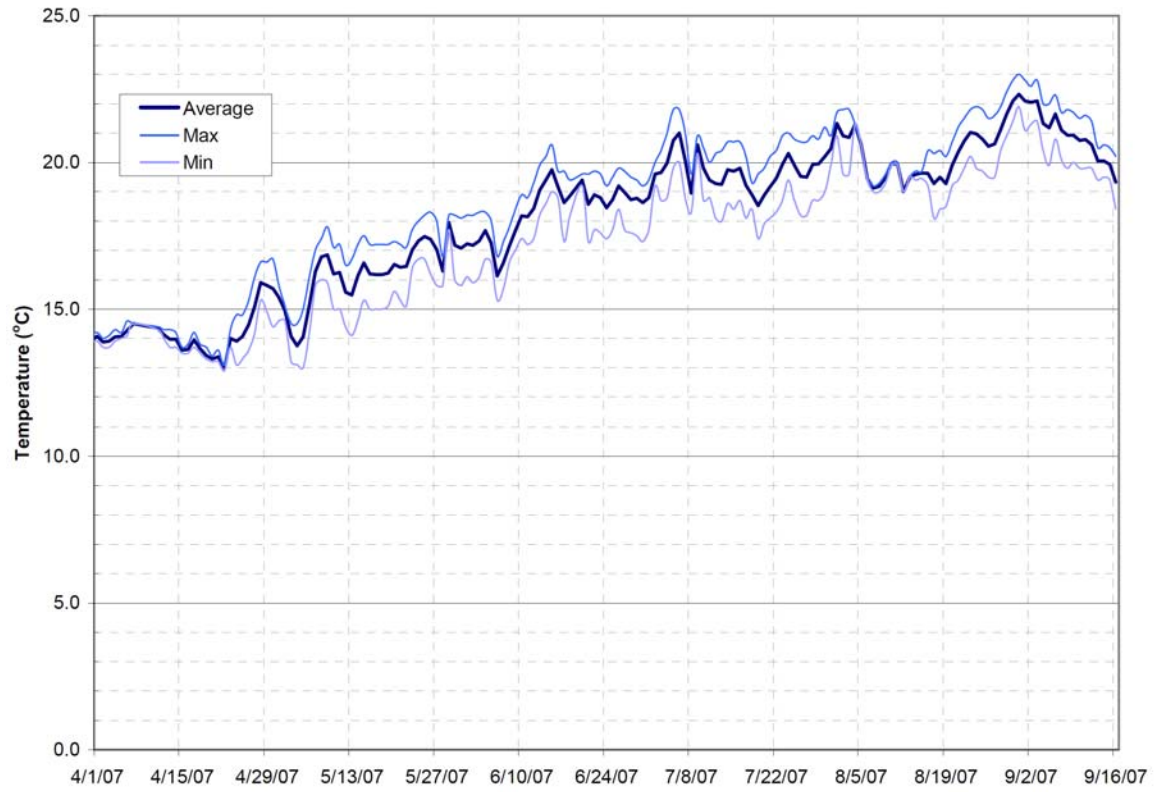
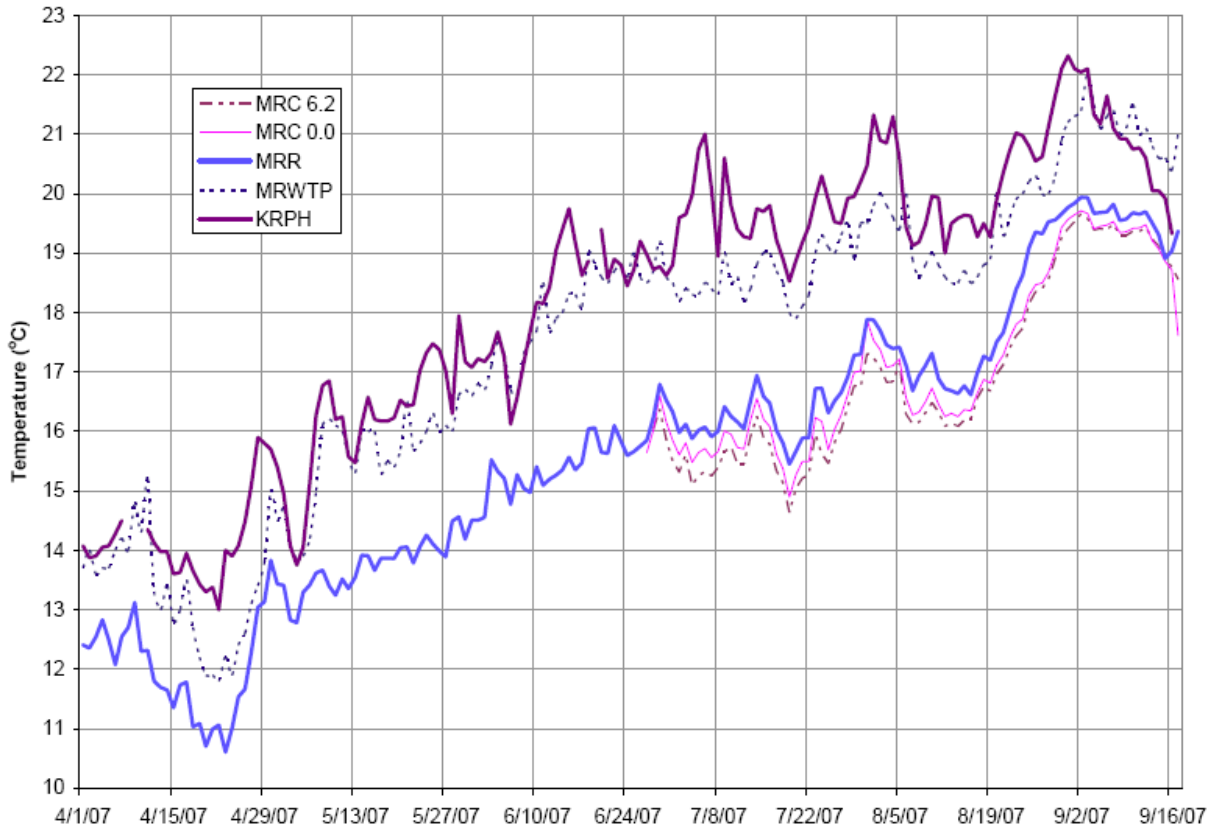


Figure 3-11. Daily average, maximum, and minimum water temperatures (°C) collected at Kelly Ridge powerhouse in 2007. (Source: Stillwater Sciences, 2007)



Note: MRC 6.2 = entrance to Miners Ranch conduit; MRC 0.0 = downstream end of Miners Ranch conduit; MRR = inlet to Miners Ranch reservoir; MRWTP = Miners Ranch water treatment plan; and KRPH = Kelly Ridge powerhouse.

Figure 3-12. Daily average temperatures (°C) collected at locations from the inlet of Miners Ranch conduit downstream through Kelly Ridge powerhouse in 2007. (Source: Stillwater Sciences, 2007)

Although the maximum quantity of water contributed to the Thermalito diversion pool from the Kelly Ridge powerhouse is small in comparison to the maximum flows from the Hyatt powerhouse (261.8 cfs versus up to 16,000 cfs, respectively), the projects are not always operated at maximum flow, and, in fact, depending on water year, among other factors, Hyatt powerhouse is shut down during the evening and early morning hours.¹⁸ To assess the effects of discharges from Kelly Ridge powerhouse on water temperatures in the Thermalito diversion pool, DWR monitored water temperatures at the discharge from Kelly Ridge powerhouse and at locations in the Thermalito diversion pool approximately 1,000 feet upstream and downstream from the powerhouse during the

¹⁸ DWR letter to the Commission dated February 11, 2008.

period from August 2 through September 14, 2008.¹⁹ DWR reported that, during this time period, the average water temperature downstream of the powerhouse was 0.94°F warmer than the temperature measures upstream of the powerhouse, and the maximum instantaneous temperature difference was 14.08°F on August 30 at 11:45 PM. For temperatures measures at the discharge of the Kelly Ridge powerhouse, water temperatures were on average 2.54°F higher than they were at the upstream location, and the maximum instantaneous difference was 11.58°F. Although DWR did not provide information on the average outflows from the Hyatt powerhouse during the monitored time period, they report that Hyatt releases were less than 2,000 cfs more than half of the time, and less than 231 cfs 27 percent of the time. Based on information obtained from DWR's website (<http://cdec.water.ca.gov/selectQuery.html>, accessed April 8, 2009), we estimate that the average outflow from Oroville reservoir during this time period was 3,507 cfs. Outflows from Kelly Ridge powerhouse during this time period averaged 237 cfs, or 6.3 percent of the combined outflow from Oroville and Kelly Ridge powerhouse.

As noted above, DWR's sampling location for the 13,350 acre-foot diversion pool was located only about 1,000 feet downstream of the Kelly Ridge powerhouse, and more than 5 miles upstream of the water temperature compliance points located at the fish hatchery and at Robinson Riffle. While this location is well suited to show differences between Hyatt and Kelly Ridge releases, it is of minimal value in demonstrating the effects of Kelly Ridge releases on water temperature in the vicinity of the water temperature compliance points and downstream anadromous fishes.

We note that even in the worst-case scenario of no releases from Oroville's Hyatt powerhouse and 24 hour-per-day maximum generation at Kelly Ridge, the small volume of Kelly Ridge powerhouse releases compared to the volume of the diversion pool, Kelly Ridge releases displace only 3.89 percent of the water in the diversion pool on a daily basis. As such, we consider it unlikely that Kelly Ridge releases have an appreciable effect on water temperature in the main body of the diversion pool or points downstream.

Nonetheless, shutdown of the Kelly Ridge powerhouse during periods when the temperature of powerhouse outflows is high and Hyatt powerhouse releases are low, as has been done in the past, could be one method to help DWR meet its downstream temperature objectives and would forestall the need for DWR to make additional cool water releases from Lake Oroville to meet temperature targets. Excess water not passed through the Kelly Ridge powerhouse may need to be spilled into Lake Oroville at the Ponderosa dam, depending on inflow to Ponderosa reservoir, its elevation at the start of the shutdown, the length of the shutdown, and the magnitude of consumptive deliveries from Miners Ranch reservoir. This would provide up to 31,149 acre-feet of water²⁰ that

¹⁹ DWR letter to the Commission dated March 24, 2009.

²⁰ Based on a 60-day shutdown at Kelly Ridge's maximum capacity of 261.8 cfs.

would then be available to DWR for generation, consumptive water supply, or for meeting downstream environmental objectives, which could include DWR's temperature objectives, or water quality objectives further downstream, including the Bay-Delta. Of course, this approach would preclude South Feather from realizing the benefits of using this water for generation.

Periodic shutdown of the Kelly Ridge powerhouse at critical times may also assist DWR with meeting its temperature objectives during the interim before DWR identifies and implements the structural modifications to improve temperature control discussed above. Improving compliance with the temperature objectives identified in the Oroville Settlement Agreement could benefit anadromous fish by reducing the potential for stress and mortality of adult broodstock, eggs, or juvenile salmon and steelhead caused by exposure to high water temperatures.

However, shutting down or reducing flows through the Kelly Ridge powerhouse may result in increased warming of Miners Ranch reservoir, which may exacerbate downstream temperature problems when generation resumes at Kelly Ridge powerhouse. In their comments on the draft EIS, SWC/MWD noted that this adverse effect could be minimized by drawing Miners Ranch reservoir down to its minimum operating level before flows from Kelly Ridge powerhouse are reduced, and re-charging the reservoir with colder water from the Miners Ranch conduit prior to resuming full generation. Although we agree that this practice has the potential to reduce the volume of water in the reservoir that would be subject to warming during the period when Kelly Ridge outflows are curtailed or discontinued, the reservoir retains almost half of its normal volume at its minimum operating level of 878 feet (the intake to the Miners Ranch Treatment Plant) and this water would be subject to warming during the period in which outflows from Kelly Ridge are curtailed.

In their comments on the draft EIS, SWC/MWD recommend that installation of temperature control curtains in Miners Ranch reservoir to direct outflows from the Miners Ranch conduit to the powerhouse intake be considered as a means to reduce the amount of warming that occurs as water passes through the reservoir. Similarly, Cal Fish & Game note that a pipeline could be used for the same purpose, as has been proposed at the DeSabra-Centerville Project (FERC Project No. 803). Both these approaches would limit mixing with warmer water in the reservoir and would likely provide some reduction in the temperature of water that is discharged from Kelly Ridge powerhouse. Some degree of warming during passage through Miners Creek reservoir would still occur, however, so these approaches would likely be less effective than shutdown of the Kelly Ridge powerhouse as a means to assist with meeting the downstream water temperature objectives. Another drawback of temperature curtains is that they have a limited lifespan. Although the operational lifespan of temperature curtains is affected by site-specific conditions, operational experience with temperature curtains installed by Reclamation at Whiskeytown reservoir indicates that a lifespan of 15 or more years is possible.

Another alternative for reducing the temperature of outflows from Kelly Ridge powerhouse could be to increase Kelly Ridge powerhouse releases. This would decrease residence time in Miners Ranch reservoir, which would reduce reservoir water heating and hence the temperature of Kelly Ridge powerhouse releases. Operation of Kelly Ridge powerhouse at a continuous 261.8 cfs would deplete 519 acre-feet of the total maximum storage of Miners Ranch reservoir of 896 acre-feet in a 24-hour period. Continuing South Feather's average historical deliveries for consumptive deliveries would remove an additional 40 acre-feet per day, further decreasing residence time and reducing Miners Ranch reservoir temperatures during the summer. Increasing Kelly Ridge powerhouse flows in this manner could, however, negatively impact other resources, particularly lake levels.

Regardless, however, of any actions South Feather may take to reduce the temperature of Kelly Ridge powerhouse releases, it is ultimately the operation of the Oroville Project that determines whether any such reductions will be conveyed to DWR's downstream compliance points and ultimately provide a benefit for anadromous fishes.

As discussed in the next section, making real-time information on Kelly Ridge powerhouse flows and water temperatures available to DWR could help DWR in its decision-making process for managing its operations to comply with its temperature objectives more efficiently.

Water Temperature Monitoring

South Feather proposes to install and maintain a continuous water temperature monitor at the USGS gage downstream of the Slate Creek diversion dam and, to enhance the ability of Slate Creek to support trout, to cease diversions from Slate Creek whenever the mean daily water temperature is greater than 20°C for three consecutive days between June 1 and September 15. South Feather also proposes to install continuous temperature monitors in the downstream ends of the South Feather diversion dam and Forbestown reaches to provide information needed to ensure that whitewater flow releases do not occur during the FYLF breeding season. South Feather also monitors water temperatures at the Miners Ranch water treatment facility.

Cal Fish & Game recommends that South Feather monitor water temperatures in the SFFR immediately above the fish passage barrier in the Forbestown reach to demonstrate whether the recommended flows in the Forbestown reach are adequate to reduce temperatures to below 20°C. Cal Fish & Game also recommends that South Feather install and maintain continuous water temperature monitors at RM 8.9 on Slate Creek, at RM 28.3 on the Little Grass Valley dam reach of the SFFR, at RMs 8.1 and 9.1 on the South Fork diversion dam reach, and at the Kelly Ridge powerhouse. The monitors would be used to record water temperatures at one-hour intervals from May 1 through September 15 annually, and the data would be provided to Cal Fish & Game and other interested agencies in a technical report within 6 months following completion of each sampling effort.

NMFS recommends that South Feather maintain a temperature monitoring station in Miners Ranch reservoir at the Kelly Ridge intake and provide temperature data at 15-minute intervals in a format that is available to the public.

Our Analysis

Water temperature data collected from the proposed monitoring site on Slate Creek would provide information that would be needed to implement South Feather's proposed flow regime for Slate Creek, which includes shutdown when daily average water temperatures exceed 20°C for three consecutive days. Ceasing diversion under these conditions would benefit trout populations in Slate Creek downstream of the diversion, and would ensure the project has no adverse effects on the beneficial use of supporting coldwater aquatic life.

South Feather's proposal to monitor water temperatures at the downstream ends of the South Feather diversion dam and Forbestown reaches would provide information that would help to ensure that the release of whitewater boating flows do not adversely affect FYLF breeding. NMFS' proposal to monitor water temperatures at the Kelly Ridge powerhouse would help to identify time periods when project operations may be adversely affecting water temperatures downstream of the powerhouse. The temperature data, along with flow information would assist DWR and South Feather in coordinating their projects' operation to meet DWR's obligation to achieve temperature objectives specified under the Oroville Settlement Agreement while meeting system needs for the quantity and timing of hydroelectric generation and consumptive water supply.

Cal Fish & Game's proposal to monitor water temperature data at five additional locations and to provide annual technical reports summarizing monitoring results would help to document any changes in water temperatures that occur under the minimum flow regimes that are implemented in a new license. However, we note that the water temperature and fish population monitoring studies conducted by South Feather and filed with its license application indicate that the existing minimum flow releases under the current license support healthy trout populations, as indicated by biomass levels that are generally comparable to or greater than the reference sites and other streams of comparable size in the region, and that these populations would be enhanced if instream flows are increased in the next license.

Daily mean water temperatures in the Little Grass Valley dam reach did not exceed 20°C at any time. Although water temperatures measured in the South Fork diversion dam reach did at times exceed 20°C in the lower end of the reach, exceedances were rare and the maximum daily mean water temperature was not far above the 20°C threshold. The average biomass of trout in the reach (table 3-17) exceeded the biomass found at the upstream reference reach and also the average biomass of 24 pounds per acre reported by Gerstung (1973) for streams of similar size (having average widths of 26 to 40 feet) in the region. Although the average trout biomass in the Forbestown reach was slightly below the mean biomass in the reference site (table 3-17), this site may be better

Table 3-17. Trout biomass in the SFFR reaches with comparisons to the SFFR reference reach. (Source: South Feather, 2007)

		Trout Biomass (lbs/acre)						No.	Site	Ref.	P
Site Description	Site Name	1993	1996	1999	2002	2005	2006	Years	Mean	Site Mean	Value
SFFR Reference Reach											
Above Little Grass Valley Reservoir	SFFR 32.9	–	21	42	46	21	16	5	29	–	–
Little Grass Valley Dam Reach											
At Bear Creek Confluence	SFFR 24.4	39	36	31	43	28	–	5	36	29	0.73
Above South Fork Diversion	SFFR 19.2	116	34	83	120	94	82	6	90	29	0.01
Reach Average		77	35	57	81	61	–	–	63	29	0.03
South Fork Diversion Dam Reach											
Below South Fork Diversion	SFFR 18.4	40	22	43	48	62	48	6	43	29	0.16
SFFR/Lost Creek Reach											
Above Forbestown Diversion	SFFR 8.2	35	15	44	25	37	–	5	31	29	0.81
Forbestown Diversion Dam Reach											
Below Forbestown Diversion	SFFR 7.2	47	21	35	17	14	–	5	27	29	0.18

described as a warmwater site, because it supports substantial populations of hardhead (table 3-18), a Forest Service species of concern. The average biomass in Lost Creek directly below the dam was lower than in the reference site (table 3-19), but the next site about 1 mile downstream had a biomass substantially higher than that of the reference site and of the average biomass reported by Gerstung (1973). Because each of the SFFR and Lost Creek reaches support healthy trout populations and this support would be improved with increased minimum flows, we see little benefit in conducting additional water temperature monitoring in these reaches.

We do, however, find that it would be beneficial to design a temperature monitoring program that would provide real-time information to DWR on the amount and temperature of water being released at the Kelly Ridge powerhouse or that would be released if operation of the powerhouse was resumed after a period of shutdown. This information could assist DWR in evaluating and implementing its various options for maintaining water temperatures at the Feather River fish hatchery and fish barrier dam specified in the Oroville Settlement Agreement. These options could include shutdown of the Kelly Ridge powerhouse with release of “excess” water into Lake Oroville from Ponderosa dam, as may be mutually agreed to with South Feather. It would likely be beneficial for South Feather to consult with DWR to determine the most appropriate location for the temperature monitoring data to be collected. We note that collection of water temperature data at the Kelly Ridge intake as recommended by NMFS may be a suitable monitoring location when diversions are occurring, but may not be the most suitable monitoring location at times when the Kelly Ridge powerhouse is not operating, because the temperature near the intake could change substantially after diversion is resumed.

Selective Withdrawal

Flows released from Little Grass Valley reservoir are drawn from deep in the reservoir, resulting in cool water temperatures in the SFFR downstream from the reservoir. Cal Fish & Game recommends that South Feather develop and implement a plan to allow water to be selectively withdrawn from the entire water column in Little Grass Valley reservoir so that the water temperature of release flows can be more closely matched to the optimum temperatures for trout.

Our Analysis

Water temperature in Little Grass Valley reach remains cold all year due to the low level release from Little Grass Valley reservoir. Cal Fish & Game has expressed concern that water temperatures in this reach are below optimum for rainbow trout growth, and that low temperatures may delay spawning, slow egg development, and result in lower overwinter survival, because trout would not attain as large a size. Figure 3-5 shows water temperatures measured in 2005 at three locations in the Little Grass Valley reach in relation to temperature preference ranges identified by Cal Fish & Game.

Table 3-18. Hardhead population data summary from the SFFR above Ponderosa reservoir (SFFR 2.1) in 1993, 2004, and 2005. (Source: South Feather, 2007)

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Year	Site/ Segment	Site Length (ft)	Site Aver age Width (ft)	Biomass (lbs/ac)	Biomass 95% CI	Density (No./ac)	Density 95% CI
ALL AGE CLASSES							
1993	Upper	201.0	26.4	9.8	+/-2.1	376.2	+/-81.3
	Lower	a	a	b	b	b	b
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	1.2	+/-0.3	383.7	+/-109.8
	Lower	113.0	44.3	1.7	+/-0.5	353.0	+/-103.1
	Site	297.5	45.6	1.4	+/-0.3	372.5	+/-77.3
2005	Upper	176.0	57.3	2.9	+/-0.3	887.1	+/-101.8
	Lower	108.2	45.6	5.1	+/-0.2	2,857.5	+/-107.6
	Site	284.2	51.9	3.6	+/-0.1	1,545.0	+/-62.8
YOUNG-OF-YEAR(<80 mm)							
1993	Upper	201.0	26.4	0.2	+/-0.1	35.8	+/-16.8
	Lower	a	a	b	b	b	b

Year	Site/ Segment	Site Length (ft)	Site Average Width (ft)	Biomass (lbs/ac)	Biomass 95% CI	Density (No./ac)	Density 95% CI
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	0.7	+/-0.2	337.0	+/-91.7
	Lower	113.0	44.3	0.5	+/-0.2	313.3	+/-140.1
	Site	297.5	45.6	0.6	+/-0.2	328.6	+/-76.6
2005	Upper	176.0	57.3	0.6	+/-0.1	747.5	+/-90.7
	Lower	108.2	45.6	2.3	+/-0.1	2,665.8	+/-90.8
	Site	284.2	51.9	1.2	+/-0.0	1,385.6	+/-52.9
JUVENILE (80 – 160 mm)							
1993	Upper	201.0	26.4	6.6	+/-1.3	291.4	+/-56.4
	Lower	a	a	b	b	b	b
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	0.6	+/-1.6	57.0	+/-152.6
	Lower	113.0	44.3	1.0	+/-0.2	53.6	+/-
	Site	297.5	45.6	0.7	+/-0.3	44.4	+/-18.3
2005	Upper	176.0	57.3	2.3	+/-0.8	140.8	+/-49.2

Year	Site/ Segment	Site Length (ft)	Site Average Width (ft)	Biomass (lbs/ac)	Biomass 95% CI	Density (No./ac)	Density 95% CI
	Lower	108.2	45.6	5.0	+/-7.7	298.3	+/-
	Site	284.2	51.9	3.0	+/-1.3	179.8	+/-76.4
ADULT (>160 mm)							
1993	Upper	201.0	26.4	2.43c	+/-3.03c	32.84c	+/-41.04c
	Lower	a	a	b	b	b	b
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	0.0	+/- -	0.0	+/- -
	Lower	113.0	44.3	0.0	+/- -	0.0	+/- -
	Site	297.5	45.6	0.0	+/- -	0.0	+/- -
2005	Upper	176.0	57.3	0.0	+/- -	0.0	+/- -
	Lower	108.2	45.6	0.0	+/- -	0.0	+/- -
	Site	284.2	51.9	0.0	+/- -	0.0	+/- -

^a No data available.

^b Unable to calculate.

^c Calculated by max-likelihood.

Table 3-19. Trout biomass in the Lost Creek dam reach with comparisons to the Lost Creek reference site. (Source: South Feather, 2007)

Trout Biomass (lbs/acre)											
Site Description	Site Name	1993	1996	1999	2002	2005	2006	No. Years	Site Mean	Ref. Site Mean	P Value
Lost Creek Reference Reach											
Above Sly Creek reservoir	LC 10.2	–	17	21	51	40	–	4	32	–	–
Lost Creek Dam Reach											
Near the stream ford	LC 3.1	15	4	13	17	12	–	5	12	32	0.04
About 1 mile below Lost Creek dam	LC 2.3	64	32	40	35	21	–	5	38	32	0.99

Because the temperature data in figure 3-5 indicate that water temperatures in the Little Grass Valley dam reach are below the optimum range for growth of rainbow trout, increasing water temperatures into the optimal range identified in the literature would likely provide some benefit to trout populations. We note that rainbow trout are known to occur over a very wide range of temperature conditions (Moyle, 2002; Behnke, 1992), and that fish population sampling conducted by South Feather shows that trout populations downstream of Little Grass Valley reservoir are in very good condition. The average biomass of trout at both sampling sites in the Little Grass Valley dam reach, and at the sampling sites in the South Fork diversion dam and Lost Creek reaches (all of which are affected by release temperatures from Little Grass Valley reservoir) exceeded the biomass found at the upstream reference reach and the average biomass of 24 pounds per acre reported by Gerstung (1973) for similar size streams in the region (see table 3-13). These data indicate that the low temperature of water released from Little Grass Valley reservoir is not having a substantial adverse effect on downstream trout populations, suggesting that the potential magnitude of benefit from implementing selective withdrawal may be limited. We also note that releasing warmer water from Little Grass Valley reservoir would contribute to high water temperatures further downstream in the Forbestown reach of the SFFR, and could adversely affect trout populations there.

Fish Entrainment

Entrainment of fish into hydroelectric intakes typically causes injury or mortality to a portion of the fish that are entrained, 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 smaller passageways (Cook et al., 1997; Franke et al., 1997; Winchell et al., 2000). South Feather evaluated the potential for fish entrainment in its license application, and concluded that effects of the project on trout populations were likely to be minor, and did not propose any measures to reduce or mitigate for fish entrainment.

Forest Service filed a preliminary 4(e) condition that would require South Feather to conduct statistically valid empirical studies to determine the amount of fish entrainment losses in the Woodleaf power tunnel intake and the effects of any fish losses on fish populations in the project area including Slate Creek and the SFFR, and to develop and implement a plan to mitigate for any losses. Forest Service subsequently revised its 4(e) condition to eliminate the fish entrainment studies, but included a requirement that South Feather develop and implement a wild fish supplementation program to mitigate for lost fish resources in the SFFR, in Slate Creek, and in Sly Creek and Lost Creek reservoirs. The plan would be developed in consultation with the Forest Service and other state and federal agencies that have regulatory authority, and would include the following elements: (1) the numbers of wild fish to be planted annually; (2) protocols for the capture and rearing of wild fish brood stock; (3) methods for spawning wild fish brood stock and incubation of eggs; (4) timing of planting wild stock that are free of diseases from the hatchery; and (5) placement locations of young-of-the-year wild fish planting. The basis for determining the amount of fish to be planted would be determined by reviewing age class distributions of rainbow trout in the Little Grass Valley reservoir and the upper Slate Creek diversion dam reach, and estimating the numbers of fry needed to enhance rainbow trout production toward density and biomass level observed in streams surrounding the project area. In its reply comments, South Feather stated that it supports each of the revised 4(e) conditions, including the wild fish supplementation program.

Cal Fish & Game recommends that South Feather develop and implement a plan to screen the diversions at South Fork diversion dam, Slate Creek diversion dam, and the Woodleaf powerhouse intake in Lost Creek dam with fish screens acceptable to Cal Fish & Game and in accordance with their screening criteria.

Our Analysis

South Feather developed and implemented a study in consultation with the agencies to assess the potential for entrainment losses to affect fish populations in the project area. The study focused on rainbow and brown trout, and included a literature review, review of the likelihood of entrainment based on physical characteristics of each intake, and assessment of trout populations upstream and downstream of each intake.

The results of South Feather's literature review and analysis indicate that entrainment potential at the Sly Creek reservoir power tunnel intake is probably low due to the depth of the intake, which is submerged by a minimum of 84 feet when the reservoir is drawn down to its minimum surface elevation. South Feather's review of existing studies indicated that juvenile and adult rainbow and brown trout tend to reside the upper levels of reservoirs, and would have relatively little risk of exposure to entrainment at such a deep intake.

The top of the intake to the power tunnel in Lost Creek reservoir (which leads to the Woodleaf powerhouse) is submerged at a minimum depth of 25 feet, but the trashracks extend to an elevation that is 6 feet above the water surface when the reservoir is at minimum pool. The maximum average velocity at the racks (at the maximum flow rate of 625 cfs with the reservoir at minimum pool) is 1.12 feet per second, excluding the top 6 feet of the racks, which are 15 feet wide by 43 feet tall. The relatively low velocity at the trashrack probably limits the potential for fish entrainment at this intake.

The Forbestown power tunnel intake may have a greater potential to entrain fish than the intakes in Sly Creek and Lost Creek reservoirs, because the intake is located closer to the surface of the diversion pool and the average approach velocity at the trashrack is relatively high (5.5 feet/second at the maximum flow of 660 cfs). However, the relatively high average biomass of trout in the SFFR/Lost Creek reach upstream of the Forbestown diversion, which was higher than the upstream reference reach and the average biomass for similar-sized streams in the region reported by Gerstung (1973), indicate that entrainment rates are not having a substantial adverse effect on the trout population upstream of the diversion. South Feather reports that the total trout density, total trout biomass, and total catchable trout upstream of the diversion are comparable to and slightly exceed the corresponding values downstream of the diversion.

Construction of effective fish screening facilities at each diversion as recommended by Cal Fish & Game would reduce entrainment mortality, and would likely provide some benefit to trout populations. However, construction of an effective screening facility at Slate Creek is probably not feasible given the stream's high sediment load, which has filled in most of the diversion pool.

Implementing the wild fish supplementation program specified by the Forest Service would serve to augment fish populations in any reaches where recruitment is inadequate to meet the habitat's carrying capacity. Using population assessment data to guide the stocking program would ensure that stocking effort is directed to reaches where it would provide the most benefit to trout populations.

Fish Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan a plan to monitor fish populations in affected bypassed reaches, in consultation with the Forest Service and other interested governmental agencies. South Feather indicated in its reply comments that it fully

supports all of the Forest Service revised 4(e) conditions, including the fish monitoring plan.

The plan specified by the Forest Service would involve:

- Use of the same sampling methods to sample eight of the locations previously established during the relicensing surveys.
- Collection of data on species size/age distributions and condition factors.
- Physical measurements and observations of stream conditions.
- Fish surveys would be conducted in two successive years and begin in the fifth full year after implementation of new license streamflows. Fish surveys would be conducted in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach or at a frequency jointly agreed to by the agencies. If sampling is scheduled in years with high peak flows, the survey may be postponed by 2 years to avoid confounding effects of high peak flows on fish recruitment and populations. Subsequent years of sampling and timing would be jointly agreed to by the agencies listed above.
- When scheduling sampling site selection or field data collections, South Feather would notify the agencies at least 30 days in advance to provide the opportunity to participate or observe. If field conditions or operational situations preclude a 30-day notification, South Feather would provide notice as far in advance as feasible.
- South Feather would provide the results of fish monitoring to the agencies in a technical report at an annual consultation meeting following completion of each sampling effort. In addition to describing the results, the report would compare the results with those of previous surveys, and discuss implications of the results of benthic macroinvertebrate monitoring regarding trends in fish abundances.

Cal Fish & Game recommends a fish monitoring plan that is identical to the Forest Service plan, except that no provision is made to postpone sampling in years with high peak flows and that fish sampling would occur at all 11 of the sites established in the sampling plan that guided the licensing studies.

Our Analysis

Monitoring fish populations would assist in determining the effects of any changes in operation or measures that are implemented in a new license to enhance trout populations, and in assessing whether or not any further modifications or additional measures are needed.

South Feather's analysis of fish population data indicates that fish populations in the project reaches can be substantially reduced during and following severe flood events. Postponing sampling by up to 2 years after a flood event as specified by the Forest

Service would improve data consistency, which would help to identify population trends associated with the measures or operational changes that are implemented in a new license.

In its reply comments, South Feather indicates that the smaller number of study sites that are specified by the Forest Service is more appropriate than the 11 sites recommended by Cal Fish & Game. South Feather reports that the sites that are not included in the Forest Service-prescribed plan include two sites that are dominated by warmwater fish, which are not an agency management priority, and one Lost Creek site that has been affected by local site disturbance and excessive angling pressure.

Benthic Macroinvertebrate Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan, in consultation with the Forest Service and other interested governmental agencies, to monitor benthic macroinvertebrates in affected bypassed reaches. South Feather indicated in its reply comments that it fully supports all of the Forest Service revised 4(e) conditions, including the benthic macroinvertebrate monitoring plan.

The plan specified by the Forest Service would involve:

- Surveys would be conducted in the same years as fish population monitoring (unless an alternative monitoring schedule is approved in consultation with the Water Board, Forest Service, Cal Fish & Game, and FWS).
- The plan would be designed to assess the effects on the macroinvertebrate community in the project bypassed reaches under new flow regimes and other changes that may be stipulated in the new license.
- The plan would describe the methods that South Feather would use to monitor benthic macroinvertebrate species composition and relative abundance. Data would be used to determine trends in the macroinvertebrate community structure, as represented by metrics (e.g., taxa richness, EPT index, tolerance value), such as the California Stream Bioassessment Procedure, and determine the trends in metrics within reaches, between reaches, and in comparison with previous results.
- When scheduling sampling site selection or field data collections, South Feather would notify the agencies at least 30 days in advance to provide the opportunity to participate or observe. If field conditions or operational situations preclude a 30-day notification, South Feather would provide notice as far in advance as feasible.
- South Feather would provide the results of benthic macroinvertebrate monitoring to the agencies in a technical report at the annual consultation meeting following completion of each sampling effort. In addition to

describing the results, the report would compare the results with those of previous surveys.

Cal Fish & Game recommends a benthic macroinvertebrate monitoring plan that is identical to the Forest Service plan, except that sampling would be conducted in years 1 through 4 and in years 8, 12, 16, and 24, unless an alternative monitoring schedule is approved in consultation with the agencies. In addition, Cal Fish & Game recommends that South Feather follow the most recent Cal Fish & Game for sampling benthic macroinvertebrate species composition and abundance.

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 to 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. Identifying the procedures that would be followed in the sampling plan would ensure that comparable methods are employed in different years, and would not be subject to any biases associated with any changes in sampling protocols.

Annual Consultation

The Forest Service specifies that South Feather consult with the Forest Service each year with regard to measures that are needed to ensure protection and utilization of the National Forest resources affected by the project (Forest Service Standard Condition No. 3). The date of the consultation meeting would be mutually agreed to by South Feather and the Forest Service but in general would be held 60 days prior to the beginning of the recreation season to facilitate implementation of flow management requirements and recreational management activities. Representatives from other interested agencies would be able to request to attend the meeting. 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.
- South Feather 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. South Feather 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 South Feather, 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 South Feather, 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.

Cal Fish & Game recommends that South Feather, in consultation with the agencies, develop and implement an adaptive management plan acceptable to Cal Fish & Game that will allow Cal Fish & Game and other interested governmental agencies to recommend changes to project operation during the license term based on the results of biological monitoring. The plan would include a process for identifying whether changes to project operation including, but not limited to, operation of fish screens, operation of a thermal control device, riparian vegetation management, ramping rates, and the amount and timing of flow releases from project features are required, and a mechanism for implementing those changes.

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 important environmental resources are protected. Opening the meeting to all interested parties would assist with interpretation

of monitoring results and ensure that the full range of effects of any changes in operation or measures are fully considered.

3.3.2.3 Cumulative Effects

The construction and operation of the South Feather Power Project contributes to cumulative effects on water resources and fisheries resources within the South Feather basin. Project effects on water temperatures are likely variable by reach, reducing summer temperatures below major storage reservoirs with deep releases such as Little Grass Valley reservoir and Sly Creek, while increasing the amount of warming that occurs within bypassed or diverted reaches. Increased water temperatures from reduced flows in Slate Creek downstream of the Slate Creek diversion and in the Yuba River downstream of the Slate Creek confluence may act in concert with other factors including logging, wildfires, land clearing, and consumptive water uses, to cause a cumulative reduction in streamflow and increase in water temperatures. South Feather's proposal to cease diversions from Slate Creek when the average water temperature exceeds 20°C would eliminate the project's contribution to cumulative effects on water temperature in Slate Creek during the critical high temperature period of the year.

South Feather's impoundments, tunnels, and canals also support some diversions for non-project consumptive uses, which contribute a minor cumulative reduction in flow volumes downstream of these diversions in addition to any reductions associated with upstream consumptive uses. Diversion of flow from Slate Creek by South Feather also contributes to a cumulative reduction in flow volumes in lower Slate Creek and in the Yuba River downstream of the Slate Creek confluence. As noted above, South Feather's proposal to cease diversions from Slate Creek when the average water temperature exceeds 20°C would eliminate the project's contribution to cumulative effects on water temperature in Slate Creek during the critical high temperature period of the year.

Trapping of gravel in project impoundments also may contribute to a reduction in the supply of spawning gravels caused by other diversions and impoundments in the basin. However, the results of South Feather's fish population surveys did not indicate any lack of recruitment, indicating that enough spawning gravel exists to allow sufficient trout spawning to occur.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Vegetation

South Feather conducted field surveys in 2004 and used existing vegetation GIS data prepared by the California Department of Forestry and Fire Prevention, the Plumas National Forest, and DWR to identify vegetation communities within the project area. Tree-dominated communities cover 84 percent of the study area, and dominant conifer species within these communities include ponderosa pine, Douglas fir, white fir, and

incense cedar. Dominant hardwood species include blue oak, California black oak, Oregon white oak, canyon live oak, tanoak, and Pacific madrone. Riparian vegetation accounts for 0.3 percent of the area covered by tree-dominated communities. Tree species within the riparian areas include black cottonwood, willow, alder, and dogwood. Chaparral shrublands and herbaceous areas cover an additional 2.7 percent (2.1 and 0.6 percent, respectively) of the project area. Aquatic habitats, bare areas, and developed areas account for the remaining 13.3 percent.

Riparian Vegetation

South Feather conducted surveys focused on riparian vegetation in 2005 to more accurately describe vegetation dynamics within 200 feet of the normal high water line along river reaches in the project area. The surveys produced a more detailed map and description of existing riparian vegetation and a characterization of tree age structure within these communities.

Dominant riparian communities in the project area include the white alder type (30 percent of total area), followed by the white alder/Indian rhubarb type (15 percent). The mountain alder type, which only occurred at the upper Little Grass Valley dam reach site, comprised 13 percent of the total mapped area. Table 3-20 (at the end of this resource section) presents a complete summary of the composition of riparian vegetation within each surveyed area.

Species composition and age structure studies indicate that species composition is similar at all sites and consistent with regional patterns. For example, Indian rhubarb was found at all sites and white alder occurred in every site except the highest elevation site, where it was replaced by thinleaf alder. Three genera dominated the riparian tree and shrub layers: alders, dogwoods, and willow. Alder species tended to dominate the riparian overstory at all sites. Dogwood species tended to be more abundant at mid- to high elevation sites, and willow species at low- to mid-elevation sites within the study area. Distribution of vegetation is strongly influenced by the natural channel morphology in the study area. The channels are steep, narrow, confined, and dominated by bedrock and boulder substrates, which naturally results in patchy distribution of riparian vegetation. Age analysis focused on white alder because it is the most prevalent tree species within the selected study sites. The study found recruitment at all sites, and a low presence of old trees at lowest elevation sites.

Following a request from the Forest Service, South Feather mapped woody vegetation encroachment on the stream channel within the Forbestown diversion dam reach. South Feather used video footage taken during a helicopter flight along the project and mapped vegetation within the active channel. The survey identified 16 sites ranging from 25 to 150 feet long where encroachment occurred. Combined, these sites comprised 1,250 feet of the 5.5-mile reach (4 percent).

Noxious Weeds

South Feather identified 10 state-designated noxious species within the project boundary during 2004 vegetation surveys for special status plant species. The surveys also identified 12 species listed by the Forest Service or the California Invasive Plant Council (Cal-IPC), but not state listed. Table 3-21 (at the end of this resource section) presents the state- and federally listed noxious species and species identified by Cal-IPC identified within the study area, the size of the populations, and the general location of the recorded observations.

Special Status Plant Species

South Feather conducted a special-status plant survey in 2004 that covered a 0.5-mile buffer around project facilities (table 3-22). The methods used were in conformance with the Special-status Plants Survey Study Plan, which South Feather filed with the Commission on April 8, 2004. These methods are consistent with *Guidelines for Assessing Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* and *California Native Plant Society Botanical Survey Guidelines*. South Feather conducted special-status plant surveys during times plants would be most visible, from March 24, 2004, to July 30, 2004, depending on elevation and climatic conditions. The study area was stratified into low (< 1,700 feet), middle (1,700 to 4,000 feet), and high (4,000 to 5,000 feet) elevation strata. Project facilities and features at which surveys were conducted were grouped into each stratum. Each project facility/feature was surveyed twice to capture the appropriate blooming times for all potential special-status plant species. South Feather's survey identified 10 special status species distributed across a total of 37 sites in the study area. Several species were represented at some but not all sites. Three of the 10 species, Lake Almanor clarkia (*Clarkia stellata*), round-leaf sundew (*Drosera rotundifolia*), and Northern California walnut (*Juglans hindsii*), were not on the initial target list. No federally or state-listed threatened or endangered plant species were observed during the survey.

Wildlife

The diversity of forested, reservoir, and stream habitats in the project area supports a wide variety of invertebrates, amphibians, reptiles, birds, and mammals. Project reservoirs provide habitat and a prey base for piscivorous birds, such as bald eagles and osprey, and nesting and migratory habitat for a diversity of waterfowl. A variety of bat species including, but not limited to, western mastiff bat, Mexican free-tailed bat, pallid bat, Townsend's big-eared bat, big brown bat, red bat, long-eared myotis, little brown myotis, and long-legged myotis occur in or on tunnels, buildings, bridges, or other project features. Game species in the project vicinity include deer, waterfowl, and wild turkey.

Common birds in the project area include waterfowl, gulls, pelicans, and common nighthawks. Columbian black-tailed deer, a subspecies of mule deer found in the project area, use the areas within the project as migration corridors and are known to migrate along the ridgetops to the south of the Sly Creek reservoir. Survey information from Cal

Fish & Game indicates that California's deer populations are "stable" to "slightly declining" Major factors affecting deer herds include fire suppression, timber management practices, livestock grazing, and weather patterns, although hunter harvest, predation, and road kills are also important factors affecting population fluctuations. The Miners Ranch conduit study area is within Cal Fish & Game's Deer Assessment Unit 4. The deer population within Deer Assessment Unit 4 is estimated at 33,960 and slightly declining due to less-than-optimal deer habitat; this trend is expected to continue. Other mammals in the project area include coyote, gray fox, marten, black bear, and beaver.

Special Status Wildlife Species

South Feather conducted a search of federal and state databases of wildlife with special status and consulted with agency (Forest Service, FWS, and the California Natural Diversity Database [CNDDDB]) biologists familiar with special status species locations and determined that 68 vertebrate species and 2 invertebrate species with special status could potentially occur in the project vicinity. Of these species, South Feather identified one invertebrate, eight birds, three mammals, and three amphibians with recorded occurrences on project lands and/or near project facilities. Table 3-23 lists these species.

South Feather conducted more detailed studies for the valley elderberry longhorn beetle, bald eagle, California spotted-owl, northern goshawk, special status bat species, mountain yellow-legged frog, foothill yellow-legged frog, and California red-legged frog. Two of these special status species, valley elderberry longhorn beetle and California red-legged frog, both federally listed as threatened, are discussed in section 3.3.4, *Threatened and Endangered Species*.

Bald eagle – Bald eagles nest in mature forests near bodies of water that provide a suitable fish population for foraging. Nests are typically constructed in large trees with an open view of the surrounding forest and are often used by the same pair of birds in consecutive years. Within the project boundary, nesting bald eagles only occur near Little Grass Valley reservoir. One pair have been recorded nesting near the reservoir since 1987, and have used two different nest sites over that period. Wintering and transient bald eagles have also been observed at the Sly Creek, Lost Creek, Ponderosa, and Miners Ranch reservoirs.

Management of lands surrounding the known nesting territory is guided by the Little Grass Valley reservoir Bald Eagle Management Plan. The Forest Service developed this plan with the intent of implementing, to the extent reasonably possible, resource management strategies to provide sufficient suitable nesting and foraging habitat for bald eagles at Little Grass Valley reservoir for the next 25 to 50 years. The plan includes several protection zones and measures that include the establishment of limited operating periods, promoting perch trees, and restricting the use of herbicides and pesticides. Also, under the plan, the Plumas National Forest is responsible for monitoring human use trends and considering restrictions in areas where conflicts arise,

monitoring and surveying for bald eagles, and coordinating with other agencies, including Cal Fish & Game, and South Feather, to effectively implement the plan.

California spotted owl – The California spotted owl occupies habitat with dense, multi-layered evergreen forest that includes a diversity of tree species, large trees, some trees with evidence of decadence, and open areas under the canopy. Occupied habitat is most often on lower, north-facing slopes of canyons and usually within 0.2 mile of water. The owls feed nocturnally on small rodents.

The Forest Service has designated several areas within the project PACs based on suitable habitat for the California spotted owl. Little Grass Valley, Sly Creek, Lost Creek, Ponderosa, and Miners Ranch reservoirs, as well as the Forbestown, Slate Creek, and South Fork diversions are all within 1 mile of California spotted owl PACs. During the 2004 survey period, Plumas National Forest contractors detected California spotted owls within 0.5 mile of Sly Creek reservoir along the south shore and within 0.5 mile of Horse Camp campground at the northeastern portion of Little Grass Valley. During the 2005 survey period, Plumas National Forest contractors detected California spotted owls within 0.5 mile of Little Grass Valley reservoir. In addition, the Plumas National Forest contractors reported a single detection along the south shore, north of Strawberry campground. Finally, Plumas National Forest surveys near Slate Creek diversion dam yielded three detections and one active nest discovery on Onion Creek. All three detections and the nest discovery near Slate Creek occurred more than 0.5 mile away from the Slate Creek diversion dam and impoundment. During the 2004 and 2005 survey seasons, South Feather detected spotted owls throughout the study area at Sly Creek reservoir, Lost Creek reservoir, and Slate Creek, including one confirmed nesting pair in Strawberry campground at Sly Creek reservoir.

Northern goshawk – The northern goshawk nests in a variety of forest types but generally prefers large tracts of mature or old growth forest. Nesting habitat in the western United States typically occurs in ponderosa pine, lodgepole pine, or mixed coniferous forests. Northern goshawks forage in both densely wooded and open forests. Prey typically includes small mammals, reptiles, and some insects. Two PACs for northern goshawk exist within 1 mile of Little Grass Valley reservoir.

In 2004 and 2005, South Feather, in coordination with the Plumas National Forest, conducted surveys for northern goshawk near the Little Grass Valley, Sly Creek, Lost Creek, Ponderosa, and Forbestown reservoirs; near the Miners Ranch conduit; and near the Slate Creek diversion dam. Surveyors detected northern goshawks, including one active nest, in the Little Grass Valley reservoir study area. South Feather did not detect goshawks in any of the other study areas in 2004 or 2005. However, previous studies did detect this species near Lost Creek, Sly Creek, and Slate Creek.

Bats – There are 10 special status bat species with the potential to occur in the project area (see table 3-24). South Feather surveyed 30 project facilities with the potential to provide roosting habitat for bats. Of these, surveyors identified 10 structures

that either showed evidence of bat activity or had a high potential for use. In 2004, South Feather used passive and active acoustic monitoring and net or trap capture stations to identify bats roosting near these facilities. These surveys encountered 6 of the 10 species listed in table 3-24. Other recent surveys in the project area (2001 to present) encountered three of the remaining four species. The remaining species, the small-footed myotis, may occur in the area, but based on the distribution of existing records, this seems unlikely. This species is not well studied in California, but is presumed to be crevice-dwelling and associated with cliff habitat.

Foothill yellow-legged frog – The foothill yellow-legged frog (FYLF) inhabits small streams below 5,000 feet elevation. Breeding occurs in low to moderate gradient streams in shallow edgewater areas; often close to confluences with tributary streams. Preferred substrate consists of cobble and small boulder bars in side pools and side channels with open sunny areas and little riparian vegetation. FYLF deposit masses of eggs on the downstream side of cobbles and boulders in gentle stream of water flow. Egg laying occurs in spring once water temperatures reach 12 to 13°C. Tadpoles occupy areas adjacent to riffles, cascades, main channel pools, and plunge-pools that provide escape cover and food. These areas are typically associated with edgewater habitat with substrate interstices, vegetation, and detritus for cover. The tadpoles tend to remain near the site of the egg mass they hatched from. Juvenile and adult FYLF prefer perennial streams and ephemeral creeks with pools and areas that provide exposed basking sites and cool shady areas adjacent to water's edge. Preferred streams contain shallow, flowing water, with some cobble-sized substrate.

Egg laying for FYLF is thought to occur over a 2-week period (Nussbaum et al., 1983; Stebbins, 1985; Jennings, 1988). Eggs hatch in 15 to 30 days depending on water temperature, and tadpoles metamorphose into juvenile frogs in 3 to 4 months. Males reach sexual maturity in 1 to 2 years, and females in 2 years (Nussbaum et al., 1983). Life expectancy for FYLF is an estimated 3 years or longer (Duellman and Trueb, 1986).

South Feather conducted an assessment of potential habitat based on video from helicopter flights over the project reaches in 2003 and pedestrian habitat surveys in 2004. Using this information, South Feather selected 30 sites in areas with potential habitat and conducted between 1 and 4 visual encounter surveys at each site. Project reaches where surveyors encountered adult or juvenile FYLF are Lost Creek reach (2 sites), Forbestown diversion dam reach (7 sites), and Slate Creek diversion dam reach (2 sites). Egg masses and/or tadpoles occurred at three sites along the Lost Creek reach and one site along the Slate Creek reach.

Mountain yellow-legged frog – The mountain yellow-legged frog (MYLF) occurs in montane riparian habitats with slow-moving streams, lakes, and ponds above 4,500 feet. MYLF use habitat very similar to FYLF, but with deeper water (12 to 20 inches) and at higher elevation. MYLF egg masses are typically not attached to substrate. Using similar methods to those discussed above, South Feather identified five sites with

potential MYLF habitat and conducted visual encounter surveys. All five sites are located along the SFFR upstream from Little Grass Valley reservoir. During site visits, surveyors determined that MYLF habitat was of low quality due to a lack of deep, slow-moving water and overwintering habitat. No MYLF were encountered.

3.3.3.2 Environmental Effects

Noxious Weeds

Project operation potentially affects vegetation through the introduction and spreading of noxious weed species. Any O&M actions, including road blading, vegetation control along roadsides and in transmission corridors, and fluctuating water levels, that disturb soil or remove existing vegetation could increase the spread of noxious weeds and would have a direct effect on vegetation. Potential indirect project effects could come from recreational users that spread noxious weed seeds or other regenerative plant materials from colonized to non-colonized areas.

South Feather proposes several measures to prevent and control the spread of A and B-rated noxious weeds on National Forest System lands within the project boundary.²¹ South Feather would also implement control measures where contiguous populations continue on National Forest System lands outside of the FERC project boundary, as long as the majority of the treated area is on project lands. Specific measures proposed by South Feather include training staff to recognize noxious species, monitoring populations, sharing information on new populations with the Forest Service, and several best management practices aimed at reducing the spread of noxious weeds.

Forest Service Condition No. 26 prescribes that, within 2 years of license issuance, South Feather would file with the Commission an invasive weed management plan developed in consultation with the Forest Service, appropriate county agricultural commissioner, and California Department of Food and Agriculture. South Feather would control invasive weeds that are defined in the California Food and Agriculture code, and other species identified by the Forest Service. The majority of the prescribed plan is consistent with South Feather's proposed measure; however, the prescription includes several additional requirements that would have South Feather: (1) address aquatic and terrestrial invasive weeds; (2) include protocols for locating, monitoring, and controlling weed populations; (3) include a public education program and facilities for public use to reduce the spread of aquatic species; and (4) provide information on noxious weed populations in a data format compatible with the Forest Service GIS database.

²¹ As defined by the California Department of Food and Agriculture, A-rated species require eradication, containment, rejection, or other holding action at the state-county level. Quarantine interceptions for A-rated species are to be rejected or treated at any point in the state. B-rated species require eradication, containment, control, or other holding action at the discretion of the Commissioner.

Our Analysis

Twenty-two species of noxious weeds occur within the project boundary, eight that Cal-IPC lists as high priority. Both special status and noxious weed species have been observed along most project reaches. Noxious weeds have the potential to out-compete special status plant species, if they move into special status plant habitat. Project maintenance and operation can aid the proliferation of noxious weeds. Project roads can act as a method of seed dispersal into areas previously not infested and vegetation management within transmission lines can cause disturbance which allows noxious weeds to move in. Finally, project-related recreation acts both as a means of dispersal from one project area to another and as a source of disturbance, which creates conditions favorable to noxious weed establishment.

Implementing the proposed invasive weed and vegetation management plan would control current populations and future infestations of noxious weeds within the project boundary on Forest Service lands. We interpret the proposed invasive weed management plan to be intended for lands within the project boundary that are adjacent to project features directly affecting National Forest System lands. Because not all project-related noxious weed infestations occur on project lands adjacent to National Forest System lands, expanding the invasive weed and vegetation management plan to all lands within the project boundary that are affected by project operation or maintenance would result in more complete control of noxious weeds that are affected by the proposed project.

In addition to A- and B-rated species (defined above), the California Department of Food and Agriculture rating system defines C-rated species as those requiring state holding action and eradication only when found in a nursery. Also, at the discretion of the Commissioner, the state can take action to retard spread outside of nurseries. The rating system defines Q-rated species as those pending evaluation for a permanent rating. These species are treated as A-rated species in the interim, which requires action at the state and county level. If, as specified by the Forest Service, South Feather includes Q-rated species, and any additional C-rated species for which the County Agricultural Commissioner's Office has implemented additional control measures, such as the yellow star thistle, in the list of species managed as noxious weeds, project effects on vegetation would be further minimized.

Successful weed control requires a cooperative effort by all landowners and land managers in the vicinity, because untreated weeds on adjacent lands provide a ready seed source for infestation by new species and re-infestation after treatment of existing problem weeds. Communication between South Feather and the Forest Service would be a necessary component of a successful weed management program. South Feather's proposed measures include informal monitoring of known populations and advising the Forest Service of new populations on National Forest System lands. The coordination process would be more productive if this communication includes maps showing locations of all populations on project lands with the potential of spreading onto National Forest System lands. A database prepared using GIS software, as prescribed by the

Forest Service, would be beneficial to the management of noxious weeds and would facilitate communication between the Forest Service and South Feather. South Feather prepared the South Feather Power Project Relicensing GIS Database as a component of filing its application for license renewal and has demonstrated the ability to use such resources. If, as prescribed by the Forest Service, South Feather compiles and maintains a Forest Service-compatible GIS data layer for noxious weeds, South Feather would minimize effects on vegetation.

Recreational boaters may spread noxious aquatic plants to other locations within the project boundary and to other waters in the region. These species could result in degraded aquatic ecosystems affecting wildlife and recreational resources in locations where they are not controlled. If measures including public education and boat cleaning stations are incorporated into the management of noxious weeds, as prescribed by the Forest Service, South Feather would minimize the spread of noxious aquatic weeds.

Riparian Vegetation Encroachment

Project operation has the potential to affect riparian vegetation by altering the timing, magnitude, and duration of water flows (i.e., hydrograph) along project stream channels. Many species of riparian trees, including Fremont cottonwood and willow, have specific requirements for micro-habitats within which seeds can germinate and survive. Altering the flows could cause either riparian encroachment into the channel or limit the extent of the riparian corridor. South Feather does not propose to change large flood flow control from current practices.

The Forest Service specifies in Condition No. 19, part 3, and Cal Fish & Game recommends that South Feather conduct video surveys to identify areas of vegetation channel encroachment. Surveys would be conducted the fourth year after license issuance and repeated every 10 years. South Feather would conduct the surveys by helicopter along the South Fork diversion dam and Forbestown diversion dam reaches. South Feather and the agencies would review the video and identify up to three 100- to 300-foot long segments within the South Fork diversion dam reach, and up to five 100- to 300-foot long segments in the Forbestown diversion dam reach where vegetation is encroaching into the channel. South Feather would then treat these reaches with vegetation removal measures, and evaluate the effectiveness of the treatments every 5 years to determine if conditions would require another treatment.

South Feather agreed to Forest Service Condition No. 19, part 3, in its reply comments.

Our Analysis

By nature, riparian systems are highly dynamic, with changes in vegetation structure occurring over space and time. The presence of some vegetation within the channel is expected as it is a component of channel formation and vegetation regeneration processes. The spatial pattern of riparian vegetation is controlled by the

timing, duration, and frequency of water flows. High flood flows remove vegetation from the stream channel and deposit sediments suitable for establishing new vegetation. Low flow levels determine whether enough water is present for vegetation to persist.

South Feather maintains that the magnitude and frequency of floods that have occurred during the life of the project have been suitable for maintaining a healthy riparian ecosystem. Past floods have been large enough to control encroachment of vegetation into the channel, and also have promoted the regeneration of riparian trees. South Feather's studies indicate that existing flooding processes active within the Forbestown and South Fork reaches are sufficient to prevent substantial channel encroachment of vegetation. Encroachment was only evident along 4 percent of the Forbestown diversion dam reach and was not observed at the South Fork diversion dam reach. We would expect to see this condition at more than 4 percent of the area if project operation was not sufficiently controlling encroachment. The new license would not alter the low frequency, high magnitude floods that are associated with the formation of germination sites and control of riparian encroachment. The new license also would increase minimum flows, and maintain a wider active channel. We do not expect proposed project operation to result in an increase in riparian encroachment compared to current operations. Furthermore, removing riparian vegetation also would cause a loss in habitat for other species and potential increases in erosion. The Forest Service condition to treat riparian vegetation would have an adverse effect on riparian vegetation and habitat for some wildlife species because habitat would be removed. However, as discussed below, the benefits to FYLF could outweigh these adverse effects if encroachment of riparian vegetation is adversely affecting FYLF habitat.

Special Status Plant and Wildlife Species Management

New species are added to and removed from special status lists maintained by FWS, Forest Service, and Cal Fish & Game on an annual basis. Currently, 10 plant and 15 wildlife species with some form of special status occur within the project area. Disturbance from road maintenance, reservoir water level fluctuations, weed management and debris removal, and recreation activities associated with the project could reduce habitat or cause mortality of special status plant and wildlife.

South Feather proposes to annually review, in consultation with the Forest Service, any new species proposed for listing under the Endangered Species Act, California Endangered Species Act, California Native Plant Protection Act, or by the Forest Service, to assess the potential for those species to occur on NSF lands within the project boundary and to be affected by project O&M. South Feather would develop and implement a study plan, in consultation with resource agencies, to assess the effects of continued project O&M on such species. This study would include a detailed description of the methodology to be used and schedule for conducting the study. In addition, the study plan would (1) describe the goals and objectives of the study; (2) address any known resource management goals related to the species; (3) describe existing information regarding the species, including its abundance and distribution; (4) explain

the nexus between normal project O&M and potential effects on the species; (5) explain how the study methodology is consistent with generally accepted practices in the scientific community; and (6) describe considerations of level of effort and cost. Additionally, South Feather would annually train employees in the proper procedures for minimizing effects on special status plant and wildlife species.

The Forest Service specifies in Condition No. 24 an annual review process similar to that proposed by South Feather. The Forest Service specification does not include any additional measures not already addressed by South Feather's proposal; however, the Forest Service specifies that, before construction of any new project features on National Forest System lands that might affect Forest Service special status species or their critical habitat, South Feather should prepare a Biological Evaluation. The Biological Evaluation would analyze the effects of the new construction on the species and habitat, report findings from any necessary surveys, propose mitigation measures, and describe monitoring efforts that would be implemented to ensure mitigation is effective.

Our Analysis

Project operation and management activities (including roadside vegetation management, hazard tree removal, fire management practices, and reservoir level fluctuations) and recreation activities could affect special status plant and animal species. These activities could alter or eliminate existing habitat, or directly result in mortality of some individuals. Resource agencies maintain lists of rare, threatened, or endangered species to preserve biodiversity and limit the risk of species extinctions. As new information becomes available and environmental conditions change, species are added to and removed from these lists. An adaptive management program for special status species would ensure that project management considers potential impacts on sensitive species, is aware of changes in the status of species, and lists and modifies project O&M as appropriate.

Measures proposed by South Feather and prescribed by the Forest Service for protecting future special status species are consistent and compatible. South Feather and the Forest Service would develop a set of study methodologies and procedures that would adequately monitor and protect these resources. If South Feather prepares a Biological Evaluation, as specified by the Forest Service, prior to the construction of any new development on National Forest System lands, effects on special status plant and wildlife species could be identified and minimized early. Under such circumstances, the production of a Biological Evaluation would reduce effects on special status species.

Terrestrial Habitat Connectivity

The Miners Ranch conduit contains a 5.5-mile long segment of above-ground, open canal that impedes wildlife movement near Lake Oroville. Occasionally animals become trapped in the conduit and drown. Multiple crossing points, including culverts and wildlife bridges, exist along the length of the open segment. The canal also contains escape ramps for wildlife that have fallen into the canal. Over time, large flow events,

changes in vegetation structure, or general deterioration of facilities could reduce the effectiveness of these mitigation measures. Under such conditions, the conduit could cause increased migration impediments and mortality for wildlife.

To ensure that mitigation measures in place to facilitate wildlife movement across the canal continue to be successful, South Feather proposes to consult with Cal Fish & Game regarding specifications and design prior to replacing or retrofitting existing wildlife bridge crossings or deer escape facilities. South Feather would file the design, including evidence of consultation, with the Commission within 60 days after the crossing or facility has been replaced or retrofitted.

Cal Fish & Game recommends that, in addition to consultation prior to the development of new facilities, South Feather conduct surveys to ensure that existing facilities are operational. The agency recommends that these surveys occur twice a year—in the spring and fall prior to deer migration. The recommended surveys would ensure that existing bridges, escape ramps, and fences are operational and maintained.

Our Analysis

South Feather's surveys indicate that the Miners Ranch conduit is a source of wildlife mortality, with an average of 9 mule deer trapped and killed in the canal annually. However, surveys of crossing facilities indicate that they are used by wildlife, thus reducing potential additional mortality. These studies indicated, and Cal Fish & Game agreed, that the existing facilities are sufficient for facilitating wildlife movement between the two areas of habitat bisected by the Miners Ranch conduit. As such, additional facilities are not required for mitigating project effects on terrestrial habitat connectivity. Surveys also show that the greatest use occurs in the spring and fall during seasonal migrations. If South Feather conducts surveys prior to the spring and fall migrations, it would be able to evaluate the operational status of the facilities and therefore, maintain them as appropriate to ensure they are functional prior to heavy use periods. Such monitoring and maintenance would ensure that existing habitat connectivity over the Miners Ranch conduit is maintained for the term of the new license.

Bald Eagle

One pair of bald eagles has been recorded nesting in the project area. The pair has used two nest sites, both located on National Forest System lands in the vicinity of the Little Grass Valley reservoir. In 2002, the Forest Service developed and implemented, and FWS approved, the Little Grass Valley reservoir Bald Eagle Management Plan. This plan established management guidelines, including limited operation periods, timber and hazard tree removal prescriptions, and eagle monitoring programs, aimed at addressing the needs of the Little Grass Valley reservoir bald eagles. Where applicable, South Feather adheres to the measures prescribed in this plan and has not proposed any additional measures relating to the bald eagle. The Forest Service specifies in Condition No. 25 that South Feather consult with the Forest Service to update and revise the existing Bald Eagle Management Plan based on new project O&M.

Our Analysis

Relicensing the project would result in changes in project O&M, which could include increases in minimum flows released from reservoirs. Increasing water releases would affect reservoir levels, which would affect foraging area for the bald eagle. A reduction in water surface area may provide reduced fishing area for eagles and more competition between eagles and recreational anglers; conversely, it may provide better forage opportunity, by concentrating fish in areas with suitable water depth resulting in more fish per acre. As such, it is not possible to ascertain whether the project would adversely affect bald eagles; effects are expected to be both positive and negative and vary across space and time. If South Feather consults with the Forest Service, as specified, to revise and update the existing Little Grass Valley reservoir Bald Eagle Management Plan, as prescribed by the Forest Service, effects on the bald eagle could be reduced.

Bat Management

During pre-licensing surveys, South Feather observed six special status bat species using project facilities for day and night roosting habitat. None of the six species are state or federally listed as endangered or threatened. To reduce potential effects of project O&M on bats, and address potential health concerns associated with South Feather employees working in proximity to bats, South Feather proposes to replace existing bat exclusion devices on project facilities that are regularly visited by employees. South Feather would not place such devices within tunnel areas behind grates to allow bats to have access to these areas where human activity is minimal. South Feather would select the exclusion devices following consultation with Cal Fish & Game or a Bat Conservation International-approved specialist.

Forest Service Condition No. 25 specifies and Cal Fish & Game recommends that South Feather consult with resource agencies and develop a bat management plan to mitigate effects on bats that result from project associated recreation and vegetation management activities.

Our Analysis

Continued operation of the project has the potential to disturb foraging and roosting bats as a result of recreational activities or vegetation management. South Feather could mitigate these effects with the installation of bat boxes or other protection or mitigation measures. South Feather's maintenance of existing bat exclusion devices would reduce the potential for human health concerns were bats to occupy project facilities frequented by project personnel. If South Feather consults with resource agencies to develop a bat management plan, as specified by the Forest Service and recommended by Cal Fish & Game, the agencies and South Feather would identify and implement such protection and mitigation measures and South Feather would reduce effects on special-status bat species.

Foothill Yellow-legged Frog

South Feather identified suitable habitat and observed FYLF within three project reaches: the Lost Creek/SFFR, Forbestown diversion dam, and Slate Creek diversion dam reaches. New minimum flows, ramping rates, and flow pulses associated with continued operation of the project could affect water velocity, temperature, and channel morphology in reaches with FYLF. These changes in habitat could cause increased stress, affect the timing of breeding, and reduce reproduction success for FYLF.

South Feather proposes several measures to minimize effects on FYLF, including considering FYLF habitat preference when developing minimum flow levels (discussed in detail in section 3.3.2, *Aquatic Resources*) and avoiding high pulse flows. South Feather proposes to avoid the release of controlled high flows during periods when FYLF are expected to be active. This measure would be in effect from April 15, or whenever water temperatures reach 13°C (whichever is later) until October 31 of each year.

Cal Fish & Game recommends that South Feather develop a FYLF monitoring plan. The plan would include annual surveys monitoring FYLF adult, tadpole, and egg mass numbers in the SFFR/Lost Creek dam, Forbestown diversion dam, and Slate Creek diversion dam reaches for the first 10 years after relicensing, followed with similar surveys every 5 years for the term of the license. Cal Fish & Game also recommends that following 5 years of FYLF monitoring, South Feather implement ramping rates that would protect FYLF egg masses and tadpoles in all reaches where they occur.

In addition to the population monitoring recommended by Cal Fish & Game, the Forest Service specified in preliminary Condition No. 19, 2.2 through 2.4, the development of a population model, a population viability model, a 2-D habitat model, a temperature monitoring protocol, and a geomorphology and riparian encroachment monitoring protocol.

In response to the Forest Service condition, South Feather commented that the development of population and habitat models and studies relating water temperature to development processes would be overly expensive and are not necessary for evaluating effects of the project. South Feather also states that these prescriptions are not directly related to the project, but are research projects aimed at better understanding FYLF biology in general. South Feather filed an alternative 4(e) condition in which it proposed to eliminate the population model, population viability model, 2-D habitat model, temperature monitoring and associated studies, and geomorphology and riparian encroachment monitoring from Forest Service's 4(e) condition. South Feather's alternative 4(e) condition also proposed a monitoring plan which would include two types of surveys: full reach and representative. South Feather would conduct full reach surveys in first year following relicensing and then repeat them every 10 years. These surveys would consist of surveying all reasonable accessible FYLF habitat in the SFFR/Lost Creek, Forbestown diversion dam, and Slate Creek diversion dam reaches. South Feather would conduct the representative surveys once every 10 years starting the fifth year after relicensing which would include surveys located at one site within each of

the three reaches. South Feather would conduct both the full reach and representative surveys following the methodology used for the pre-license application studies. Based on the results of these surveys, South Feather, in consultation with the Forest Service, would evaluate project effects on FYLF. If it is evident that there are adverse project-related effects, South Feather, in consultation with the Forest Service, would recommend more targeted studies aimed at identifying the mechanisms for such adverse effects and identifying appropriate mitigation measures. South Feather would implement any such recommendations subsequently approved by the Commission.

Following issuance of the draft EIS, the Forest Service issued its final conditions on March 6, 2009. The final conditions differ substantially from the preliminary conditions in terms of monitoring frequency and monitoring intensity. The final 4(e) conditions also provide more detail regarding the type of data South Feather should collect to determine potential effects of temperature on development rates and conducting a population viability analysis. Rather than requiring South Feather to develop a population model, the Forest Service has provided a model and specified data collection protocols for determining tadpole and adult survival rates for use with the existing model. Specifics of these conditions are described in the following section.

In its final 4(e) Condition No. 19, part 2, the Forest Service specifies that, within 1 year of license issuance, and after consultation with the Forest Service, and other interested governmental agencies, South Feather file with the Commission an amphibian monitoring plan approved by the Forest Service. The Plan would outline sampling to be conducted in the following reaches: Little Grass Valley dam, South Fork diversion dam, SF Feather River/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam.

The amphibian monitoring plan for the above reaches would include targeted monitoring of Forest Service-listed sensitive amphibians beginning no later than the first spring following license issuance and continuing at some level through out the project license period. Monitoring would include FYLF population status, distribution, viability, and reproductive success. Because the new minimum streamflow conditions would alter the base flow levels and timing of flows relative to recent project operation, the following would be assessed in detail for typical oviposition (egg-laying) and rearing (tadpole) habitats for both occupied and non-occupied habitat locations: temperature regimes; riparian vegetation establishment, encroachment, and scouring; habitat conditions (water depths, velocities, bank slopes, etc.); and river bar formation/loss. In addition, a ramping rate assessment is specified.

The Forest Service condition specifies that South Feather conduct full reach visual encounter sampling for FYLF in the Little Grass Valley dam, South Fork diversion dam, SF Feather River/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam reaches during the first year following issuance of the new license. If such surveys are not possible during the first year due to weather, timing of surveys, or

project operations, the surveys are to be completed during the second year. Full reach surveys in each of these six reaches are then to be repeated every once every 10 years for the duration of the license.

Based on the results of the initial surveys under a new license, South Feather, in consultation with the Forest Service, would select representative sample sites in each of the six reaches mentioned above. The Forest Service condition specifies that South Feather conduct visual encounter surveys at these representative sampling sites in years 2-6 of the new license, and once every 4 years for the duration of the license. Annual surveys of the representative sites would resume for the last 3 years of the license period.

In addition to visual encounter surveys, the Forest Service final 4(e) conditions specify temperature and habitat monitoring, and data collection to determine FYLF incubation period (time from egg laying to hatching), metamorphosis period, and size of metamorphs, to determine the influence of water temperature on development rates. South Feather would collect temperature and growth rate data annually until data for all three water year types has been collected. The Forest Service specified habitat monitoring would include measuring the size (length and width during breeding and rearing season) of depositional bars, bank slope, substrate composition, and vegetation cover at all FYLF breeding sites. These surveys would occur once every 10 years in conjunction with the full reach visual encounter surveys.

Finally, the Forest Service final 4(e) conditions specify a method for determining appropriate ramping rates to protect FYLF. To make this evaluation, South Feather would provide to the Forest Service its expectation of the water year type through July of that year and: (1) a brief description of the protocols that it proposes to use for the sampling described below and (2) the locations it proposes for monitoring. Monitoring locations would coincide with known FYLF breeding sites in the following stream reaches: (1) SFFR from the confluence with Lost Creek to Forbestown diversion dam (SFFR/Lost Creek reach); (2) SFFR from Forbestown diversion dam to Ponderosa reservoir (Forbestown diversion dam reach); and (3) Slate Creek from Slate Creek diversion dam to New Bullards Bar reservoir (Slate Creek diversion dam reach). The monitoring locations are to be representative of FYLF breeding sites in each reach. Sampling would include the following two components:

1. Velocity and Stage Measurements. At each of the above listed project dams, South Feather would implement each step reduction from May through July in two approximately equal steps over 2 hours (e.g., a step reduction from 126 to 53 cfs would occur over 2 hours with a reduction at the beginning of the first hour from 126 to 89 cfs, and the reduction at the beginning of the second hour from 89 to 53 cfs). During each reduction, immediately prior to the reduction in flow at the dam and approximately every 30 minutes after the reduction in flow at the dam, South Feather would measure stage (total depth in tenths of a foot) and water velocity (mean column velocity in tenths of a foot per second) at the monitoring locations. Monitoring would continue until stage

change related to the step reduction is no greater than 0.1 foot between sampling events at the monitoring location.

2. Habitat Monitoring. At the highest and lowest step reduction flow, South Feather would map FYLF habitat availability at each monitoring location, including showing location of the edge of water. Mapping protocols would be similar to those for FYLF habitat mapping in Silver Creek performed by the Sacramento Municipal Utility District for its Upper American River Project relicensing (FERC Project 2100) or other protocols approved by the Forest Service.

Within 3 months of completing the sampling for a given water year type, South Feather would prepare a draft report that describes the results of the sampling, including curves that relate stage and velocity to discharge at each monitoring location sampled, and the results of the habitat mapping in appropriate plots. The report would discuss the findings in relation to the Forest Service's water velocity and stage targets described above and recommend a ramping rate (in cfs per unit time) at each of the South Fork, Forbestown, Lost Creek, and Slate Creek dams for the periods from May through July for the water year type in which the sampling was performed. The report is to also include an estimate of accretion from the project dams to the monitoring locations during the sampling, and the actual water year types for each month during which the sampling occurred. The report would be provided to the Forest Service for 60-day review. Within 60 days of the close of the comment period, South Feather would file with the Commission a final report including evidence of consultation and any written comments made by the Forest Service. Following Commission approval, South Feather would subsequently implement the specific ramping rate for that water year type.

South Feather would conduct the above measurements for each water year type. If the expected water year type in a subsequent year is the same as a water year type for which monitoring has previously been performed or if data from previous years is deemed adequate by the Forest Service to address the expected water year type, South Feather would not repeat the exercise in that year. The sampling would occur for a maximum of 4 years.

Our Analysis

Proposed project operation would alter the existing hydrograph in stream channels known to support FYLF, including the SFFR/Lost Creek reach, Forbestown diversion dam reach, and Slate Creek diversion dam reach. Quickly reducing high flows to minimum low flow levels could increase mortality of egg masses and tadpoles by stranding them in dry areas as flows recede. Conversely, high flows could wash egg masses, tadpoles and adults downstream to unsuitable habitat, which could increase mortality. The degree to which these changes would affect FYLF populations is unknown. Monitoring the effect of high flow releases on FYLF populations is needed to determine whether proposed changes in project operation adversely affect FYLF, and to develop measures that may be warranted to reduce adverse effects.

The release of high flows for recreational purposes is discussed in section 3.3.4.2, *Recreational Resources*. The FYLF breeding period is triggered by water temperatures warming to 12°C following springtime high water flows associated with snowmelt. The date this occurs will vary from year to year depending on climatic conditions. Avoiding the release of pulse flows between the date water temperatures reach 12°C and October 31 would avoid affecting FYLF during their spring and summer periods of activity.

The implementation of an appropriately structured monitoring plan that identifies changes in FYLF habitat, breeding periods, and population levels would be a necessary tool for evaluating project effects on FYLF, and developing and implementing mitigation measures. South Feather's alternative 4(e) condition includes surveys in the SFFR/Lost Creek, Forbestown diversion dam and Slate Creek diversion dam reaches in the first year of the license and every 5 years thereafter. However, to detect the effects of new license conditions on amphibian populations, it is important to incorporate lag times into the design and interpretation of monitoring because the response of breeding populations may not be detected for years after the new discharge regimes have altered conditions for spawning and tadpole rearing (Kupferberg, 1996). It would take 1 to 2 years for new eggs to hatch, mature, and reproduce. Therefore, the full effects of initial project-related changes in breeding success on population levels would not be evident for several years. As such, annual monitoring for the first 10 years, as specified by the Forest Service and recommended by Cal Fish & Game, would be needed to identify any unanticipated short term effects early in the license term, while monitoring every 5 years thereafter would be sufficient to detect any long-term changes.

South Feather's alternative 4(e) condition would include full-reach surveys of all reasonably accessible FYLF habitat in the first year of the license, and every 10 years thereafter, while all other surveys would be conducted in representative areas within each reach. The survey protocols recommended by Cal Fish & Game did not specify the extent of the surveys to be conducted in each reach. The Forest Service specified sampling would include full reach surveys in all six project reaches in year 1 and every 10 years thereafter, supplemented with representative surveys in years 2-6 and once every 4 years thereafter.

Representative sampling is an accepted scientific method for collecting biological data, and if used appropriately, could detect most changes in FYLF populations and habitat conditions. However, as channel morphology adjusts to the new hydrologic conditions, suitable FYLF habitat could be removed in some areas and created in others. As a result, periodic full reach surveys would be needed to detect such long-term shifts in habitat. A monitoring methodology that includes both full reach and representative surveys would be appropriate for detecting changes in habitat and population levels. We recommend that visual encounter surveys be consistent with the Forest Service 4(e) specifications. Such survey frequencies and intensities are necessary to determine both short- and long-term effects of project operations on FYLF population levels.

In its alternative to the Forest Service preliminary 4(e) conditions, South Feather states that, in the event South Feather's monitoring surveys suggest adverse effects related to the project, South Feather would consult with the Forest Service to initiate more focused studies aimed at identifying the mechanisms for such adverse effects and for mitigating those effects. However, the results of the Forest Service-specified data collection to support population modeling and temperature studies would be informative and could enhance conservation efforts for FYLF. These components of the final 4(e) conditions were scaled back from the preliminary conditions and are presented in an explicit manner that describes the specified procedures. Changes in project operations, including increases in minimum flows, are expected to influence water temperature and sediment erosion and deposition processes. To complete its lifecycle, FYLF requires suitable water temperatures and stream channel substrates. As such, monitoring these components of FYLF habitat is an important step in ensuring the project does not have adverse effects on this species. The specified monitoring and data collection measures would provide quantitative information to determine project effects on population size, distribution, development rates, and habitat characteristics.

The encroachment of vegetation into the stream channel could affect FYLF by slowing water velocities and altering patterns of sediment scour and deposition. Channel substrates in areas with slow water velocity are dominated by fine silts, which could replace gravel bars preferred by FYLF. The Forest Service specifies habitat and geomorphological surveys in Condition No. 19, parts 2 and 3. South Feather's encroachment study indicated that the intensity and timing of flood flows and associated channel scour processes that have occurred under current operations have been effective in controlling encroachment. However, there are some locations where riparian vegetation is present in the active channel. These results suggest that the current effect of encroachment on the FYLF population is probably minimal, and that treatment would be premature at this time. However, if future monitoring indicates that encroachment of riparian vegetation is affecting FYLF, implementation of the Forest Service specified treatment protocol may be warranted.

Controlling the rate at which managed flow increases or decreases occur would be a necessary component of a successful FYLF management strategy. Increasing flows too quickly would increase the potential for FYLF eggs, tadpoles, or adults to be washed downstream into unsuitable habitat. Similarly, decreasing flows at too great a rate would increase the potential for all lifestages to become stranded in pools where conditions could become unsuitable as flows continue to decrease and pools dry up. Minimum flow requirements, as discussed above, would depend upon current climatic conditions. Implementing a methodology, as recommended by Cal Fish & Game, that identifies suitable rates of flow fluctuation based the needs of FYLF would reduce effects on this species. A methodology for determining appropriate ramping rates for each water year type, as specified by the Forest Service, would further reduce effects on FYLF.

Table 3-20. Field-mapped riparian vegetation types at eight intensive study sites and at the Slate Creek diversion dam impoundment, based on the Potter (2003) classification. (Source: South Feather, 2007)

Acres and Percent of Total Site												
Potter Vegetation Type	Little Grass Valley Dam Reach		South Fork Diversion Dam Reach	Forbestown Diversion Dam Reach		Lost Creek Dam Reach	Slate Creek Diversion			Study Area Totals		
	SFFR 27.4 (4,641 ft)	SFFR 22.7 (3,920 ft)	SFFR 13.7 (3,100 ft)	SFFR 7.2 (1,607 ft)	SFFR 3.5 (1,050 ft)	LC 3.3 ^b (3,116 ft)	SC 7.8 (3,378 ft)	SC 1.1 (2,066 ft)	Impoundment ^c (3,552 ft) ³	Total Acres	% Total Area	No. of polygons
White Alder		0.31 (19%)	0.98 (39%)	1.16 (59%)	0.79 (41%)		1.12 (50%)	0.73 (32%)	2.87 (47%)	7.97	30.80	80
White Alder / Indian Rhubarb	0.14 (2%)	0.93 (57%)	0.67 (27%)		0.10 (5%)	0.97 (86%)	0.44 (20%)	0.65 (29%)		3.91	15.12	42
Bedrock and Boulder	2.23 (37%)	0.39 (24%)	0.03 (1%)	0.02 (1%)	0.94 (49%)		0.32 (14%)	0.59 (26%)	0.08 (1%)	4.61	17.82	54
Mountain Alder	3.47 (57%)									3.47	13.40	35
Unclassified Riparian Scrub	0.08 (1%)		0.22 (9%)	0.21 (11%)	0.06 (3%)	0.16 (14%)	0.05 (2%)	0.06 (3%)	0.87 (14%)	1.71	6.62	15
Unconsolidate d Material			0.52 (20%)	0.09 (5%)			0.24 (11%)	0.17 (7%)	2.34 (38%)	3.36	12.99	32
Mid- elevation Unclassified Riparian Forb	0.04 (1%)			0.11 (6%)			0.05 (2%)			0.21	0.80	2

Acres and Percent of Total Site												
Oregon Ash				0.37 (19%)						0.37	1.44	8
Unclassified Riparian Forest and Woodland		0.09 (4%)						0.01 (1%)		0.11	0.42	2
Douglas fir / Incense Cedar / White Alder	0.08 (1%)									0.08	0.31	1
Fremont Cottonwood / Red Willow				0.02 (1%)						0.02	.06	1
Low Elevation Unclassified Riparian Forb								0.06 (3%)		0.06	0.23	1
Totals	6.04 (100%)	1.64 (100%)	2.52 (100%)	1.97 (100%)	1.92 (100%)	1.13 (100%)	2.23 (100%)	2.26 (100%)	6.16 (100%)	25.86	100.00	273

Notes: Table includes extent (acres), percent of total acres, and frequency (number of polygons) of field-mapped riparian vegetation and cover types in the study area.

- ^a The following intensive study sites were not mapped due to poor image quality of orthophoto basemaps and/or shading by upland vegetation: South Fork Diversion Dam Reach upper site (SFFR 16.5) and South Fork Feather/Lost Creek Reach site (SFFR 8.7)
- ^b Riparian vegetation at the Lost Creek dam reach site (LC 3.3) was mapped further upstream than where greenline surveys occurred, due to poor image quality of orthophoto basemaps and shading by upland vegetation. These areas exhibited similar vegetation types as those found at the greenline transects.
- ^c Consists of additional mapping conducted in and around the Slate Creek diversion dam impoundment.

Table 3-21. Summary of incidental observations of non-native species designated as noxious weeds. (Source: South Feather, 2007)

Scientific Name	Common Name	CDFR Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Aegilops triuncialis</i>	Barbed goatgrass	B	High	-Miners Ranch reservoir		
<i>Carduus pycnocephalus</i>	Italian thistle	C	Moderate	-Miners Ranch reservoir -Little Grass Valley reservoir		
<i>Centaurea solstitialis</i>	Yellow star-thistle	C	High	-Kelly Ridge powerhouse -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -Sly Creek reservoir		Common in disturbed, dry areas (e.g., in and around powerhouse yards). Especially abundant on dam faces and along roadsides. Dense infestation along southern berm slope of Miners Ranch reservoir. Scattered, diffuse occurrences along Miners Ranch conduit.
<i>Cirsium vulgare</i>	Bull thistle	UR	Moderate	-Miners Ranch reservoir -Ponderosa reservoir -South Fork diversion -Little Grass Valley reservoir -Sly Creek reservoir		
<i>Convolvulus arvensis</i>	Bindweed	C	Eval No List	-Kelly Ridge powerhouse -South Fork diversion -Little Grass Valley reservoir -Sly Creek reservoir		
<i>Cynodon dactylon</i>	Bermuda grass	C	Moderate	-Ponderosa reservoir -Sly Creek reservoir		

Scientific Name	Common Name	CDFR Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Elytrigia repens</i>	Quackgrass	B		-South Fork diversion -Lost Creek reservoir -Sly Creek reservoir		
<i>Genista Monspessulana</i>	French broom	C	Moderate	-Kelly Ridge powerhouse	2	(1) One mature shrub (2) Dense patch
<i>Hypericum perforatum</i>	Klamath weed	C	Moderate	-Kelly Ranch powerhouse -Miners Ranch conduit -Miners Ranch reservoir -Forbestown diversion -Lost Creek reservoir -Sly Creek reservoir -Slate Creek reservoir		
<i>Taeniatherum caput-medusae</i>	Medusa-head	C	High	-Miners Ranch reservoir		Scattered occurrences in dry, disturbed areas (e.g., along roads/trails surrounding reservoir) with other Mediterranean grasses.
<i>Ailanthus altissima</i>	Tree-of-heaven	N/A	Moderate	-Miners Ranch conduit -Forbestown diversion	1 1	One mature tree Four large plants with abundant root suckers
<i>Arundo donax</i>	Giant-reed	N/A	High	-Ponderosa reservoir		Each population consists of a large mature patch
<i>Brassica nigra</i>	Black mustard	N/A	Moderate	-Kelly Ridge powerhouse -Miners Ranch reservoir -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -Lost Creek reservoir -Sly Creek reservoir	2	Widespread in disturbed areas (e.g., roadsides)
<i>Bromus madritenis ssp. rubens</i>	Foxtail chess	N/A	High	-Kelly Ridge powerhouse -Miners Ranch reservoir -Miners Ranch conduit		Common in disturbed dry areas. Especially abundant on dam faces and along

Scientific Name	Common Name	CDFR Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Ficus carica</i>	Edible fig	N/A	Moderate	-Ponderosa reservoir -Forbestown diversion -Kelly Ridge powerhouse -Ponderosa reservoir -Forbestown diversion		roadsides. Limited to one or two mature trees at each facility, with the exception of a large well-established population above Kelly Ridge powerhouse
<i>Hedra helix</i>	English ivy	N/A	High	-Ponderosa reservoir	1	Near abandoned shack along edge of reservoir.
<i>Leucanthemum vulgare</i>	Oxeye-daisy	N/A	Moderate	-Slate Creek diversion		
<i>Robinia pseudoacacia</i>	Black locust	N/A	Limited	-Miners Ranch Reservoir -Ponderosa reservoir		One tree was found at a riparian study site within the FDD reach.
<i>Rubus discolor</i>	Himalayan blackberry	N/A	High	-FDD reach (SFFR 3.9) -Kelly Ridge powerhouse -Miners Ranch Reservoir -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -Lost Creek reservoir -Sly Creek reservoir -Sly Creek powerhouse -Little Grass Valley reservoir -FDD reach (SFFR 3.9 and SFFR 6.9) -LCD reach (LCD 3.0) -SFF/LC reach (SFFR 8.4)	3	Species is wide-spread and well established at all Project facilities. Typically found at or above high water line in dense, patchy to continuous stands surrounding reservoirs. Also commonly found in mid- to low-elevation Project reaches as understory component in riparian zone, often in dense thickets.
<i>Saponaria officinalis</i>	Bouncing-bet	N/A	Limited	-Slate Creek diversion and reach		Widespread on large cobble bars in middle of Slate Creek Diversion. Also found downstream of the

Scientific Name	Common Name	CDFA Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Spartium junceum</i>	Spanish broom	N/A	High	-Miners Ranch conduit	4	diversion as patchy understory component along riparian zone. (1) One main dense patch (2-4) Individuals
				-Miners Ranch reservoir	10	(1-5) individuals (6) large patch ~ 75ft X15ft (7) Patch of 5-10 large plants (8) Large patch ~ 60ft X 30ft (9) Approx. 7 medium plants (10) Two plants
<i>Verbascum thapsus</i>	Woolly mullen	N/A	Limited	-Kelly Ridge powerhouse -Miners Ranch reservoir -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -South Fork diversion -Lost Creek reservoir -Sly Creek reservoir -Slate Creek diversion -Little Grass Valley reservoir		

^a CDFA 2004. These are considered Noxious Weeds by the state of California and have received the following ratings:

B: Weeds subject to action by CDFA only when found in a nursery, and otherwise subject to eradication, containment, control, or other holding action at the discretion of the local county agricultural commissioner.

C: Not subject to state action except to provide for general pest cleanliness in nurseries; reject by CDFA only when found in a crop seed for planting or at the discretion of the commissioner, action to retard spread outside of nurseries at the discretion of the county agricultural commissioner.

UR: Unrated.

^b Cal-IPC 2006.

High: These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate: These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited: These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Eval No List: Evaluated but not listed due to either lack of sufficient information to assign a rating or the available information indicates that the species does not have significant impacts at the present time.

Table 3-22. Summary of special-status plant occurrences located in 2004. (Source: South Feather, 2007)

<i>Scientific Name</i>	Common Name	Status^a	Total No. of Populations	Location	Approx. No. Plants w/in Population
<i>Cardimine pachystigma</i> var. <i>dissectifolia</i>	Dissected-leaved toothwort	Fed: None PNF: FSI Cat 1 CA: None CNPS: 3	1	Forbestown diversion	2
<i>Clarkia biloba</i> ssp. <i>brandegeae</i>	Brandegee's clarkia	Fed: FSC PNF: FSS CA: None CNPS: 1B	4	Miners Ranch conduit	50; 50; 25; 100
<i>Clarkia mildrediae</i> ssp. <i>lutescens</i>	Golden-anthered clarkia	Fed: None PNF: FSI Cat 1 CA: None CNPS: 4	10	Little Grass Valley reservoir	1,000; 500; 10; 5; 150; 1
				Sly Creek powerhouse Slate Creek diversion	400; 300; 300 1,000
<i>Clarkia mosquinii</i>	Mosquin's clarkia	Fed: FSC PNF: FSS CA: None CNPS: 1B	4	Miners Ranch conduit	30
				Ponderosa reservoir	1; 20
				Lost Creek reservoir	3
<i>Clarkia stellata</i>	Starry clarkia	Fed: None PNF: FSS CA: None CNPS: None	1	Little Grass Valley reservoir	30
<i>Drosera rotundifolia</i>	Round-leaved sundew	Fed: None PNF: FSI Cat 2 CA: None CNPS: None	1	Little Grass Valley reservoir	1,000
<i>Fritillaria eastwoodiae</i>	Butte County fritillary	Fed: FSC PNF: FSS CA: None CNPS: 3	2	Forbestown diversion	5

<i>Scientific Name</i>	Common Name	Status^a	Total No. of Populations	Location	Approx. No. Plants w/in Population
				Ponderosa reservoir	No data ^b
<i>Juglans hindsii</i>	Northern California black walnut	Fed: None PNF: None CA: None CNPS: 1B	1	Miners Ranch reservoir	1
<i>Vaccinium coccineum</i>	Siskiyou Mountains huckleberry	Fed: None PNF: FSS CA: None CNPS: 3	2	South Fork diversion	1
<i>Viola tomentosa</i>	Woolly viola	Fed: FSC PNF: FSI Cat 1 CA: None CNPS: 4	5	Sly Creek reservoir Little Grass Valley reservoir	150; 5; 50; 100; 20

^a Status listing definitions are as follows:

Federal Status (Fed):

FE Listed as endangered under the federal Endangered Species Act.
 FT Listed as threatened under the federal Endangered Species Act.
 FC Federal candidate species.
 FSC Federal species of concern (SFWP 2003)

Plumas National Forest (PNF) Status:

MIS Considered a Management Indicator Species by the USDA Forest Service under the National Forestry Management Act (USDA 1988).
 FSS Considered a sensitive species by the USDA Forest Service under the National Forestry Management Act.
 FSI Cat1 Special Interest Category 1-survey and recommend conservation measures.
 FSI Cat2 Special Interest Category 2-report occurrences and Forest Service recommend conservation measures.

California (CA) Status:

CT Listed as threatened under the state Endangered Species Act.
 CE Listed as endangered under the state Endangered Species Act.
 CR Listed as rare under the California Native Plant Protection Act.

California Native Plant Society (CNPS) Status:

1A Plants presumed extinct in California
 1B Plants rare, threatened, or endangered in California and elsewhere
 2 Plants rare, threatened, or endangered in California, but more common elsewhere
 3 Plants for which more information is needed to determine its status.
 4 Limited distributions (watch list).

^b This cell should contain an estimate for the number of plants in a population of an RTE species; however, the cell was blank in South Feather's application.

Table 3-23. Special-status wildlife species with documented occurrences in the project area. (Source: South Feather, 2007)

Common and Scientific	Status	Habitat Notes	Occurrences in Project Area
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	FT	Entire life cycle dependent on elderberry plants (<i>Sambucus</i> spp.), which occur within riparian forests or occasionally in separate patches or as individuals in non-forested habitat types in the Central Valley. Elderberry typically grows in association with various species of woody plants, often on the top and slope of banks, and rarely on sandbars. VELB appears to typically prefer larger, mature plants. Conservation guidelines consider potential host plants with one or more stems measuring 1 in (2.5 cm) in diameter or greater at ground level. Emergence holes have been observed at heights of 4 ft (1.2 m) or less. Specific conservation guidelines for VELB include survey protocols and measures for avoiding, protecting, restoring and monitoring impacted VELB habitat.	<ul style="list-style-type: none"> • Only known location in PNF with potential VELB habitat found near Pulga Road south of Poe Dam on Hwy 70 at the western boundary near Lassen National Forest (T23N R5E S32). No VELB was recorded at this site although exit holes have been observed in the elderberry plants here. • Elderberry occurs in scattered locations throughout PNF, but no other areas have shown evidence of VELB activity.
Canada goose <i>Branta canadensis</i>	MIS	Use a variety of habitats including lacustrine, fresh emergent wetlands, moist grasslands, croplands, pastures, and meadows.	<ul style="list-style-type: none"> • Occur at Little Grass Valley and Ponderosa reservoirs; also observed at Sly Creek and Lost Creek reservoirs.
Osprey <i>Pandion haliaetus</i>	CSC	Nest in large trees near open, fish-bearing water.	<ul style="list-style-type: none"> • Project reservoirs have increased the distribution and amount of potential foraging and nesting habitat in the vicinity of the Project; Osprey are known to occur at Little Grass Valley, Sly Creek, and Lost Creek reservoirs, and near Miners Ranch conduit (along Lake Oroville).
Bald eagle <i>Haliaeetus leucocephalus</i>	CE, CFP, MIS	Tend to nest in areas of primarily mature/late-successional, or old-growth forest in fairly close proximity to water. Nests usually constructed in very large trees within fairly open stands of approximately 40% canopy closure. The nest tree is often the dominant or co-dominant tree in the surrounding stand and must be sturdy enough to support a large, heavy stick nest (e.g., 5 feet wide and 3 feet deep) and often re-used and/or reconstructed each year. Breeding territories may include one or more alternate nests. Fish	<ul style="list-style-type: none"> • Project reservoirs have increased the distribution and amount of potential foraging and nesting habitat in the vicinity of the Project; occur at Little Grass Valley, Sly Creek, Lost Creek, and Ponderosa reservoirs, and near Miners Ranch conduit (along Lake Oroville). • Nesting has been documented at Little Grass Valley reservoir which supports the only known bald eagle nest territory in the vicinity of the Project; located on south side of reservoir, 3 miles north of La Porte. • Spring hollow territory; south of the Middle Fork

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
Northern goshawk <i>Accipiter gentiles</i>	FSC, CSC, MIS, FSS	are primary diet although waterfowl, gulls and other birds, mammals, and carrion may also be taken. Large bodies of water required for hunting, including estuaries and coastal waters, rivers, large lakes, and reservoirs. Open, easily approached perches and feeding areas are preferred. Winter habitat requirements include adequate food supplies and the presence of roosting sites generally located close to open water but can be up to over 20 mi (32 km) from foraging areas. Important perch and roost sites include snags and dead-topped, live trees located in areas with minimal human disturbance. Prefers dense, late successional stage forest interspersed with meadows and other openings, and low-elevation riparian habitats (middle and higher elevations).	Feather River arm of Lake Oroville, 5.5 mi WSW of Feather Falls. <ul style="list-style-type: none"> • One CNDDDB occurrence at UTM 672731 4399488. • One CNDDDB occurrence at UTM 661899 4367010. • One CNDDDB occurrence at UTM 640937 4381717. <ul style="list-style-type: none"> • Forbestown. • Mooreville Ridge, 1.5 miles west of Lost Creek Reservoir. • Four nests northeast of Little Grass Valley reservoir in the Bald Onion Management Unit • 13 goshawk detections and three active nests in the vicinity of the confluence of Lost Creek and the SFFR. • One CNDDDB occurrence at UTM 10 647669 437760. • One CNDDDB occurrence at UTM 10 657833 438207. • The nearest known or suspected peregrine falcon sites are on bridges at Lake Oroville, and north of the Middle Fork Feather River near Lake Oroville.
American peregrine falcon <i>Falco peregrinus anatum</i>	CE, CFP, MIS	Use a variety of habitats, including wetlands, woodlands, cities, agricultural lands, and coastal areas. Often nest in open areas near rivers, lakes, and coasts, and increasingly, in urban settings. Nests usually located near water, typically constructed on ledges of large cliff faces; birds in urban environments nest on city buildings and bridges. Nests consist of a well-rounded hollow scrape with accumulated debris in tree cavities, caves or on cliff ledges, occasionally lined with grass. Peregrine falcons may hunt prey in a variety of open habitat types such as wetlands, estuaries, mudflats, marshes, meadows, lakes, and rivers. Individuals have been known to forage up to 15 km (9 miles) from their nest sites.	
Greater sandhill crane <i>Grus canadensis tabida</i>	CT, CFP, FSS	Winters in the Central Valley, where it feeds on grasses, forbs, waste grains, small mammals, amphibians, snakes, and invertebrates in relatively	<ul style="list-style-type: none"> • Although 7 pairs were found nesting in Plumas County in 1988, there are no sandhill crane records documented in the CNDDDB for the Project area.

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
California spotted owl <i>Strix occidentalis occidentalis</i>	FSC, CSC, MIS, FSS	treeless plains, pastures, flooded grain fields, wet meadow, shallow lacustrine, and fresh emergent and seasonal wetlands habitats. Found in late- and mid-successional stage forest; dense multi-layered mixed conifer, redwood, and Douglas-fir habitats (0–7,500 ft [2,300 m]).	<ul style="list-style-type: none"> California spotted owl observations have been recorded throughout PNF since 1975 with nests documented (outside Project areas) in the vicinity of: Little Grass Valley reservoir, Pinkard Creek near Sly Creek reservoir, and Devil’s Gap near South Fork diversion dam.
Great grey owl <i>Strix nebulosa</i>	CE, FSS	Found in old-growth forests interspersed with openings for foraging, particularly mixed conifer and red fir forests of the Sierra Nevada during the breeding season. Distributed mainly in the scattered meadow-mature forest zone on the west slope of the central Sierra Nevada.	<ul style="list-style-type: none"> No owls observed during 2002 surveys of Watdog and Bald Onion Management Areas (Klamath Wildlife Resources 2002) or during surveys of Blakeless-Grizzly Creek (PNF) in 1984. One 1937 record of an owl shot 3 miles south of Mt. Ingalls along Blakeless Creek in September 1937.
Western Mastif bat <i>Eumops perotis</i>	FSC, CSC, WBWGH	Found in open areas with abundant roost locations provided by crevices in rock outcrops and buildings (lower elevations, but as high as 8,700 ft [2,660 m]) ^c	<ul style="list-style-type: none"> Multiple observations noted from Plumas County. Confirmed population associated with the basaltic table mountains near Oroville; additional population noted near Chico thought to be year-long resident.
Pacific fisher <i>Martes pennanti</i>	FSC, CSC, FSS, FC	Occur in late successional forest near streams and meadows (0–11,000 ft [3,350 m])	<ul style="list-style-type: none"> Vicinity of Bullards Bar Reservoir, the south side of Bullards Bar Dam. Plumas National Forest.
California wolverine <i>Gulo gulo luteus</i>	FSC, CT, FSS	Most historical records in the Sierra Nevada associated with coniferous forests. Home range size extremely variable and appears to depend on the abundance and distribution of food. Localized areas of high food availability tend to result in smaller home ranges. Home range size varies from less than 39 mi ² (100 km ²) to over 347 mi ² (900 km ²). Natal den sites located in cavities in trees and snags and in holes dug under standing trees or downed logs in forested areas. Dens also found in abandoned beaver lodges, within the roots of recently downed trees, among boulders, on rock ledges, old bear dens, and in caves. Dense cover used for resting and reproduction, open areas used for hunting (4,300–7,545 ft [1,300–2,300 m]). Topographic features such as rivers, lakes, and	<ul style="list-style-type: none"> White Springs.

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
Mountain yellow-legged frog <i>Rana muscoca</i>	FSC, FC, CSC, CP	mountain ranges do not appear to block the movement of wolverines. Riparian areas are used as travel corridors. In the Sierra Nevada, wolverine populations may have become isolated due to human activities, and their current distribution in the Sierra Nevada is unknown. Montane riparian habitats with slow moving streams, lakes, and ponds (above 1,372 m [4,500 feet])	<ul style="list-style-type: none"> • Pine Grove Creek, 0.7 miles NW of Howland Flat, Plumas National Forest. • Pinkard Creek; 1.1 miles directly north of Lost Creek Reservoir and 2 miles directly east of Sugar Pine Point. • Vicinity of Bottle Springs, 6.4 miles north of Fowler Peak and 5.7 miles west of Little Volcano.
Foothill yellow-legged frog <i>Rana boylei</i>	FSC, CSC, CP	Moderate-sized, open streams with coarse substrate and low gradients (0–1,524 m [0–5,000 feet])	<ul style="list-style-type: none"> • Observed on Slate Creek upstream and downstream of Slate Creek Diversion Dam. • Slate Creek, north of forest road 512, 3 miles SE of Little Grass Valley Reservoir • SFFR, at forest road 22N24, Plumas National Forest. • Oroleve Creek, just east of forest road 20N29 (Forbestown Dam Road), Plumas National Forest. • Woodruff Creek, approximately 2.0 miles south of Goodyear’s Bar, North Yuba River Basin. • North Yuba River, from the mouth of Humbert Creek to Devils Canyon Creek, Tahoe National Forest. • Unnamed tributary to Woodruff Creek, along Mountain House Road, 1 mile SSW of Goodyears Bar, North Yuba River Basin, Tahoe National Forest. • Unnamed tributary to Woodruff Creek, along Mountain House Road, 2 miles SSW of Goodyears Bar, North Yuba River Basin, Tahoe National Forest. • Fiddle Creek, at Fiddle Creek Ridge Trailhead, North Yuba River Basin, Tahoe National Forest. • Woodruff Creek, 0.6 mile south of Goodyears Bar (0.8 mile south of HWY 49), North Yuba River Basin, Tahoe National Forest • Along forest road 22N62, east of Milsap Bar, Middle Feather River Basin, Plumas National Forest.

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
California red-legged frog <i>Rana aurora draytonii</i>	FT, CSC, CP	Wetlands; wet meadows; ponds and lakes; and pools in low-gradient, slow moving stream reaches, with permanent sources of deep water and riparian vegetation (0– 1,524 m [0–5,000 feet])	<ul style="list-style-type: none"> • North side of Little Oregon Creek, just east of Oregon Hill Road (CNDDDB 2004, Challenge Quad). • Closest occurrence (from 1994) is approximately one mile north of Lost Creek Reservoir along Pinkard Creek.

Notes:

FE = Listed as endangered under the federal ESA.

FT = Listed as threatened under the federal ESA.

FTPD = Listed as threatened under the federal ESA but currently proposed for delisting.

FP = Proposed for listing under the federal ESA.

FC = Federal candidate species.

FSC = Federal species of concern (former Category 2 candidate for listing under the ESA).

CE = Listed as endangered under the California Endangered Species Act.

CT = Listed as threatened under the California Endangered Species Act.

SC = Candidate for listing under the California Endangered Species Act.

CFP = Fully protected by the state of California.

CSC = Considered a species of special concern by the state of California.

MIS = Considered a Management Indicator Species by the Forest Service under the National Forestry Management Act.

FSS = Considered a Sensitive Species by the Forest Service under the National Forestry Management Act.

WBWG-H = Considered imperiled or are at high risk of imperilment by the WBWG.

Table 3-24. Roosting and foraging behavior summary of special-status bat species potentially occurring in the study area. (Source: South Feather, 2007)

Common and Scientific Names	Regulatory Status^a	Roosting Behavior	Foraging Behavior
Western mastiff bat <i>Eumops perotis</i>	CSC, FSC, WBWG-H	Colonial (30–300); predominantly cliff-dwelling; associated with major river canyons, and basaltic tablelands.	Aerial forager; feeds in both aquatic and terrestrial habitats; strong, long distance flier (1- way distance up to 25 km/night).
Pallid bat <i>Antrozous pallidus</i>	FSS, CSC, WBWG-H	Colonial (30–300); roosts in caves, abandoned mines, tree hollows, buildings, and bridges; often associated with oak habitat; somewhat sensitive to human disturbance.	Forages primarily on large, ground dwelling arthropods (scorpions, Jerusalem crickets, long-horned beetles); comes to water to drink.
Townsend's big-eared bat <i>Corynorhinus townsendii</i>	FSS, CSC, FSC, WBWG-H	Colonial (30–300); roosts in caves, abandoned mines, and cavity-like manmade structures (e.g., enclosed attics); restrictive roost requirements; sensitive to human disturbance; roosts in large, basal redwood hollows.	Moth specialist; forages close to vegetation, often following secondary stream drainages, often away from water sources.
Spotted bat <i>Euderma maculatum</i>	FSS, CSC, FSC, WBWG-H	Little known about roosting behavior; typically only one is caught per night at a given site; individuals well dispersed, separated by distances of 750–1,000 m.	Forages on moths; less than 10 km from diurnal roost; seems to forage constantly; roost faithful—returns to same diurnal roost every night during summer.
Red bat <i>Lasiurus blossevillii</i>	FSS, CSC*, WBWG-H	Non-colonial; foliage-roosting; summer breeding populations found predominantly in	Feeds predominantly on moths; often forages above canopy height, in association

Common and Scientific Names	Regulatory Status^a	Roosting Behavior	Foraging Behavior
		mature riparian forests in Central Valley; migrates through Central Valley in spring and fall.	with both aquatic and terrestrial habitats.
Small-footed myotis <i>Myotis ciliolabrum</i>	FSC	Non-colonial or small colonies; often associated with rock features; roosting behavior poorly known; may tree roost.	Generalist; aerial hunter of small flying insects; diet poorly known in California.
Long-eared myotis <i>Myotis evotis</i>	FSC	Small colonies (10-30); crevice-roosting in trees, caves, mines, rock jumbles (riprap) and sometimes in buildings.	Forages in close association with vegetation; in clutter and along edges in both aquatic and terrestrial habitats.
Fringed myotis <i>Myotis thysanodes</i>	FSC, CSC*, WBWG-H	Generally small colonies (10-100); roosts in trees (primarily bark crevices in snags) caves, mines, and sometimes in buildings.	Aquatic and terrestrial habitats, often along secondary streams; feed mainly on beetles.
Long-legged myotis <i>Myotis volans</i>	FSC, CSC*, WBWG-H	Colonies (30-100); day roosts in trees, sometimes in buildings or caves; very few roosts known in California; night roosts on bridges.	Feeds predominantly on moths; forages in aquatic, riparian, and terrestrial habitats, often along secondary streams.
Yuma myotis <i>Myotis yumanensis</i>	FSC	Colonial; versatile roosting habits—caves, mines, trees, buildings, bridges.	Species dependent on aquatic habitats; often skims open water surface.

Notes: CSC = Considered a species of special concern by the state of California

FSC = Federal species of concern (former Category 2 candidate for listing under ESA).

FSS = Considered a Sensitive Species by the Forest Service under the National Forestry Management Act.

WBWG-H = Considered imperiled or are at high risk of imperilment by the WBWG.

* Status proposed.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Central Valley Spring-run Chinook Salmon

On September 19, 1999, NMFS listed the Central Valley spring-run Chinook salmon ESU as threatened under the ESA, and the listing was reaffirmed on June 28, 2005. The Central Valley spring-run Chinook salmon ESU is also listed as endangered under the California Endangered Species Act. The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River, as well as fish from the Feather River Hatchery spring-run Chinook program. NMFS' Central Valley Technical Recovery Team believes that the existing spring-run population in the Feather River, including the hatchery fish, may be the only remaining representative of this important ESU component and that the Feather River Hatchery spring-run Chinook salmon stock may play an important role in the recovery of spring-run Chinook salmon in the Feather River Basin as efforts progress to restore natural spring-run populations in the Feather and Yuba rivers (70 FR 37,160).

A designation was published on September 2, 2005, with an effective date of January 2, 2006. NMFS identified occupied habitat in the Feather River downstream of the fish barrier dam at the Feather River Hatchery as critical habitat for Central Valley spring-run Chinook salmon. NMFS further ruled that it is premature to include areas upstream of Oroville dam until ongoing recovery planning efforts in the central valley identify above-dam unoccupied areas that are essential for conservation of these ESUs (70 FR 52,630).

Historically, spring-run Chinook salmon were reported to have ascended to the very highest streams and headwaters in the Feather River watershed while they completed gonadal maturation (Cal Fish & Game, 1998a). The fish barrier dam, located 5 miles downstream of Oroville dam, is now the upstream limit to anadromous fish migrations. The Oroville facilities block the upstream migration of anadromous salmonids into historical spawning habitat in upstream tributaries, including the SFFR. Blocked access to historical spawning grounds in the upper watershed causes spring-run Chinook salmon to spawn in the same lowland reaches of the Feather River that fall-run Chinook salmon use as spawning habitat. The overlap in spawning sites and in spawning timing (Moyle, 2002) may be responsible for inter-breeding between spring-run and fall-run Chinook salmon in the Feather River (Hedgecock et al., 2001).

In the Feather River, it has been reported that adult spring-run Chinook salmon enter the river from March through June (Sommer et al., 2001), and are found holding at the Thermalito afterbay outlet and the fish barrier dam as early as April (FERC, 1997). When daily average water temperatures decrease to about 60°F, female Chinook salmon begin to construct nests (redds) into which their eggs (simultaneously fertilized by the male) are eventually released. Fertilized eggs are subsequently buried with streambed

gravel. Spawning activity in the Feather River occurs from late August through December and generally peaks in mid to late November (Myers et al., 1998), and incubation may extend through March.

Water temperatures reported to be optimal for rearing of Chinook salmon fry and juveniles are between 45 and 65°F (NMFS, 2002; Rich, 1987; Seymour, 1956). Juvenile fall-run Chinook salmon normally rear for 1 to 7 months in freshwater before migrating to the ocean (Yoshiyama et al., 1998), and normally spend 4 to 5 years in the ocean (Moyle, 2002). Juvenile Chinook salmon in the Feather River have been reported to emigrate from about mid-November through June, with peak emigration occurring from January through March (DWR, 2002c; Painter et al., 1977).

California Central Valley Steelhead

Steelhead are native to California rivers. On March 19, 1998, NMFS listed the naturally spawned California Central Valley steelhead as threatened under the ESA (63 FR 13,347). In June 2005, NMFS determined that hatchery stocks are to be included in a steelhead Distinct Population Segment if they are no more than moderately diverged from local, native populations in the watershed(s) in which they are released.

In its final listing determination published January 6, 2006 (71 CFR 834), NMFS concluded that the threatened California Central Valley Steelhead Distinct Population Segment includes all naturally spawned populations of steelhead (and their progeny) below natural and manmade barriers in the Sacramento and San Joaquin rivers and their tributaries. The listing excludes steelhead from San Francisco and San Pablo bays and their tributaries, and includes steelhead from Feather River Fish Hatchery.

Critical habitat for California Central Valley steelhead was designated by NMFS in September 2005 (70 FR 52,488), and includes all occupied habitat in the Feather River downstream of the fish barrier dam at the Feather River Hatchery.

Most of the natural steelhead spawning in the Feather River occurs in the low flow channel, particularly in its upper reaches near Hatchery Ditch, a side-channel located between RM 66 and 67. Limited steelhead spawning also occurs below the Thermalito afterbay outlet. Soon after emerging from gravel, a moderate percentage of the fry appear to emigrate. The remainder of the population rears in the river for at least 6 months to 1 year. Studies have confirmed that juvenile rearing and probably adult spawning are associated with secondary channels within the low flow channel (DWR, 2005a). The lower velocities, smaller substrate size, and greater amount of cover (compared to the main river channel) likely make these side-channels more suitable for juvenile steelhead rearing.

Currently, this type of habitat comprises less than 1 percent of available habitat in the low flow channel (DWR, 2001b). Juvenile steelhead in the Feather River emigrate from about February through September, with peak emigration occurring from March through mid-April. However, empirical and observational data suggest juvenile steelhead potentially emigrate during all months of the year in the Feather River.

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desomcerus californicus dimorphus*) is listed as threatened under the ESA. All lifestages of the beetle are associated with elderberry plant (*Sambucus* spp.). Adult females lay eggs in crevices in the bark of the host plant. After the eggs hatch, the larvae spend 1 to 2 years eating elderberry wood, which is the insect's only food source. The larvae pupate in the tree, exit to breed, and then the life-cycle is complete. The host plants are found in riparian areas in California, but the beetle has only been observed on plants below 3,000 feet. During pre-licensing surveys, South Feather conducted surveys for valley elderberry longhorn beetles following FWS survey protocols. Surveyors did observe some elderberry plants within the project area; however, all observations were recorded near 5,000 feet. No elderberry plants were recorded at elevations suitable for the valley elderberry longhorn beetle.

California Red-legged Frog

The California red-legged frog (*Rana aurora draytonii*) is listed as threatened under the ESA. This species occurs in wetlands; wet meadows; ponds and lakes; and pools in low-gradient, slow moving stream reaches, with permanent sources of deep water and riparian vegetation, at elevations ranging from 0 to 5,000 feet). Eggs are laid in ponds or backwater pools and attached by females to an emergent vegetation brace. Tadpoles inhabit the same area as eggs, often occurring in slow-moving, shallow riffle zones, and along the margins of pools. The larvae spend most time in submergent vegetation or organic debris. Following metamorphosis, adults and juveniles occur in emergent and/or riparian vegetation, undercut banks, semi-submerged root masses, open grasslands with seeps, or springs with dense growths of woody riparian vegetation. Cattails, bulrushes, and willows are good indicator species for frog presence. Adults are typically associated with deep (>0.7 meter), still or slow-moving water. Juveniles prefer open, shallow aquatic habitats with dense submergents. In the project area, the closest recorded observation of California red-legged frog is about 1 mile north of Lost Creek reservoir along Pinkard Creek. As part of the re-licensing process, South Feather conducted habitat and visual encounter surveys following FWS protocols for the California red-legged frog. Based on review of helicopter flight video, potential habitat for California red-legged frog was identified in the Forbestown diversion dam reach, Lost Creek dam reach, and at Miners Ranch reservoir; however, only one of these reaches was accessible for on-the-ground surveys. Two additional areas of potential habitat were identified during ground reconnaissance along the Lost Creek dam reach. Areas of potential habitat were limited and generally of poor quality due to high silt content, lack of appropriate vegetation, and presence of predators. Visual encounter surveys were conducted at three sites. No California red-legged frog observations were made during these surveys.

3.3.4.2 Environmental Effects

As discussed in section 3.3.2, *Aquatic Resources*, during summer months, discharge of warm water from the Kelly Ridge powerhouse has the potential to increase water temperatures in the upper portion of the Thermalito diversion pool. However, we have seen no data showing, and consider it unlikely that the addition of this water at the head of the diversion pool would cause any appreciable increase in temperature at the downstream compliance points (i.e., the Feather River Fish Hatchery and Robinson Riffle) where these listed anadromous fish are found. As noted previously, listed salmonids do not occur in the vicinity of the Kelly Ridge tailrace or in the Thermalito diversion pool. Consequently, we conclude that the proposed project may affect, but is not likely to adversely affect, Central Valley spring-run Chinook salmon and California Central Valley steelhead, and critical habitat for these species.

There is no known potential valley elderberry longhorn beetle habitat in the project area. No comments filed with the Commission address this species. Although it is unlikely that this species occurs in the project area, it cannot be ruled out. We conclude the proposed project may affect, but is not likely to adversely affect, this species.

Potential habitat for the California red-legged frog in the project area is generally limited and of poor quality. However, several areas of potential habitat were not accessible for ground surveys and the presence of California red-legged frog in these areas is unknown. Ground reconnaissance and visual encounter surveys conducted in the accessible reaches indicated a presence of predatory species and did not record any occurrences. No comments filed with the Commission address this species. However, if California red-legged frog were to occur in the project area, the species could be affected by project effects on flow regimes, water levels, and riparian habitats. As a result, we conclude that the proposed project may affect, but is not likely to adversely affect, this species.

3.3.5 Recreation Resources

3.3.5.1 Affected Environment

Regional Recreation Resources

More than half of the South Feather Power Project is located on lands within the Plumas National Forest. The Plumas National Forest, totaling 1,146,000 acres, provides a variety of recreational opportunities such as camping, fishing, hunting, picnicking, off-highway vehicle (OHV) areas, mountain biking, water skiing, whitewater boating; snow skiing, snowmobiling, and more than 300 miles of hiking trails including the Pacific Crest National Scenic Trail, and the Feather Falls and Hartman Bar National Recreation Trails. The Pacific Crest National Scenic Trail stretches across the Plumas National Forest for 75 miles, while the Feather Falls and the Hartman Bar trails extend 3.5 miles each. The Plumas National Forest hosts nearly one million visitors a year.

The Lake Oroville State Recreation Area adjoins the South Feather Power Project, making up 0.5 percent of the lands within the project boundary. The park offers camping, picnicking, horseback riding, hiking, boating, water-skiing, fishing, and swimming. Lake Oroville State Recreation Area has a visitor center, museum, store, 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. There are more than 200 campsites for tents and recreational vehicles with restrooms and showers, boat-in campsites, floating campsites, and one group campground. More than 100 primitive camping sites are available by boat access only.

Other recreation areas outside of the project area, but within the project region, include: Bucks Lake Recreation Area, New Bullards Bar reservoir, Feather Falls National Scenic Area, and Plumas-Eureka State Park. Additional recreation areas within the region include Silver Lake, which is adjacent to the Bucks Lake Wilderness Area, the North Fork Feather River recreation complex that includes numerous family campgrounds and day-use areas; the Lakes Basin and Sierra Buttes recreation areas that offer hiking trails, snowmobile trails, developed campgrounds, day-use areas, boat launch facilities, scenic trails and overlooks, cabins, private resorts and dispersed recreation opportunities; and the Middle Fork Feather River Wild and Scenic River with opportunities for hiking trails into the river corridor, including Bald Rock Dome trail, Big Bald Rock trail, fishing, whitewater rafting and kayaking; and various dispersed recreation and OHV camps.

Bucks Lake Recreation Area offers activities such as swimming, boating, hunting, fishing, hiking, and snowmobiling in winter. There are seven public campgrounds for tents and recreational vehicles, three boat launches, and two day-use areas. Private recreation facilities around Bucks Lake include campgrounds, cabins, a country store, a marina, slip rentals, a grocery store, a gas station, a restaurant, boat rentals, boat launch areas, a swimming area, and a water ski beach. The Bucks Lake Wilderness Area provides opportunities for non-motorized, dispersed recreation.

Recreation facilities at New Bullards Bar reservoir includes six private campgrounds including group camping, shoreline camping, boat-in camping, and land-based camping and two boat launches. Feather Falls National Scenic Area, located northeast of Lake Oroville, provides hiking opportunities along the Feather Falls National Recreation Trail and scenic views of a 640-foot waterfall. Plumas-Eureka State Park is 20 miles east of Little Grass Valley reservoir and offers 67 campsites, a visitor center and museum, fishing opportunities, hiking, bike trails, natural trails, guided tours, a nature study, and picnic areas.

Project Area Recreation Resources

There are two developed recreation areas within the project boundary: Little Grass Valley reservoir recreation area and Sly Creek reservoir recreation area; both are located within the Sly Creek development. South Feather constructed and currently

operates and maintains the Sly Creek reservoir recreation area facilities. South Feather constructed the Little Grass Valley reservoir recreation area facilities, with the exception of the Horse Camp campground and the fishing trail, which were constructed by the Forest Service. At the Forest Service's request, South Feather turned over ownership of the Little Grass Valley reservoir recreation area facilities to the Forest Service, which currently administers, maintains, and operates these facilities. The Plumas National Forest and South Feather contract with Northwest Parks Management to operate and maintain the facilities at these two areas, which offer recreational opportunities such as camping, picnicking, hiking, waterskiing, swimming, boating, fishing, sightseeing, snowmobiling, and cross-country skiing. Hunting is allowed only in the general forest area outside and beyond the developed recreation area boundaries.

Little Grass Valley Reservoir Recreation Area

The Little Grass Valley reservoir recreation area has eight campgrounds, three boat ramps, two day-use areas, and four trails (figure 3-13 and table 3-25). The campgrounds include Little Beaver, Red Feather, Running Deer, Horse Camp, Wyandotte, Peninsula, Black Rock, and Tooms.

Paved access to the reservoir occurs on FS Road 27 and FS Road No. 120 (La Porte Road). On the eastern shoreline, Running Deer, Little Beaver, and Red Feather campgrounds can be accessed by FS Road No. 22N57. Wyandotte, Tooms RV, and Peninsula Tent campgrounds are located on a protruding peninsula on the south shore, and can be accessed by FS Road No. 22N57Y. The Black Rock campground and Horse Camp campground facilities are accessed via FS Road No. 22N57 that extends around the eastern and northern shore of Little Grass Valley reservoir. The campgrounds at Little Grass Valley reservoir recreation area combined offer 295 campsites with tables, fire rings, grills, water, and restrooms. Some units provide space for trailers up to 40 feet. No hookups are provided but dump stations are available near Little Beaver, Peninsula, and Wyandotte campgrounds.

The three boat ramps on Little Grass Valley reservoir (Black Rock, Tooms, and Maidu) are paved, have loading docks, and nearby parking areas. Black Rock boat ramp is located at the Black Rock RV campground while Tooms is located near Tooms RV campground, and Maidu is located adjacent to Bluewater Beach day-use area and Little Beaver campground. South Feather states that elevation 5,022 feet msl is 2 feet above the edge of the paved portion of the boat ramps, and is considered by South Feather to be the minimum elevation at which the boat ramps are available for use by anglers and recreationists.

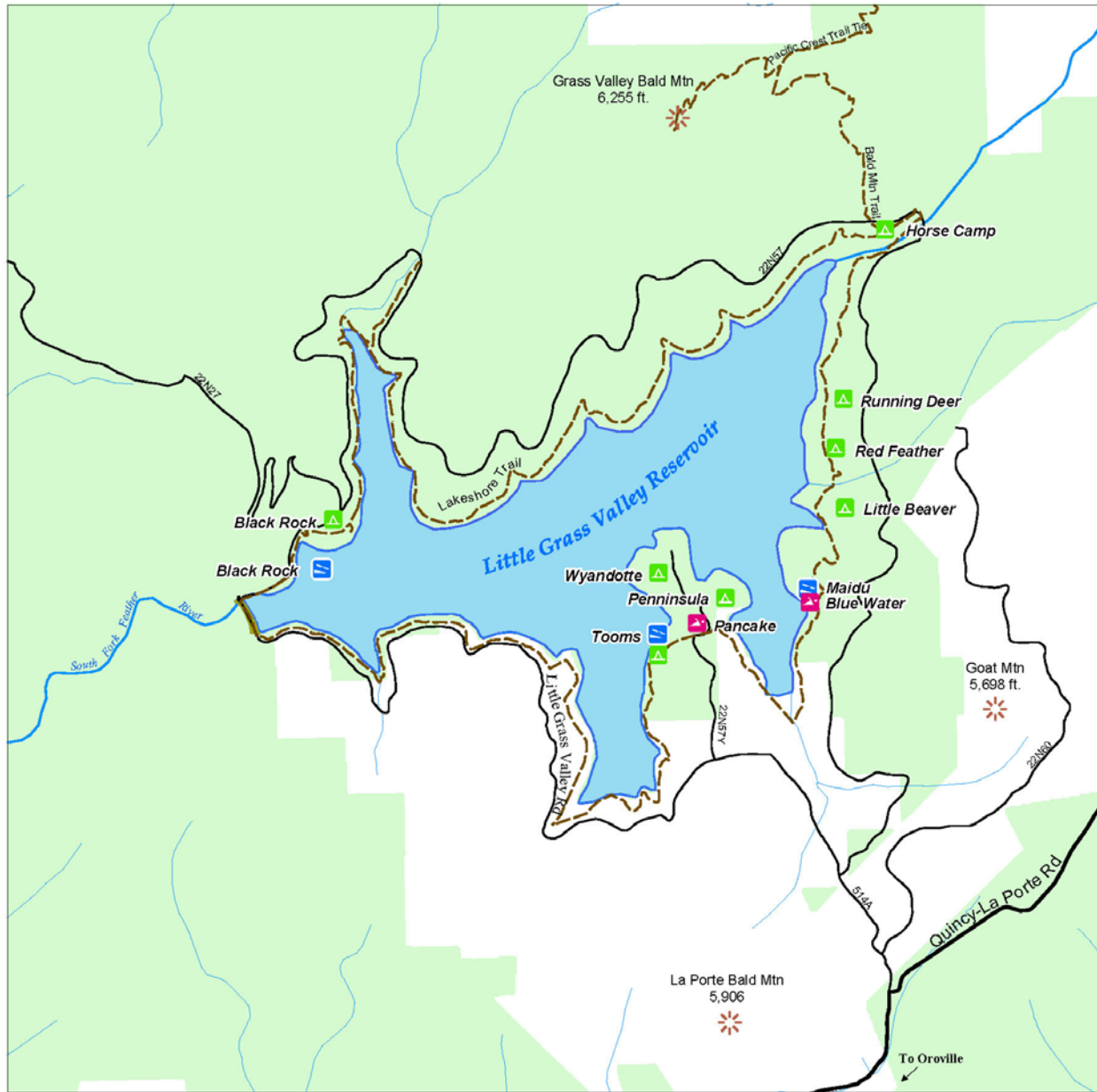


Figure 3-13. Recreation sites at Little Grass Valley reservoir recreation area. (Source: South Feather, 2007)

Table 3-25. Recreation facilities at the Little Grass Valley reservoir recreation area. (Source: South Feather, 2007, staff)

Site Name	Facilities
Little Beaver Complex	120 campsites including six lakeside sites, trailer space, flush toilets, drinking water

Site Name	Facilities
Red Feather campground	60 campsites including 12 lakeside sites with trailer spaces, flush toilets, drinking water
Running Deer campground	40 campsites including five lakeside sites with trailer space, flush toilets, drinking water
Horse Camp campground	10 campsites with trailer space, vault toilets, no piped drinking water, a warming hut, restricted to use by campers with horses only, Pacific Crest Trail trailhead and parking area
Wyandotte campground	30 campsites, trailer space, flush toilets, drinking water, pump station, four picnic units
Peninsula Tent campground	25 tent-only campsites, drinking water, flush toilets
Black Rock Tent campground	10 walk-in campsites, two picnic units, vault toilets, drinking water
Black Rock RV campground	20 parking spaces for RV's, vault toilets, drinking water, boat ramp
Black Rock boat ramp	Paved ramp, loading dock, parking area, accessible restroom, fish cleaning station
Tooms RV camp	12 parking spaces for RV's, vault toilets, drinking water, dump station, nearby boat ramp
Tooms Boat Ramp	Paved ramp, loading dock, parking area, accessible restroom, fish cleaning station, lighting
LGV RV dump station	RV wastewater septic tank and running water for rinsing
Bluewater Beach day-use area	12 picnic units, flush toilets, drinking water, changing rooms, amphitheater nearby, swimming area
Maidu boat ramp	Paved ramp, loading dock, parking area, accessible restroom, fish cleaning station, amphitheater
Pancake Beach day-use area	12 picnic units, vault toilets, drinking water, changing rooms, swimming area
Little Grass Valley lakeshore trail	13.5 mile trail around most of reservoir
Little Grass Valley accessible fishing trail	Accessible 800 foot cement trail, accessible parking area, and accessible restroom

Site Name	Facilities
Bald Mountain trailhead	15 mile Forest Service trail
Black Rock Creek trail	0.58 mile trail

Since 2000, improvements at all three boat ramps were implemented through funding from the California Department of Boating and Waterways, which provides grants to public agencies for the construction of boat launching ramps and ancillary facilities. At Tooms boat launch, these improvements included: widening of the existing launch ramp; repair of damaged parking areas and roadways; construction of an accessible restroom, and removal of the old restroom; and the installation of a fish cleaning station and area lighting. At the Black Rock and Maidu boat ramps, improvements included: widening the existing boat ramps, applying seal to the parking areas, installing accessible restrooms, and adding a fish cleaning station at each ramp.

The two day-use areas, Pancake Beach and Bluewater Beach, both consist of 12 picnic units, drinking water, restrooms, and changing rooms. Pancake Beach is located on the peninsula, while Bluewater Beach is near Maidu boat ramp. Hiking, boating, swimming, and picnicking are available on the reservoir at or near all day-use areas.

Four trails exist along Little Grass Valley reservoir. The Lakeshore trail is 13.5 miles long and is open only for foot traffic. The cement accessible fishing trail is located near the Little Grass Valley dam and extends 800 feet to the water level and is accessible at different elevations to accommodate fishing access as the reservoir elevation fluctuates. The Bald Mountain trailhead is located in the Horse Camp campground. This trail is a Forest Service trail that extends 15 miles. The Black Rock Creek Trail extends 0.58 mile in length and begins at the road edge, adjacent to Black Rock Creek, and extends down to the large rock outcropping.

The Davis-Grunsky Act (Chapter 5, commencing with Section 12880, of Part 6 of Division 6 of the California Water Code) provides financial assistance for local water supply and sanitation projects and is administered by DWR. The 1967 contract between South Feather and DWR provided about \$2.5 million for construction of on-shore recreation facilities at Little Grass Valley reservoir (the Forest Service now operates these facilities.). In accordance with the South Feather's Davis-Grunsky Contract, South Feather has maintained the Little Grass Valley reservoir at or above 58,500 acre-feet (elevation 5,022 feet msl) through September 30 to keep boat ramps operational. South Feather's contract with DWR expires when the current FERC license for the project expires.

South Feather currently assists the local county sheriff departments to install public safety buoys in Little Grass Valley and Sly Creek reservoirs. The buoys provide the public with information regarding boat speed in restricted areas, danger areas, and

other safety information. The buoys are typically installed each year around Memorial Day at the start of the recreation season and removed after Labor Day.

Sly Creek Reservoir Recreation Area

At Sly Creek reservoir, there are two campgrounds, two boat ramps/launches, and a day-use area (figure 3-14 and table 3-26). This reservoir offers many recreational opportunities, although steep terrain makes access more difficult than at Little Grass Valley reservoir. The boat ramp facilities provide access to the water for fishing, water-skiing, and boating. Sly Creek reservoir can be accessed by FS Road No. 21N16 (Barton Hill Road). Sly Creek campground is located on the southwest side of Sly Creek reservoir. Adjacent to Sly Creek campground is the Mooreville boat ramp and day-use area. Sly Creek campground and Mooreville boat ramp and day-use area are accessible from Barton Hill Road. The Strawberry campground is located on FS Road No. 21N20, on the northeast side of the reservoir. Nearby is a car-top boat launch facility for canoes, rafts, or kayaks.

In 1999-2001, South Feather with its own funding and funding from the California Department of Boating and Waterways, made improvements to the recreation facilities at Sly Creek reservoir recreation area. Sly Creek campground improvements included: road and site development, the purchase and installation of picnic tables, fire rings, vault toilets, and paving the campground road and parking areas. Improvements at Mooreville boat ramp included: relocation of the ramp off the end of the trailer parking area, extension of the ramp to accommodate launching at lower water levels, courtesy floats, and a fish cleaning station. Upgrades at the car-top boat launch include paving the parking area, paving a 250-foot footpath, and adding a restroom.

Lost Creek Reservoir

There are no developed recreation sites at Lost Creek reservoir. Access to this reservoir is difficult and limited to the areas near Lost Creek and Sly Creek dams. Upstream from Lost Creek dam is an informal boat ramp, accessible only by high clearance vehicles.

Ponderosa Reservoir

There are no developed recreation facilities at Ponderosa reservoir. Access to the reservoir is limited to unimproved Forest Service roads or private roads. FS Road No. 20N24 turns into a primitive trail that leads to the shoreline of Ponderosa reservoir. Three private residences are located on private lands along the reservoir shoreline.

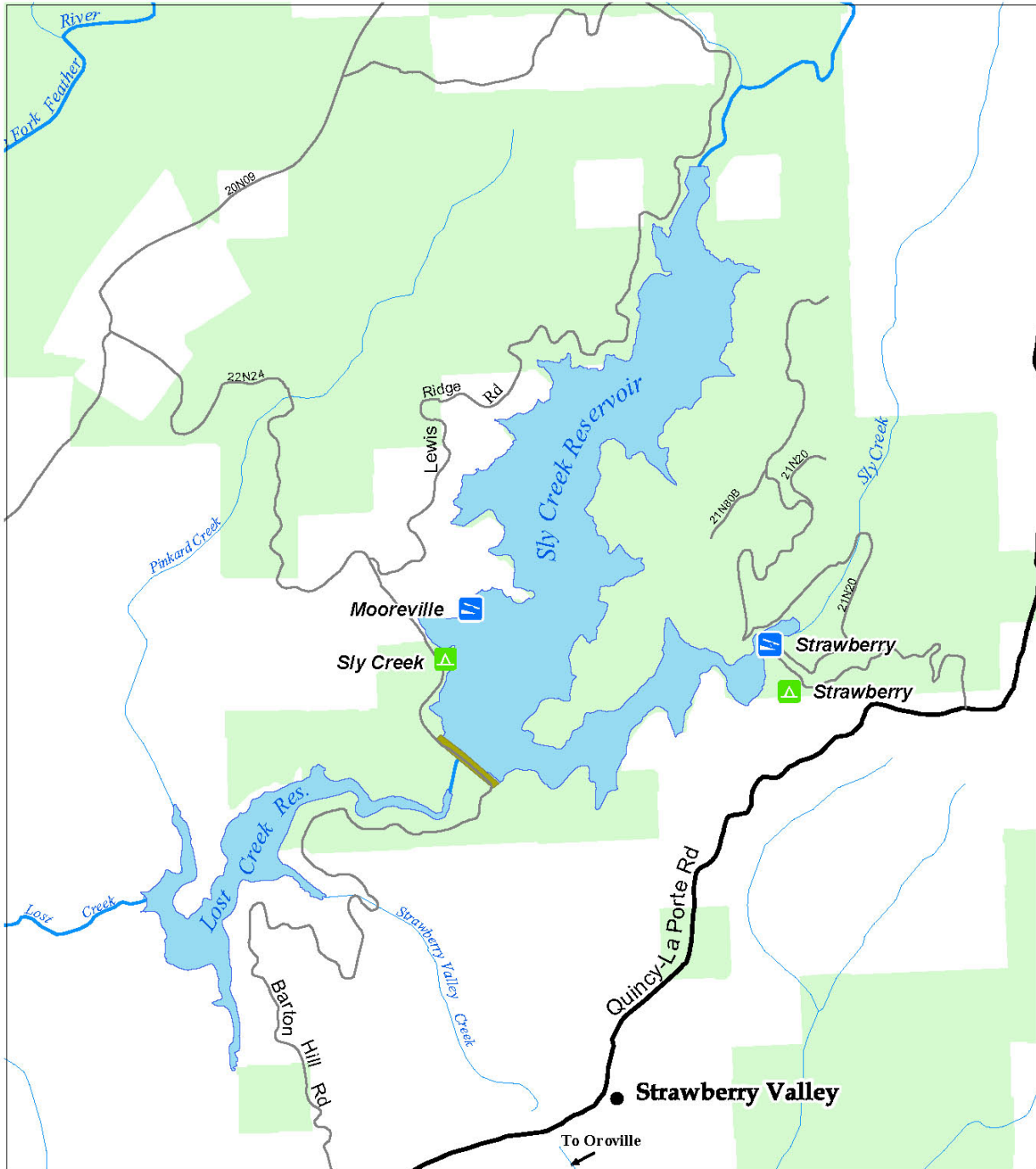


Figure 3-14. Recreation sites at Sly Creek reservoir recreation area. (Source: South Feather, 2007)

Table 3-26. Recreation facilities at the Sly Creek reservoir recreation area. (Source: South Feather, 2007, staff)

Site Name	Facilities
Sly Creek campground	30 campsites, drinking water, picnic tables, fire rings, vault toilets, trailer space, two campsites with picnic tables, accessible restrooms
Mooreville boat ramp and day-use area	Concrete boat launch, courtesy floats, fish cleaning station, picnic tables, fire ring/grill, vault toilets, water hydrant, parking area
Strawberry campground and car-top boat launch	Campground - 17 campsites with trailer spaces, vault toilets, drinking water; boat launch – paved foot path, water access for car-top boats, paved parking area, restroom

Miners Ranch Reservoir

Public access at Miners Ranch reservoir is prohibited. The reservoir is locked and gated to prevent use because it is part of the domestic water supply. The lands surrounding the reservoir are zoned for public use, residential use light commercial use, and state use as the Lake Oroville State recreation area.

South Fork, Slate Creek, and Forbestown diversions

At South Fork, Slate Creek, and Forbestown diversions, there is no developed recreation. Access to the South Fork and Slate Creek diversions is difficult and limited due to the steep terrain and location in the canyons. Roads used for access are 21N11Y from 21N16 (Mooreville Ridge), and Upper Scales Road, a Yuba County road. Forbestown diversion can be accessed by FS Road No. 20N27 that ends at the Woodleaf powerhouse. Shoreline fishing is permitted at the Forbestown diversion, however, boating and swimming are not permitted because of the overflow spillway and use for domestic water supply. The South Fork diversion dam impoundment is used as a take-out by whitewater boaters.

Recreation Use and Facility Capacity

Recreation use within the project boundaries occurs at the two developed recreation areas, Little Grass Valley and Sly Creek recreation areas, and dispersed recreation use at the undeveloped recreation areas. According to the Plumas National Forest, dispersed recreation makes up 60 percent of all recreation in the Plumas National Forest. Based on visitor surveys conducted by South Feather in 2004, the primary recreation uses within the project include relaxing/camping (33 percent), picnicking (16 percent), swimming (13 percent), boating (12 percent), fishing (8

percent), and hiking/walking (7 percent). At Little Grass Valley recreation area, the top five activities by percentage, accounting for greater than 80 percent of the total recreational activity, included: relaxing/camping, boating (motorized), swimming, picnicking, and fishing (lake or lakeshore). At Sly Creek reservoir recreation area, the top five activities, accounting for 90 percent of the total activity, included picnicking, relaxing/camping, swimming, OHV use, and boating (motorized). About 10 percent of visitors surveyed at Sly Creek reservoir recreation area spent their time riding OHVs, compared to less than one percent of Little Grass Valley recreation area visitors that were surveyed. The Forest Service states that Sly Creek dam borrow pit is an unofficial OHV play area.

In 2005, South Feather estimated use based on the extrapolation of visitor counts (number of people at one time at the facilities) at the day-use areas and boat launches at Little Grass Valley and Sly Creek reservoirs during the peak recreation season (table 3-27). South Feather defines the peak recreation season for Little Grass Valley reservoir as May 21 through October 15, and April 28 through October 15 for Sly Creek reservoir. The Forest Service states that peak use typically occurs during Memorial Day weekend; before and after July 4 and Labor Day weekend are the highest occupancy weekends of the season; and that fishing and boating access continues into the fall, up until the first snowfall. South Feather estimates use in recreation days was highest at Bluewater Beach and Pancake Beach at Little Grass Valley reservoir recreation area and at the Mooreville day-use area at Sly Creek reservoir recreation area. South Feather estimates percent capacity at day-use areas and boat launches is highest on holiday weekends and some weekend days in July and August.

South Feather estimates the site occupancy at the campgrounds at Little Grass Valley recreation area was at 13.3 percent capacity in 2003, 15 percent in 2004, and 22.7 percent capacity in 2005 (table 3-28). South Feather suggests the number of visitors per year and percent capacity varies due to open and close dates for each facility. In addition, Forest Service states that other factors also influence recreational visitation in the vicinity of the project, including road conditions and road construction, logging operations within the recreation area, fire incidents and closures on the forest, costs of travel and gasoline, and presence or lack of snow in the late fall. In terms of estimated future use and capacity, South Feather estimates that, by the year 2050, the campgrounds would only be at about 41 percent of overall capacity at Sly Creek recreation area and at about 26.9 percent of overall capacity at Little Grass Valley recreation area. At the day-use facilities, South Feather estimated that none of the facilities would reach full capacity by the year 2050; however, it is likely Bluewater Beach and Mooreville day-use area would be at full capacity on most holiday days.

Table 3-27. 2005 Peak season day-use estimates in recreation days for the day-use facilities at Little Grass Valley and Sly Creek reservoir recreation areas. (Source: South Feather, 2007)

Facility	Use Estimate (recreation days) ^a
Little Grass Valley Reservoir Recreation Area	
Maidu boat launch	526
Tooms boat launch	527
Black Rock boat launch	601
Pancake beach	1,614
Bluewater beach	2,324
ADA Fishing trail	582
<i>Subtotal</i>	6,174
Sly Creek Reservoir Recreation Area	
Mooreville boat launch	986
Strawberry car-top boat launch	455
Mooreville day-use area	1,126
<i>Subtotal</i>	2,567
<i>Project Total</i>	8,741

^a Recreation day is each visit by a person to a development for recreation purposes during any portion of a 24-hour period (as defined in the glossary of FERC Form 80 terms).

Table 3-28. Annual use and capacities at campgrounds. (Source: South Feather, 2007, staff)

Campground (Sites per Facility)	2003			2004			2005		
	No. Sites Occupied	No. Visitors	Percent Capacity	No. Sites Occupied	No. Visitors	Percent Capacity	No. Sites Occupied	No. Visitors	Percent Capacity
Little Grass Valley Reservoir Recreation Area									
Black Rock (22)	355	1,199	11.1	436	1,413	13.8	331	1,211	11.0
Horse Camp (10)	50	154	3.4	115	465	8.0	133	418	10.4
Little Beaver (120)	3284	11,210	18.9	3,253	11,686	18.8	3,627	13,258	23.3
Peninsula Tent (25)	134	567	3.7	177	823	4.9	CLOSED		
Red Feather (60)	1391	5,909	16.0	1,435	6,530	16.6	1,491	6,713	26.2
Running Deer (41)	980	4,172	16.5	837	3,808	14.2	1,123	5,107	28.8
Tooms RV (20)	11	27	.1	45	110	1.6	CLOSED		
Wyandotte (30)	893	3,355	20.6	803	3,056	18.6	CLOSED		
Annual Totals (328)	7,098	26,593	13.3	7,101	27,891	15.0	6,705	26,707	22.7
Sly Creek Reservoir Recreation Area									
Sly Creek (30)	1,377	5,873	29.8	1,398	6,143	30.3	1,571	6,633	34
Strawberry (17)	269	982	12.1	130	404	5.8	50	169	4.2
Annual Totals (328)	1,649	6,855	24	1,528	6,547	22.3	1,621	6,802	27.9

South Feather also evaluated the vehicle data in vehicles-at-one-time at the parking lots of each recreation facility. On average, Little Grass Valley day-use parking capacities were lower than Sly Creek day-use parking areas. In 2005, Maidu boat launch was the only facility at Little Grass Valley to exceed capacity. At Sly Creek, South Feather estimated use at Mooreville day-use area was on average 41 percent capacity, while the parking lot, on five different occasions, met or exceeded 100 percent capacity. Tables 3-29 and 3-30 show average and maximum vehicle data.

Table 3-29. Average, minimum, and maximum vehicles at one time observed by day type for day-use facilities at Little Grass Valley reservoir recreation area, summer 2005. (Source: South Feather, 2007)

Day Type	Total Spaces			Percent Capacity ^a		
	Ave	Min	Max	Ave	Min	Max
Maidu Boat Launch (50 spaces)						
Overall	11.8	0	51	23.6	0	102
Weekday	5.4	0	11	10.8	0	22
Weekend	15.2	6	37	30.3	12	74
Holiday	14.8	0	51	29.6	0	102
Tooms Boat Launch (30 spaces)						
Overall	0.9	0	7	3.1	0	23.3
Weekday	0.5	0	2	1.7	0	6.7
Weekend	0.7	0	6	2.4	0	20
Holiday	1.6	0	7	5.2	0	23.3
Black Rock Boat Launch (25 spaces)						
Overall	3.4	0	10	13.6	0	40
Weekday	2.2	0	5	8.9	0	20
Weekend	3.4	0	7	13.6	0	28
Holiday	4.6	0	10	18.2	0	40
Pancake Beach (20 spaces)						
Overall	1.8	0	14	8.8	0	70
Weekday	0.7	0	3	3.3	0	15

Day Type		Total Spaces			Percent Capacity ^a		
		Ave	Min	Max	Ave	Min	Max
	Weekend	1.4	0	7	7.2	0	35
	Holiday	3.2	0	14	15.8	0	70
Bluewater Beach (30 spaces)							
	Overall	5.2	0	22	17.2	0	73.3
	Weekday	1.6	0	4	5.2	0	13.3
	Weekend	5.8	0	19	19.4	0	63.3
	Holiday	8.1	0	22	27.0	0	73.3
ADA Fishing Trail (10 spaces)							
	Overall	0.6	0	3	5.9	0	30
	Weekday	0.3	0	2	3.3	0	20
	Weekend	0.7	0	3	7.2	0	30
	Holiday	0.7	0	2	7.2	0	20
Bald Mountain Trailhead (4 spaces)							
	Overall	0.3	0	2	7.9	0	50
	Weekday	0.1	0	1	2.8	0	25
	Weekend	0.2	0	2	5.6	0	50
	Holiday	0.6	0	2	15.3	0	50

^a Percent capacity is the total number of spaces occupied during the season divided by the total spaces available for the days observed.

Table 3-30. Average, minimum, and maximum vehicles at one time observed by day type for day-use facilities at Sly Creek reservoir recreation area, summer 2005. (Source: South Feather, 2007)

Day Type		Total Spaces			Percent Capacity ^a		
		Ave	Min	Max	Ave	Min	Max
Mooreville Boat Launch (24 spaces)							
	Overall	8	0	24	32	0	100

Day Type		Total Spaces			Percent Capacity ^a		
		Ave	Min	Max	Ave	Min	Max
	Weekday	2	0	4	8	0	17
	Weekend	9	4	18	36	17	75
	Holiday	12	3	24	51	13	100
Strawberry Car-top Boat Launch (8 spaces)							
	Overall	0	0	2	6	0	25
	Weekday	0	0	1	1	0	13
	Weekend	0	0	2	5	0	25
	Holiday	1	0	2	10	0	25
Mooreville Day Use (3 spaces)							
	Overall	1	0	5	41	0	167
	Weekday	0	0	2	15	0	67
	Weekend	1	0	2	33	0	67
	Holiday	2	0	5	76	0	167

^a Percent capacity is the total number of spaces occupied during the season divided by the total spaces available for the days observed.

Angling

The project reservoirs and streams provide angling opportunities. Survey data collected by South Feather indicated a high level of participation in angling. The percentage of visitors who fished at a developed recreation site was highest at Little Grass Valley reservoir (36 percent) and lowest at Sly Creek reservoir (18 percent). The percentage of visitors who fished at an undeveloped recreation site was highest at Forbestown diversion (80 percent) and lowest at South Fork diversion (29 percent). None of the visitor's surveyed fished from a boat at the undeveloped recreation sites.

Overall, survey data showed that the majority of respondents, 97 percent at Little Grass Valley reservoir and 85 percent at Sly Creek reservoir, did not have problems accessing the reservoirs for fishing. Those who stated they had problems (four respondents at Little Grass Valley reservoir and two respondents at Sly Creek reservoir)

indicated that angling opportunities were inhibited by access issues, including lack of trails, roads, or signage; presence of large boulders; steep terrain; and large crowds.

Whitewater Boating

In 2004, South Feather assessed whitewater boating opportunities within the project region through a literature review and surveys of individuals knowledgeable about whitewater boating opportunities within the region. In the Plumas National Forest, to the north and west of the project, the river systems of the Main Fork and the North Fork Feather River provide numerous, well established whitewater boating opportunities of varying classes²² (table 3-31). To the south and east of the project, whitewater boating opportunities are available on the North Yuba River and its tributaries primarily during spring run-off (table 3-32). None of the river reaches within the project reaches were listed in published literature or guidebooks; however, those who were surveyed indicated they had boated the Little Grass Valley dam reach.

Following completion of the 2004 Whitewater Boating Study, the Forest Service, FWS, the Water Board, and Cal Fish & Game requested that South Feather perform controlled whitewater boating flow studies on all project reaches except the Slate Creek diversion dam reach. Accordingly, in 2005, South Feather conducted controlled flow studies for whitewater boating opportunities for the Little Grass Valley dam reach, the South Fork and Forbestown diversion dam reaches, and the Lost Creek dam reach. A controlled flow study of the Slate Creek diversion dam reach was not conducted because the project has limited ability to control flow from Slate Creek diversion dam. Instead, assessment of this reach included a survey (same survey instrument as the controlled flow studies) of three boaters who ran the reach in April 2005. The following sections summarize the characteristics and boatable and optimum flow ranges²³ for each

²² Classification of rapids is based on the International Whitewater Classification System (American Whitewater, 2008): Class II, Novice: Straightforward rapids with wide, clear channels which are evident without scouting; Class III, Intermediate: Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe; Class IV, Advanced: Intense, powerful, but predictable rapids requiring precise boat handling in turbulent water; Class V, Expert: Extremely long, obstructed, or very violent rapids that expose a paddler to above average endangerment; Class VI, Extreme and exploratory: These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

²³ The optimum flow range represents a narrower, ideal range flows for boating; the boatable flow range is a broader representation of flows that brackets the optimum range but has a slightly higher and lower end whereby some but not all boaters would run the reach at the flows outside the optimum range.

reach identified in the studies. Table 3-33 summarizes the identified boatable and optimum flow ranges for all of the reaches.

Table 3-31. Whitewater boating runs on the North and Middle forks of the Feather River, as identified by Holbeck and Stanley, 1998. (Source: South Feather, 2007)

River	Name of Whitewater Run	Put-In Take-Out	Length (miles)	Gradient (feet/mile)	Class	Season of Boating Use
East Branch of North Fork Feather	Virgilia - Belden	Virgilia - Belden	10	40	IV-V	Spring
West Branch of North Fork Feather	Upper	Whiskey Flat Bridge - Dean Rd.	3.3	64	IV-V	Winter/ Spring
	Ben & Jerry's Gorge	Dean Road – Lake Oroville	4	118	V+	Winter/ Spring
North Fork Feather	Rock Creek Run	Rock Creek Dam – Rock Creek Powerhouse	8	50	III-V	Spring
	Cresta Run	Cresta Dam- Cresta Powerhouse	6.5	48	III-V	Spring
	Poe Run	Poe Dam- Poe Powerhouse	7.5	70	IV-V	Spring
Middle Fork Feather	Devils Canyon	Nelson Point– Milsap Bar	32.5	70	V	Spring
	Devils Canyon	Nelson Point– Milsap Bar	6.5	108	V+	Spring
Little North Fork Middle Feather	n/a	Glazer Creek – Milsap Bar	9.8	196	V-VI	Winter/ Spring

Table 3-32. Whitewater boating runs on the North Fork of the Yuba River, as identified by Holbeck and Stanley, 1998. (Source: South Feather, 2007)

Name of Whitewater Run	Put-In Take-Out	Length (miles)	Gradient (feet/mile)	Class	Season of Boating Use
Loves Falls	Salmon Creek – Wild Plum Road	2.8	300	V+	Winter/Spring
Sierra City to Downieville	Wild Plum Campground – Downieville	13	109	IV-V	Spring
Rosasco Canyon	Downieville - Goodyear’s Bar	4	60	IV-V	Spring
Goodyear’s Bar	Goodyear’s Bar - Hwy. 49 Bridge	8.5	49	IV+	Spring
Bullards Bar Dam to Middle Fork Yuba	Bullards Bar Dam - Englebright Lake	2.3	80	V	Spring

Table 3-33. Boatable and optimum flow ranges for project reaches. (Source: South Feather, 2007)

Reach	Flow Ranges Based on Flow Studies (cfs)	
	Boatable Flow Range	Optimum Flow Range
Little Grass Valley dam	180 - 464	230 - 400
South Fork diversion dam	188 - 700	250 - 438
Forbestown diversion dam	216 - 400	250 - 350
Lost Creek dam	96 - 193	100 - 185
Slate Creek diversion dam ^a	167 - 517	300 - 450

^a A controlled flow study was not conducted; flow range based on knowledgeable kayakers’ survey responses.

Little Grass Valley Dam Reach

The Little Grass Valley dam reach is 9.1 miles long with an average gradient of 141 feet per mile and a number of significant drops. The reach is accessed by County Road 514 to the put-in at Little Grass Valley dam and the take-out is accessible by La

Porte Road near the South Fork diversion dam. Black Rock RV and Tent campground is located 0.25 mile from the put-in, making overnight boating on the Little Grass Valley reach possible.

Whitewater boating study participants indicated that the Little Grass Valley dam reach is best suited for hard shell and inflatable kayaks and could provide Class IV and V whitewater opportunities. Study participants indicated that boatable flows ranged between 180 and 464 cfs, with an optimum flow range of between 230 to 400 cfs. South Feather estimates that, based on the period 1972 to 2001, existing project operation provides, on average for all water years, 104 days when flows are in the optimal boating flow range on the Little Grass Valley dam reach.

South Fork Diversion Dam Reach

The South Fork diversion dam reach is about 9.4 miles long, consisting of the upper reach which extends about 4.3 miles from the South Fork diversion dam to the Golden Trout Crossing and the lower section extending about 5.1 miles from Golden Trout Crossing to the Forbestown diversion dam. The gradient of the upper reach is about 85 feet per mile, and the gradient of lower 5.1-mile reach averages 266 feet per mile with 1 mile that drops over 400 feet. (With the concurrence of the agencies and American Whitewater, the lower 5.1-mile reach was not further assessed due to the steep gradient and limited whitewater boating opportunities.) Access to the put-in, near South Fork diversion dam, and to the take-out, near Golden Trout Crossing, occurs only by a vehicle with high clearance or 4-wheel drive.

Whitewater boating study participants indicated that the upper portion of the South Fork diversion dam reach is best suited for hard shell kayaks, open canoes, and inflatable kayaks and that the reach could provide Class II through Class IV whitewater opportunities. The study participants indicated that boatable flows for the upper portion of the South Fork reach ranged from between 188 to 700 cfs, with an optimal flow range of 250 to 438 cfs. South Feather estimates that, based on the period 1972 to 2001, existing project operation provides, on average for all water years, two days when flows are in the optimal boating flow range on the South Fork diversion dam reach and the Lost Creek dam reach.

Lost Creek Dam Reach

The Lost Creek dam reach is 4 miles long with an average gradient of about 305 feet per mile. Access to the put-in, near Lost Creek dam, is via La Porte Road, Barton Hill Road, and FS Road No. 20N09 and access to the take-out, near the Forbestown diversion dam, is via Forbestown Road and FS Road No. 20N29. Whitewater boating study participants indicated that the Lost Creek dam reach is best suited for hard shell kayaks and that the reach could provide Class V through VI whitewater opportunities. The study participants indicated that boatable flows at Lost Creek dam reach range from 96 to 193 cfs; while optimal flows range of 100 to 185 cfs.

Forbestown Diversion Dam Reach

The Forbestown diversion dam reach is 5.4 miles long and has an average gradient of 135 feet per mile. The put-in can be accessed by a steep bank near the diversion dam via Forbestown Road and FS Road No. 20N29, and the take-out can be accessed on the Ponderosa reservoir near the Forbestown powerhouse via Lower Forbestown Road and FS Road No. 20N24. Based on gradient and number of portages, whitewater boating study participants found that the Forbestown diversion dam reach is best suited for hard shell kayaks. The study participants indicated that the reach could provide Class V whitewater opportunities, and that the boatable flows at Forbestown diversion dam reach were between 216 and 400 cfs, with an optimal flow range of between 250 to 350 cfs. South Feather estimates that, based on the period 1972 to 2001, existing project operation provides, on average for all water years, 33 days when flows are in the optimal boating flow range on the Forbestown diversion dam reach.

Slate Creek Diversion Dam Reach

The Slate Creek diversion dam reach is 8.8 miles long with a gradient of 172 feet per mile and extends from the base of Slate Creek diversion dam to the confluence with the North Yuba River. The put-in is located at the base of Slate Creek diversion dam and accessed from County Road 2 and the take-out is at FS Road No. 20N16 at the confluence of North Yuba River. Survey respondents indicated that the Slate Creek diversion dam reach is best suited for hard shell kayaks and could provide Class IV or V whitewater opportunities. Based on survey responses, boatable flows at Slate Creek diversion dam reach range from 167 to 517 cfs; and optimal flows range of between 300 to 450 cfs.

The results of the study showed that boaters preferred other runs available in the area and elsewhere in California as opposed to the project reaches. Generally, boaters noted the primary draw to boat on the identified project reaches was their potential to be boated in the fall when boating opportunities are limited elsewhere.

3.3.5.2 Environmental Effects

Replace and Rehabilitate Existing Recreation Facilities

Recreation facilities at the project may need to be replaced or rehabilitated in part or in total due to decline of such facilities through age, repeated use, or increased demand by the public.

Facility Master Plans

South Feather, under Measure 45,²⁴ proposes to develop and implement facility master plans for Little Grass Valley and Sly Creek reservoir recreation areas that illustrate the layouts, locations, sizes, shapes and relationships between existing and proposed improvements. The master plan for Little Grass Valley reservoir recreation area would be filed within 1 year of license issuance and the master plan for Sly Creek reservoir recreation area would be filed within 3 years of license issuance. South Feather would obtain Forest Service approval of all plans before filing these plans with the Commission. In addition, South Feather, under Measure 34, proposes to consult annually with the Forest Service regarding planned project O&M activities on Forest Service lands for that calendar year.

The Forest Service (Condition No. 20, part 1) specifies measures for the development of facility master plans consistent with South Feather's proposal and also specifies that South Feather conduct an annual coordination meeting to help ensure the goals and objectives of the master plans are being met.

Our Analysis

South Feather's proposed master plans would provide the means to develop and implement the proposed recreation measures in a consistent and coordinated manner. Consultation, including an annual consultation meeting, with the Forest Service would help to ensure that the measures being developed and implemented would be consistent with the management goals and objectives of the Plumas National Forest. Submittal of these master plans to the Commission for review and approval would help to ensure that project facilities are maintained and adequate public recreation access is provided at the project over the term of a new license.

Individual Site Rehabilitation Measures

South Feather proposes to develop and implement individual site development plans for each existing recreation facility within the existing project boundary. The site development plans would include the following components: (1) management objectives for the site; (2) an existing conditions survey; (3) description of conceptual and specific proposed rehabilitation measures; (4) a schedule for completion of the proposed rehabilitation measures; (5) measures for South Feather to provide for all construction related to maintenance, including preparation of all necessary engineering specifications and detailed construction drawings, and to select and manage a contractor to perform the construction; (6) measures for South Feather to obtain all necessary

²⁴ As revised by South Feather in letter from M. Glaze, General Manager, South Feather, Oroville, CA, to K. Bose, Secretary, FERC, Washington, DC, October 12, 2007.

regulatory approvals and permits for the proposed construction; (7) measures for South Feather to obtain Forest Service approval of all proposed construction prior to performing any ground-disturbing activities; and (8) measures for South Feather to operate and maintain all rehabilitations, replacements, improvements and new facilities, and to include such facilities within the FERC project boundary.

Site rehabilitation measures to be incorporated into the site plans would include the following, as appropriate: (1) rehabilitation of all existing roads, parking areas, and campground vehicle spurs within the facility; (2) replacement of all existing fire rings, grills, and picnic tables within the facility; (3) ensure tent camping areas are at least 12 feet by 16 feet, and RV camping areas are 225 square feet; (4) replacement of all existing entrance signs, directional signs, and information/bulletin signs; (5) upgrade of the existing water systems at each facility unless South Feather and Forest Service agree that the upgrade is not necessary at any or all of the facilities; (6) replacement of a number of current campsites and the replacement or retro-fitting of restrooms with new campsites and restrooms that meet accessibility requirements; and (7) replacement of the existing floating boat docks and concrete launch ramps with similar structures. South Feather proposes to file site development plans for Little Grass Valley reservoir recreation area facilities within 3 years of license issuance; and for Sly Creek reservoir recreation area facilities within 5 years of license issuance. The site development plan for Peninsula Tent campground would be filed within 5 years of license issuance.

South Feather proposed specific rehabilitation and enhancement measures for the following individual recreation sites:

Little Grass Valley Recreation Area

- *Little Beaver Campground Loop C* – South Feather proposes to remove about 10 existing campsites and re-configure the existing campground layout to provide improved RV opportunities with larger vehicle spurs and campsite space, while incorporating accessibility design standards.
- *Peninsula Tent Campground* – All work described in this measure for Peninsula Tent Campground would be dependent upon the Forest Service’s and South Feather’s collaborative assessment of the facility’s usefulness, which would occur in the fifth year after license issuance. Peninsula Tent Campground may be considered for re-configuration depending upon future facility needs. If changes are proposed, South Feather would include the changes in the Peninsula Tent Campground site development plan. If South Feather and the Forest Service determine that Peninsula Tent Campground should not be re-configured, the site development plan would include rehabilitation of the existing restroom structure to meet accessible restroom standards.
- *Black Rock Tent Campground* – South Feather proposes to remove the existing restroom structure and install a two-unit vault restroom that meets accessibility

standards. South Feather would also re-size, re-pave (asphalt) and stripe the existing tent site unloading zone to accommodate two vehicles (pull-in) including installing vehicle barriers and directional signs. If it is determined that an accessible campsite is feasible at the tent campground, then one of the two vehicle unloading spaces would be modified to meet accessibility standards.

- *Black Rock RV Campground* – South Feather proposes to paint and add signage at one existing RV campsite for accessibility, including making a single (adjacent) water hydrant accessible.
- *Bluewater Beach Day Use Area* – South Feather proposes to upgrade the existing picnic sites to be fully accessible, install new trash and recycle bins, and rehabilitate existing paths. During site plan development, South Feather would consult with the Forest Service regarding the need to re-design the path or include stepped access.
- *Pancake Beach Day Use Area* – South Feather proposes to rehabilitate the existing parking area, replace the existing picnic area, and install a new beach access path. South Feather would re-design and construct a new parking area. South Feather would remove the existing restroom and install one new two-unit vault, accessible restroom facility. South Feather would remove the existing changing room structures adjacent to the restroom.
- *Black Rock and Tooms Boat Launches* – At both boat launch facilities, South Feather proposes to remove the existing two-unit accessible vault restroom and replace the facility with a similar structure.
- *Maidu Boat Launch* – South Feather proposes to remove the existing two-unit vault restroom and replace the facility with a similar structure and to install an accessible boat loading platform in the facility parking area.
- *Maidu Amphitheater* – South Feather proposes to replace the existing path to the amphitheater from the adjacent existing accessible flush restroom at Maidu Boat Launch. South Feather would re-surface, widen, and harden the existing gravel path in its current location, while incorporating accessibility design standards.
- *Horse Camp Campground* – South Feather proposes to install a water system, as long as the cost does not exceed \$217,000 (in 2004 dollars). South Feather also proposes to remove the two existing single-unit accessible vault restrooms and replace the facility with similar structures that meets Forest Service standards.
- *Little Grass Valley Reservoir Accessible Fishing Trail* – South Feather proposes to replace the existing concrete trail surface, curb and pull-outs.

Sly Creek Reservoir Recreation Area

- *Mooreville Boat Launch* – South Feather proposes to remove the existing two-unit vault restroom and replace the facility with a similar structure.
- *Mooreville Day Use Area* – South Feather proposes to provide one accessible picnic table and one accessible combination fire ring/grill at the day-use area, and provide an accessible path from the existing parking area to the accessible picnic site. South Feather would replace the one existing water hydrant with a new accessible water hydrant.
- *Strawberry Car-top Boat Launch* – South Feather proposes to re-pave the existing asphalt car-top launch ramp to the same design and remove the existing single-unit accessible vault restrooms and replace the facility with a similar structure.

Also under Measure 45, South Feather proposes to, within 1 year of license issuance in consultation with the Forest Service, conduct the following minor maintenance measures: (1) at Little Grass Valley and Sly Creek reservoir recreation areas, replace about 25 percent of all existing fire rings and grills and replace 25 percent of picnic tables; (2) at Tooms, Black Rock, Mooreville, and Strawberry car-top boat launches, paint and sign one accessible parking space adjacent to the existing accessible restroom; and (3) at Maidu boat launch, provide two accessible parking spaces adjacent to the accessible restroom including signs and striping.

The Forest Service specifies (Condition No. 20, part 1) measures for the development of individual site plans that are consistent with South Feather's proposed site plans. The Forest Service specifies that South Feather complete the individual site plans within five years of the license issuance unless otherwise agreed to by the licensee and the Forest Service. The Forest Service specifies several additional components to be incorporated into the site plans including measures for public interpretive facilities, such as kiosks and trail signs, as well as measures to develop and implement a re-vegetation plan that would be submitted within 5 years of license issuance for all developed recreation facilities within the project boundary.

The Forest Service also specifies (Condition No. 20, part 2) that South Feather consult with the Forest Service and other appropriate agencies to ensure that the recreation rehabilitation and enhancements are consistent with the overall goals of other resource conditions and management plans required under the license and initiate consultation with Native Americans to determine appropriate protection and mitigation measures if potential recreational facility construction or rehabilitation impacts to cultural resources are identified.

O'Rourke's Outdoor Adventure recommends that the license require the following recreation enhancements at the Peninsula (Tooms), Black Rock, and Little

Beaver (Maidu) boat ramps: enlarge boat ramps and vehicle turn around areas; install signs prohibiting parking in turn around or pre-launch areas and 80 yards leading to the ramp area; and extend existing boat ramps to accommodate for lower water levels. For the Peninsula, Little Beaver, Red Feather and Running Deer campgrounds, O'Rourke's Outdoor Adventure recommends that the license require the following enhancement measures: update the campgrounds to accommodate for larger trailer sizes; remove low hanging trees and branches; and remove or replace existing wood blocks along the campground roads. In addition, O'Rourke's Outdoor Adventure states that both the Forest Service and South Feather should be responsible for paving the remaining 1.9 miles of the Little Grass Valley Road and for brushing 4 miles of access road into Sly Creek for safety concerns.

Our Analysis

South Feather's proposed site rehabilitation measures include provisions for the upgrade of site facility features that would be implemented at various times over the term of a new license. These measures include provisions for rehabilitation and enhanced accessibility of project-related facilities, including trails, boat ramps, restrooms, campsites and amenities, picnic areas and amenities, trash facilities, parking, and boat loading platforms. Improving access for the disabled at the project would be consistent with the Commission's policy on recreation facilities²⁵ at licensed projects under which licensees are expected to consider the needs of the disabled in the design and construction of such facilities. These measures, along with South Feather's proposed minor maintenance measures, would provide enhanced accessibility to recreation opportunities at the project over the term of a new license.

South Feather's proposed enhancement and rehabilitation measures are consistent with the Forest Service's Condition No. 20, although that condition contains a few additional measures that South Feather did not propose. Providing interpretive facilities, such as enhanced signage and interpretive kiosks, would help enhance public use of the recreation facilities at the project. The Forest Service's proposed re-vegetation plans would help to ensure that any disturbed areas resulting from implementation of the recreation enhancements are adequately mitigated through reestablishment of vegetation, as necessary. In addition, consultation with the Forest Service and other relevant resource agencies to coordinate recreation plans with other management plans at the project would help to limit any potential adverse effects of the proposed recreation measures on other project resources.

South Feather's proposed site rehabilitation measures and maintenance measures, with the addition of the specified interpretive measures and re-vegetation plans, would help to ensure that project recreation facilities meet future recreational demand. In addition, South Feather's consultation with the Forest Service and other relevant

²⁵ See 18 CFR Part 2.7.

resource agencies would help to ensure that the proposed rehabilitation and maintenance measures would be consistent with the goals and objectives of the Plumas National Forest and other resource plans at the project.

O'Rourke Outdoor Adventures' recommended measures to enhance boat ramps and campgrounds at the project are included in South Feather's proposed rehabilitation measures and would be implemented over the term of a new license, with the exception of extending the boat ramps. In addition, South Feather has already implemented measures to improve access at Tooms Boat Launch and Black Rock and Maidu boat ramps, including widening the launch ramps, repairing damaged parking areas and roadways, constructing an accessible restroom, and installing a fish cleaning station.

O'Rourke Outdoor Adventures also recommended road maintenance measures for Little Grass Valley Dam Road and the access road to Sly Creek, such as paving and brush clearing. Both these roads are county roads and although South Feather states it currently conducts brush trimming on a regular basis along Sly Creek Road as determined during annual meetings held pursuant to the road use special-use permit between South Feather and the Forest Service, because both these roads are county roads outside of the FERC project boundary, they would not be South Feather's maintenance responsibility under a new license.

Capital Improvement Measures

South Feather proposes to construct, within 3 years of license issuance and in consultation with the Forest Service, a multi-use trail below Little Grass Valley dam to provide better access to the SFFR, primarily for recreational boating and angling. The trail would be constructed to a primitive and non-accessible standard on river left extending from the gravel parking area below the accessible restroom about 0.5 mile to the river's edge.

The Forest Service specifies (Condition No. 20, part 1) that South Feather implement the following capital improvement projects: construct a groundwater potable water well, in conjunction with the proposed upgrade of water systems, for the east shore facilities on Little Grass Valley reservoir within 5 years of license issuance; implement a horse watering supply and distribution system at Horse Camp campground within 10 years of license issuance; explore opportunities to extend paved or native trails to increase pedestrian connectivity of sites in the development of the master plans;

and construct amenities such as parking and off-loading ramps at the Sly Creek OHV use area, dependent on pending designation of the borrow site.²⁶

Our Analysis

South Feather's proposed recreation access trail below Little Grass Valley dam would improve recreational angler and boating access in this area. Currently, there is drinking water at all of the east-shore facilities on Little Grass Valley reservoir, except Horse Camp campground, and South Feather has proposed to upgrade each of these water systems as necessary. The Forest Service's specification to construct a groundwater potable water well and implement a horse watering supply and distribution system at Horse Camp campground would further improve existing facilities since there is no water for drinking or for horses at the camp.

The Forest Service's specified OHV site amenities would be associated with a currently informally designated, unconstructed facility located near the Sly Creek campground, which may or may not ever be built. Further, OHV use at the project is moderately low (15 percent) and future demand for this type of activity is estimated to increase only slightly over the next 40 years (about 3.3 percent increase). Therefore, the proposed facilities would not be necessary for current or future recreation demand at the project. If the OHV site amenities were constructed, this could stimulate increased OHV use in the project area, with associated increases in noise levels, exhaust emissions, and soil erosion.

Maintenance and Operation of Recreation Facilities

The Little Grass Valley and Sly Creek reservoir recreation areas require short-term maintenance and operation of all facilities. This would include routine maintenance such as minor repairs and/or replacement of parts, prevention measures, and cyclic maintenance to keep the facilities in acceptable condition.

Under Measure 46, South Feather proposes to file, in coordination with the Forest Service, a routine maintenance and operation plan within 6 months of license issuance for the Little Grass Valley and Sly Creek reservoir recreation areas. In Condition No. 20, part 2, the Forest Service specifies that South Feather perform routine annual maintenance at all the recreation facilities at Little Grass Valley and Sly Creek reservoir recreation facilities to keep facilities in working, acceptable condition. The

²⁶ There is a proposal to designate the borrow site for dam construction near Sly Creek campground as an open OHV use area. Undetermined amenities such as parking and off-loading ramps may be desired upon successful designation. The Forest Service specifies that specific proposals, if applicable, would be evaluated during the annual consultation process.

Forest Service specifies that South Feather develop and file a plan, in consultation with the Forest Service, within 1 year of license issuance.

Both the Forest Service and South Feather submitted a draft “Operation Plan for Little Grass Valley and Sly Creek Reservoir Recreation Facilities” to meet the proposed specified provisions related to maintenance and operation of the recreation facilities described under South Feather Measure 46 and the O&M measures specified by the Forest Service under Condition No. 20, part 2. The Forest Service states that this draft plan has been tentatively agreed to by both the Forest Service and South Feather and would be reviewed and finalized to meet license conditions within the first year following issuance of a new license for the project. The proposed operation plan specifies: (1) their respective roles and management responsibilities in the routine O&M of the project recreation facilities; (2) specific operational measures such as the operating season, length of stay at the campgrounds, and user fees; (3) specific maintenance measures, such as daily and weekly maintenance measures, and annual maintenance measures and target dates for implementation; and (4) description of measures associated with other programs such as signs, and the interpretive programs.

Our Analysis

Maintenance and operation measures associated with the project’s recreation facilities helps to ensure that these facilities and associated public recreational access are provided over the term of a license. South Feather’s proposed draft operation plan for Little Grass Valley and Sly Creek reservoir recreation facilities was developed in consultation with the Forest Service and would be consistent with Condition No. 20. The proposed plan provides specific guidelines for the O&M of the facilities associated with the project. Therefore, implementation of the proposed plan would help ensure proper maintenance and operation of the Little Grass Valley and Sly Creek reservoirs recreation facilities and would help to ensure that these facilities are maintained over the term of a new license. In addition, submittal of the final plan to the Commission for review and approval would help to ensure that the proposed O&M measures are consistent with the terms and conditions of a new license.

Monitoring Recreation Use

Recreation use, demand, and user preferences can change over time. Most project licenses extend over a 30 to 50 year timeframe and existing recreation facilities may not be adequate over time to meet future recreation demand at the project.

Under Measure 47, South Feather proposes to, concurrent with the filing of the Form 80 Recreation Report, file with the Commission a report on recreational use to determine if the capacity of existing recreation facilities is adequate to meet demand over the term of the license at the developed recreational facilities. If South Feather’s calculations show that the maximum capacity for campgrounds, day-use areas, or boat launches at either the Little Grass Valley or Sly Creek reservoir recreation areas are

exceeded, South Feather would, within 1 year of filing the report with the Commission and in consultation with the Forest Service, develop a site concept plan for that recreation area. South Feather would be fully responsible for the planning, design, construction and O&M of the new facilities. South Feather would provide a draft of the report to the Forest Service for 60-day review, would file the report with the Commission, including documentation of consultation, and would implement those measures approved by the Commission.

Under Measure 48, South Feather proposes to, concurrent with every third filing of the Form 80 Recreation Report, file with the Commission a report on recreational user surveys at developed recreational facilities at Little Grass Valley and Sly Creek reservoir recreation areas. The purpose of the report would be to determine if existing recreation facilities are adequate to meet user preferences. South Feather proposes to file this report with every third filing of the FERC Form 80 Recreation Report, therefore, every 18 years.

South Feather would prepare the report based on the survey information, including objectives, methods, results, recommended resource management measures, including assessment of the need for recreation facility modification or new facilities, and a schedule for implementation of recommended measures. South Feather would provide a draft of the final report to the Forest Service for a 60-day review and would file the report, including evidence of consultation, with the Commission concurrent with the next Form 80 filing. South Feather would implement those measures following approval by the Commission.

The Forest Service specifies (Condition No. 20, part 1) that South Feather file a Recreation Use and Facilities Condition Survey once every 6 years. The survey would determine trends of use, condition of facilities, the number of days parking capacity is met or exceeded and whether resource damage is occurring.

Our Analysis

The level and type of recreation use and recreation user preferences could change over the term of a new license. Periodic monitoring of recreation use, surveying of user preferences, and assessment of facility capacity and recreation demand can help to determine if the project's recreation facilities meet demand and provide adequate public recreational access to the project over the term of a new license.

South Feather's proposed recreation report to be filed concurrently with the FERC Form 80 filings every 6 years would provide additional periodic review of trends of recreation use, condition of facilities, and parking capacity. This is consistent with the Forest Service's Condition No. 20, part 1. South Feather's proposed recreation user survey would provide the means for further assessment of recreation demand at the project based on recreation user preferences. However, South Feather proposes to

conduct the recreation user survey every 18 years (every third filing of the Form 80), and recreation user preferences could change significantly over an 18-year timeframe. Conducting the recreation user survey every 12 years (every other filing of the Form 80), instead, would allow for enhanced assessment of the adequacy of public recreation facilities and access at the project over the course of a new license. South Feather's proposed recreation monitoring measures and associated recreation reports would be consistent with the Forest Service's specification that South Feather file a recreation use and facilities condition report. Both the recreational use report and the recreation user preference report would be submitted to the Commission for review and approval, which would provide the mechanism to help ensure that recreation facilities meet project needs and purposes over the term of a new license. Therefore, South Feather's proposed measures for monitoring and reporting recreation use, with the modification of conducting the recreation user survey every 12 years, would provide the means to assess the need to provide additional or modified recreation facilities to meet demand for public recreational access at the project over the term of a new license.

Reservoir Levels

Project operation results in drawdown and fluctuation of reservoir elevations, which can affect recreation use and access at the project reservoirs. Drawdown and fluctuation of the project reservoirs have the greatest effects on reservoirs where higher levels of recreation use and access occur such as Little Grass Valley and Sly Creek reservoirs and can substantially affect boat access and use at these reservoirs. South Feather proposes to maintain the water level at Little Grass Valley reservoir no lower than elevation 5,022 feet msl through September 15 in all water years, except Dry water years, to facilitate the use of Little Grass Valley boat launch facilities. In Dry water years, South Feather proposes to maintain Little Grass Valley reservoir as high as possible through Labor Day weekend.

The Forest Service, as part of Condition No. 20, part 2, specifies that South Feather support reservoir-based recreation consistent with lake levels required by the license conditions, and provide seasonal lake level data and monitor boat usage and fishing activities. Cal Fish & Game states that the project reservoirs provide valuable angling and other recreational opportunities, and that reservoir elevations that are too low may exclude public access to boat ramps and other recreational facilities. The public submitted various letters expressing concerns related to potential lower water surface levels at Little Grass Valley reservoir during the recreation season. Concerns included: boat ramps could become less accessible; bank fishing would be further from the tree line and more treacherous to access; reservoir surface area would be reduced; swimming and boating would become hazardous; beaches would be further from camping and picnic areas, and the potential dewatering of the Pancake Bay area.

Our Analysis

Under existing conditions, water surface elevations at Little Grass Valley reservoir can vary significantly from year to year with reservoir fluctuations ranging from about 18 to 31 feet depending on the water year type. During the primary recreation season (Memorial Day through Labor Day) elevations can typically range from about elevation 5,044 feet to elevation 5,025 feet (see figure 3-3 in section 3.3.2, *Aquatic Resources*). South Feather has historically maintained Little Grass Valley reservoir at or above elevation 5,022 feet msl through September 30 to keep boat ramps operational. South Feather's proposed measures would change the management of the Little Grass Valley water surface elevations by maintaining the water levels above elevation 5,022 feet msl through September 15. This would potentially result in lower surface water elevations during the period between September 15 and September 30, compared to existing conditions.

Most recreation use at Little Grass Valley reservoir occurs during the primary recreation season, from Memorial Day to Labor Day; however, recreation use at the project can continue into the fall period. As a result, holding the reservoir elevation at 5,022 feet msl through September 15 would preserve reservoir access and boating opportunities during the primary recreation season. The lower water surface elevations between September 16 and September 30 have some potential to adversely affect reservoir boating access compared to existing conditions.

Various individuals stated concerns regarding the potentially lower water surface elevations at Pancake Bay. Pancake Bay is a protected cove with a gently sloping bottom located in the southeastern portion of Little Grass Valley reservoir near the Peninsula area (see figure 3-13). Pancake Bay offers wind- and wave-sheltered canoeing and kayaking experiences, compared to the open reservoir. Pancake Bay begins to form when Little Grass Valley reservoir reaches an elevation of about 5,020 feet msl. The cove is rapidly inundated between elevations 5,020 and 5,040 feet msl and continues to grow in size up to the normal full pool elevation of 5,045.5 feet msl.

South Feather assessed the incidence and period of the inundation of Pancake Bay when it is at or near full inundation (between elevations 5,040 and 5,045.5 feet msl) under (1) existing (no-action) conditions; (2) South Feather's alternative 4(e) condition (adopted into the staff alternative); and (3) Forest Service's preliminary 4(e) condition and Cal Fish & Game's recommended flow regime (which are the same below Little Grass Valley dam); see further discussion of proposed flow regimes in section 3.3.2, *Aquatic Resources*). Based on this assessment (table 3-34) under the Below Normal water years the percent of years where inundation would occur at Pancake Bay area would be reduced by about 50 percent under the Forest Service's preliminary 4(e) condition and Cal Fish & Game's recommended flow regime and about 25 percent under the staff alternative (i.e., South Feather's alternative 4(e) condition) as compared to existing conditions. In Dry water years, the Pancake Bay area would not be

inundated under the Forest Service’s preliminary 4(e) condition and Cal Fish & Game’s flow regime. Under the staff alternative, the percentage of Dry water years where inundation would occur would be reduced about 38 percent, compared to existing conditions. These reductions in the inundation of the Pancake Bay area would result in potential adverse effects on recreational use of project waters in this area. The Forest Service modified the flows that it specified for the Little Grass Valley dam reach in its final 4(e) conditions, filed on March 6, 2009. The flows specified in the final 4(e) condition for below normal and dry years are reduced from the flows specified in their preliminary 4(e) condition, and average annual minimum flows in these water year types fall about mid-way between the flows included in South Feather’s alternative 4(e) condition and the flows recommended by Cal Fish & Game, so effects on water levels would be fall about mid-way between the effects of the other two flow regimes.

Table 3-34. Incidence and period of Upper Pancake Bay inundation (5,040 through 5,045.5 feet msl) under alternative flow regimes, below normal and dry water years. (Source: South Feather, 2008)

Period	No-Action Alternative	Staff Alternative (South Feather’s Alternative 4(e) Condition)	Forest Service preliminary 4(e) and Cal Fish & Game, Rec. 1
Below Normal Water Years			
Percent of Years Where Inundation Occurs	100%	75%	50%
Average Inundation Period	May 7 – June 29	May 9 – June 29	May 13 – June 29
Duration (days)	54	52	48
Dry Water Years			
Percent of Years Where Inundation Occurs	50%	12%	None
Average Inundation Period	May 19 – June 29	June 2 – June 28	None
Duration (days)	42	27	None

Implementation any of the alternative flow regimes and the corresponding potential reduced reservoir elevations, compared to existing conditions, would result in potential adverse effects on recreational use and access at Little Grass Valley reservoir. Monitoring the effects of reservoir elevations resulting from the implementation of a

modified flow regime would provide the means to assess the potential adverse effects on recreational use and access to project waters. South Feather proposes to provide a concise reservoir elevation monitoring report to the Commission annually following license issuance until the next Form 80 filing and then provide a reservoir elevation monitoring report as a component of the subsequent Form 80 report filings. The reservoir elevation monitoring report would include a summary of water surface elevations at Little Grass Valley reservoir during the May 1 through October 15 period (primary recreation period), an assessment of the duration and period of inundation of the Pancake Bay area; and an assessment of the potential effects on recreation use and access at the project. This monitoring would provide the means to evaluate these potential effects on recreational use and access at the project. The reservoir elevation monitoring report would help provide the means for the Commission to ensure that adequate public recreational use and access to project waters is provided over the term of a new license.

Whitewater Boating Flows

Project operation can change quantity and timing of flows in project-affected reaches and thereby affect potential whitewater boating opportunities. South Feather proposes various measures to provide supplemental streamflows for recreation opportunities.

Little Grass Valley Dam Reach - Under Measure 50, South Feather proposes to provide a supplemental streamflow for recreational purposes in the Little Grass Valley dam reach in all water years from September 16 of each year until the date that Little Grass Valley reservoir elevation is 5,017 feet msl. This recreational streamflow would have a target magnitude of between 180 and 460 cfs over a continuous 24-hour period.

South Fork Diversion Dam Reach - Under Measure 51, South Feather proposes to provide a supplemental streamflow for recreational purposes downstream of the South Fork diversion dam in the spring of Above Normal and Wet water years. This recreational streamflow would have a target magnitude of no less than 190 cfs and no more than 700 cfs, measured continuously over two weekend days, starting around April 1 and lasting through June 15, or no later than when the average water temperature reaches 13°C. In this measure, South Feather also proposes to install, in consultation with the Forest Service and state agencies, a continuous water temperature monitor near the Woodleaf powerhouse.

Forbestown Diversion Dam Reach - Under Measure 52, South Feather proposes a supplemental streamflow in the spring during Above Normal and Wet water years at Forbestown diversion dam reach to improve opportunities for Class IV and V whitewater boating in the spring. This recreational streamflow would have a target magnitude of no less than 215 cfs and no more than 400 cfs, measured continuously over two weekend days, from April 1 through June 15, but no later than when the

average water temperature reaches 13°C. In this measure, South Feather also proposes to install, in consultation with the Forest Service and state agencies, a continuous water temperature monitor near the Forbestown powerhouse.

Our Analysis

South Feather's proposed supplemental streamflows would provide for enhanced whitewater boating opportunities in the project reaches, compared to existing conditions. The provision of supplemental flows during the fall period at Little Grass Valley dam reach would provide opportunities for increased whitewater boating at a time when whitewater boating opportunities within the region are not as abundant, compared to the spring season. The proposed spring recreational releases at the South Fork and Forbestown diversion dams during above normal and wet years would provide additional whitewater boating opportunities during those years. The proposed installation of water temperature monitors and cessation of releases when water temperature reaches 13°C would help ensure that the spring releases at the South Fork and Forbestown diversion dams would not adversely affect FYLF. However, because FYLF breeding may commence when temperatures rise to 12°C, discontinuing whitewater releases at this temperature would be more protective.

Provision of Streamflow Information

Accurate and timely stream flow information can provide information for recreationists planning water-related visits to the project. Under Measure 53, South Feather proposes to provide streamflow information to the public within the first year after license issuance. During Above Normal and Wet water years starting March 15, South Feather would notify the public of anticipated date and magnitude of recreational streamflow release for the South Fork and Forbestown diversion dam reaches. By April 10, South Feather proposes to provide a preliminary forecast of water year type, initiation date, and duration of anticipated releases in addition to the minimum required streamflow at Little Grass Valley and Lost Creek dams. South Feather proposes to update this information on a monthly basis. South Feather also proposes to make available to the public the daily mean streamflows for the SFFR downstream of Little Grass Valley, South Fork, and Forbestown diversion dams; Lost Creek downstream of Lost Creek dam; and Slate Creek downstream of Slate Creek diversion, from May 1 through November 30. The daily average streamflow readings would be updated weekly and rounded up to the nearest 50 cfs.

Our Analysis

South Feather's proposed provision of streamflow information to the public would provide the means for the public to gain information regarding streamflow for specified stream reaches. This information could then be used by the public to determine if recreational opportunities and desired flow ranges for angling, whitewater

boating, and other recreational activities would be available. This would allow the public to take better advantage of opportunities for public recreational use at the project.

Public Safety

Public information at key locations on Little Grass Valley and Sly Creek reservoirs provides the public with information on acceptable and prohibited activities, as well as dangerous or restricted areas. Under Measure 54, South Feather proposes to install and maintain public safety buoys in Little Grass Valley and Sly Creek reservoirs. The buoys would be installed after the roads are cleared of snow and would be maintained throughout the summer recreation season. Buoys would be removed from the reservoirs after September 15 each year. South Feather would coordinate with the local county sheriff departments to ensure the proper buoys are installed at the appropriate locations. South Feather also would be responsible for the purchase and replacement of buoys, as necessary. South Feather states that inclusion of this measure does not imply that South Feather is responsible for monitoring adherence to applicable state of California regulations and county ordinances regarding speeding and public safety at Little Grass Valley and Sly Creek reservoirs.

Our Analysis

Until 2002, South Feather assisted the local county sheriff departments with the installation of public safety buoys in Little Grass Valley and Sly Creek reservoirs. South Feather took over responsibility for installing safety buoys from the local county sheriff departments in 2002. South Feather's proposed continued assistance with the installation of public safety buoys in those reservoirs would continue to provide recreation visitors information regarding boat speed limits, dangerous areas, and other safety information. The proposed installation of these buoys would continue to help ensure public safety at both Little Grass Valley and Sly Creek reservoirs. The state of California and Plumas and Butte counties would continue to be responsible for monitoring compliance with state regulations and county ordinances regarding speeding and other public safety measures at Little Grass Valley and Sly Creek reservoirs.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Definition of Historic Properties

Section 106 of the National Historic Preservation Act requires the Commission to take into account the effects of licensing a hydropower project on any historic properties, and allow the Advisory Council on Historic Preservation (Advisory Council) a reasonable opportunity to comment on the proposed action. Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources also

need enough internal contextual integrity to be considered historic properties. For example, dilapidated structures or heavily disturbed archaeological sites may not have enough contextual integrity to be considered eligible. An undertaking means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including, among other things, processes requiring a federal permit, license, or approval. In this case, the undertaking is the proposed issuance of a new license for the project.

If there would be an adverse effect on historic properties, the applicant must develop an HPMP to seek to avoid, reduce, or mitigate the effects. Potential effects that may be associated with a hydroelectric project include any project-related effects associated with the day-to-day O&M of the project after issuance of a new license. During development of the HPMP, the applicant should consult with the Commission, the Advisory Council, the State Historic Preservation Officer (SHPO), Indian tribes, appropriate land-management agencies, and any other consulting party that may be involved with the licensing process. In most cases, the HPMP would be implemented by execution of a Programmatic Agreement that would be signed by the Commission, Advisory Council, SHPO, and other consulting parties.

Section 106 also requires that the Commission seek concurrence with the SHPO on any finding involving effects or no effects on historic properties, and allow the Advisory Council an opportunity to comment on any finding of effects on historic properties. If Native American properties have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

Other federal laws, such as the American Indian Religious Freedom Act or the Native American Graves Protection and Repatriation Act, also may apply when sacred areas or burial sites of Indian tribes have been identified. These and other cultural resources that possess religious or cultural significance to an Indian tribe, if eligible, can be considered as historic properties and treated through the section 106 process. Such historic properties are called Traditional Cultural Properties (TCPs).

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 a project's APE. The APE is delineated in consultation with the SHPO and 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 and/or TCPs, if any such properties exist. For the relicensing of the South Feather Power Project, we define the APE as:

- all lands within the FERC project boundary surrounding the Sly Creek, Woodleaf, Forbestown, and Kelly Ridge developments; and
- the six project reaches as described in section 1.8, *Description of General Locale*, of the final license application (South Feather, 2007).

Excluded from the APE are project tunnels, private lands not owned by the applicant unless access by the property owner has been granted, and steep terrain where access would be unsafe.

Cultural Context

Three primary cultural complexes have been proposed for the region encompassing the South Feather Power Project area. Classification of cultural materials was first undertaken by Heizer and Elsasser (1953, as cited by South Feather, 2007). They proposed two prehistoric periods based on investigations at 26 prehistoric sites: the Martis Complex and the Kings Beach Complex.

The Martis Complex (4000 – 2000 before present [BP]) is characterized by the favored use of basalt over other lithic sources. The mano and metate, large, crudely shaped projectile points, atlatl weights, the bowl mortar and cylindrical pestle, and abundant basalt tools were identified as typical material attributes of the Martis Complex. The Martis Complex peoples were believed to be primarily interested in the exploitation of floral and faunal resources. Elsasser (1960, as cited by South Feather, 2007) felt that the widespread distribution of Martis Complex was the result of a relatively homogeneous local culture and probably represented a seasonal adaptation to an economy based on the hunting of large mammals.

Kowta (1988, as cited by South Feather, 2007) undertook an overview of the archaeology and prehistory of Plumas and Butte counties. He recognized the limitations in applying the concept of the Martis Complex to an archaeological manifestation that is presently “poorly defined” and often is loosely applied to “...archaeological assemblages, sometimes solely on the basis that basalt is the dominant lithic material in evidence” (Kowta 1988, as cited by South Feather, 2007). Kowta proposes the use of the more generic term “Martis Tradition” which can be taken to refer to the cultural remains present in the central and northern Sierra from 2,500 B.C. to A.D. 500

Elston (1971, as cited by South Feather, 2007) later proposed that the Martis Complex could be separated into two distinct phases. The Early Martis phase (1,000 B.C. to A.D. 1) is characterized by Elko, Martis Series, and Sierra Stemmed Triangular projectile points, and the Kings Beach Complex (1000 A.D. to historic contact) is defined by the dominant use of non-basalt lithic sources such as chert and obsidian, small projectile points with the inferred use of the bow and arrow, and the use of bedrock mortars. The Kings Beach Complex peoples were believed to be primarily interested in the exploitation of fish resources with a secondary emphasis on hunting. Heizer and Elsasser (1953, as cited by South Feather, 2007) suggest that the Kings Beach Complex dated from between 1,000 A.D. to the time of historic contact and was the ethnographic culture of the Washoe Indians.

Following the work of Elsasser, Elston (1971, as cited by South Feather, 2007) also defined a pre-Martis phase: the Spooner Complex. This Complex was first identified at site 26Do38 (Spooner Lake Site). Elston places the Spooner Complex

between 5,000 and 3,000 B.C. (possibly as late as 1,000 B.C.) and notes the similarities between these dates and the hypothesized Altithermal period (Antevs, 1948, as cited by South Feather, 2007) in the Great Basin. Given the similarities in dates and the presence of two projectile points typically found in the western Great Basin (Pinto and Humboldt Concave Base), Elston concludes that the Spooner Complex peoples may have been refugees from the Great Basin who began to colonize the Sierra Nevada.

Ethnographically, the project area was inhabited by the Konkow or Northwestern Maidu. The Konkow lived in village communities, comprising several adjacent villages with a head man or chief. Villages ranged in size from a single lodge to upwards of twenty lodges situated on ridgelines above major drainages or on flats situated on the sides of river canyons. Structures were either circular or semi-subterranean, or were smaller cone-shaped huts built at ground level. In the summertime, simple lean-tos were built.

Hunting and fishing grounds were owned by each Konkow community. In the mountain areas, deer, elk, and mountain-sheep were taken, while antelope and smaller animals were hunted in the Sacramento Valley. Grizzly bears, wolves, coyotes, and dogs were not hunted. Salmon was caught using large nets or gigs fashioned from antler or bone. Weirs across tributaries also assisted in salmon spearing. Salmon could be dried, pounded into a powder, stored, and eaten dry. Seasonal hunting and fishing was augmented by a strong reliance on gathering plants. Hundreds of species of plants were used for subsistence, material, and medicinal purposes. Greens, bulbs, and roots were collected during springtime; seeds were gathered in the summer; and acorns harvested in the fall. Acorns were a staple food for the Konkow and were shelled and then dried. Ground acorn was leached with warm water to remove tannins. Afterward, it could be cooked into bread.

Impacts on the Konkow way of life from American settlers began in the early 1800s. The onset of malaria in the Sacramento Valley in 1833 as a result of contact with early explorers led to significant reductions in Konkow population. Further changes occurred following the discovery of gold in 1848. An increase in the number of settlers to the area resulted in conflicts, and the practice of traditional lifeways by the Konkow was increasingly difficult. These conflicts led to attempts to negotiate treaties designed to remove the Indians to protect gold claims. The treaties established reservations and educational and economic aid in return for government title to traditional territory. The Konkow signed such a treaty. However, the treaties were not ratified by the U.S. Senate, which resulted in many Indians becoming homeless.

The first account of European exploration into the Feather River area was in 1808 when Lieutenant Gabriel Moraga searched the Central Valley for potential mission sites. He followed the Sacramento River into the lower reaches of the Feather River. In 1820, Captain Luís Argüello's party traveled into its upper reaches. He named the river

“Río de Las Plumas,” or the “River of Feathers” for the large numbers of waterfowl feathers he observed floating on the river’s surface.

Following the discovery of gold in January 1848, thousands of miners traveled to California. Miners began prospecting many rivers and creeks throughout northern California. As a result, many mining camps and small towns arose. Some of these small towns are located in the vicinity of the project, including Clipper Mills, Forbestown, American House, Mooretown, and La Porte.

In 1850, John Bodly established a trading post at Little Grass Valley that provided goods to mining camps in the area. Additionally, an ice house and a boarding house were also located in the valley.

Logging was also important in the region. Mills were established to provide lumber for mining flumes, including mills in Oroville. Railroads carried the logs to the mills until the establishment of the trucking industry in the 1920s and 1930s. This brought an end to railroad logging, and roads were pioneered to many remote sites in the region to cut the first growth timber. Major mills were located at Oroville.

In the early 20th century, a rancheria system was developed where small parcels of isolated land were purchased for various tribal groups. Many Konkow joined rancherias at Mooretown, Enterprise, Berry Creek, Strawberry Valley, and Chico. In 1953 many of these rancherias were “terminated” by the Bureau of Indian Affairs due to changing national policy. It was not until 1983 with the Tillie Hardwick et al., case that 16 rancherias in California were “unterminated.” However, nine tribes remain terminated including Strawberry Valley Rancheria, which is located on a tributary to the upper Yuba River in proximity to the project area.

Prehistoric and Historic Archaeological Resources

The project Historic and Archaeological Sites Inventory and Impact study was conducted by South Feather to determine if continued project O&M would directly affect archaeological and historic-era sites within the project APE that are listed or eligible for listing on the National Register.

South Feather conducted a record search at the Northeast Center of the California Historical Resources Information Center at California State University, Chico, and Plumas National Forest records to determine if any lands within the APE had been previously surveyed and if any cultural resource sites had been documented. The record searches resulted in the identification of 11 sites located within the APE. Three of these sites are located within the Sly Creek development (FS-04-11-53-177, FS-05-11-53-179, FS-05-11-53-180) and eight are located within the Kelly Ridge development (CA-BUT-2105H, CA-BUT-2273H, CA-BUT-2382H, CA-BUT-2515H, CA-BUT-2517, P-04-001936, P-04-002100, P-04-002516H). Three of these sites are strictly prehistoric in nature consisting of extensive lithic and tool scatters and midden development. Seven sites are strictly historic and are characterized by historic-period refuse, roads, ditches,

and/or mining-related features. A single site contains both prehistoric and historic components.

Archaeological field investigations of the project APE were conducted between September and November 2004 and in October 2005. This work was undertaken according to the methods provided in the Historical and Archaeological Sites Inventory and Impact Study filed with the Commission on April 8, 2004. Surveys were undertaken in those portions of the APE that had not been previously surveyed. Areas within the APE that were adjacent to project reservoirs were surveyed when the reservoirs were at their lowest elevation. The intensity of survey coverage was dependent upon the likelihood of encountering cultural material and the potential of project-related effects on particular areas. Survey transects varied between 30 and 50 feet in width, with particular attention paid to drainages, seeps, springs, level areas, and exposed bedrock locations. Steep sided shorelines, such as those found at Forbestown reservoir, and portions of Ponderosa reservoir, were not inspected due to safety concerns. In some areas, the researchers depended on prior surveys that they deemed adequate for the current project. These areas included the Miners Ranch conduit which DWR surveyed in 2002 (Selverston et al., 2005, as cited by South Feather, 2007).

In addition to the 11 previously recorded sites within the project APE, 8 new sites were documented. Additionally, three isolated artifacts were also identified. Table 3-35 identifies these 22 resources.

Table 3-35. Archaeological and historical resources within the South Feather Power Project APE. (Source: South Feather, 2007)

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
FS-05-11-53-177	Sly Creek (Little Grass Valley reservoir)	Previously recorded	Lithic and tool scatter and possible midden development. Unevaluated, assumed eligible.	Good
FS-05-11-53-179	Sly Creek (Little Grass Valley reservoir)	Previously recorded	Lithic and tool scatter and possible midden development. Unevaluated, assumed eligible.	Good

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
FS-05-11-53-180	Sly Creek (Little Grass Valley reservoir)	Previously recorded	Lithic and tool scatter and possible midden development, bedrock milling feature. Unevaluated, assumed eligible.	Good
CA-BUT-2105H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic-era earthen ditch. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BUT-2273H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BUT-2382H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic-era and modern refuse scatter. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BUT-2515H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BIT-2517/H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Prehistoric bedrock mortar outcrop, midden development, and lithic and tool scatter. Historic dirt road segments and two cans. Unevaluated, assumed eligible.	Unknown, Inundated

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
P-04-001936	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
P-04-002100	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
P-04-002156	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Mining-related feature with roads, ditches, and prospect pits. Unevaluated, assumed eligible.	Unknown, Inundated
PA-04-100	Sly Creek (Little Grass Valley reservoir)	New site	Prehistoric lithic scatter and a single historic bottle fragment. Unevaluated, assumed eligible.	Good
PA-04-101	Sly Creek (Little Grass Valley reservoir)	New site	Prehistoric lithic scatter; unknown historic component. Unevaluated, assumed eligible.	Good
PA-04-102	Sly Creek (Little Grass Valley reservoir)	New site	Prehistoric lithic scatter and possible shelter feature; unknown historic component. Unevaluated, assumed eligible.	Good

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
PA-04-103	Sly Creek (Little Grass Valley reservoir)	New site	Boulder containing possible prehistoric inscriptions. Unevaluated, assumed eligible.	Good
PA-04-104	Sly Creek (Little Grass Valley reservoir)	New site	Lithic and tool scatter. Unevaluated, assumed eligible.	Good
PA-04-105	Sly Creek (Little Grass Valley reservoir)	New site	Bedrock mortar outcrops. Unevaluated, assumed eligible.	Good
PA-04-106	Sly Creek (Little Grass Valley reservoir)	New site	Bedrock mortar outcrop. Unevaluated, assumed eligible.	Good
PA-04-107	Woodleaf (Lost Creek reservoir)	New site	Lost Creek dam (circa 1924). Recommended ineligible.	Compromised
IF-04-20	Sly Creek (Little Grass Valley reservoir)	New isolated find	Single basalt core. Recommended ineligible.	N/A
IF-04-21	Sly Creek (Sly Creek reservoir)	New isolated find	Single stone scraper. Recommended ineligible.	N/A
IF-04-22	Woodleaf (Lost Creek reservoir)	New isolated find	Single granite handstone. Recommended ineligible.	N/A

Each new site was recorded to current state of California Department of Parks and Recreation standards and to the standards of the Plumas National Forest, as appropriate. The condition of all sites was documented in the field.

Following fieldwork, the applicant considered the various effects on all sites to determine if it was likely that observed effects were project-related and/or ongoing. The applicant states that it intends to consult further with the SHPO and Plumas National Forest regarding these effects.

While South Feather has provided National Register eligibility recommendations for the three isolated finds identified in the APE, no formal National Register evaluations of the 18 identified archaeological sites were undertaken. However, Lost Creek dam (PA-04-107) has been recommended as ineligible on the basis of a recent evaluation of the dam by South Feather.

Traditional Cultural and Religious Sites Inventory and Impact Study

TCPs are historic properties eligible for inclusion in the National Register because of their association with cultural practices or beliefs of a living community that are (1) rooted in that community's history; or (2) important in maintaining the continuing cultural identity of the community (National Register Bulletin 38, Parker and King, 1998). Assessment of historic properties and potential TCPs is conducted in continuous consultation with the Commission, the SHPO, Native American tribes, and all appropriate agencies (e.g., Plumas National Forest, the National Park Service).

For the current project, South Feather implemented the Project Traditional Cultural and Religious Sites Inventory and Impact Study (TCP study) to identify and assess project effects on TCPs that may be eligible for National Register listing.

South Feather undertook archival research to understand the ethnographic background and past use of the project area by Native American tribes. The results of this research were presented in section 6.3.2 of the license application (South Feather, 2007) and are summarized earlier in this section.

South Feather consulted with the California Native American Heritage Commission to obtain a list of Native American groups and individuals with whom it should consult regarding relicensing the project and potential TCPs that may be located within the project APE. The California Native American Heritage Commission provided the following list:

- Berry Creek Rancheria of Maidu Indians
- Butte Tribal Council
- Enterprise Rancheria of Maidu Indians
- Mr. Joe Marine
- Konkow Valley Band of Maidu

- Maidu Cultural and Development Group
- Mechoopda Indian Tribe of the Chico Rancheria
- Mooretown Rancheria of Maidu Indians
- United Maidu Nation

Other groups and individuals were identified during the course of study implementation including the Strawberry Valley Band of Maidu, Mr. Ennis Peck, and the Greenville Rancheria. South Feather prepared presentations, held meetings, and provided site tours for tribal representatives of cultural resources located within the project APE.

South Feather met with representatives of federally recognized tribes, other tribes, and individuals regarding the project. Consultation with the Native American groups and individuals with interests in the project area did not result in the identification of any specific areas within the project APE that are potentially eligible for listing on the National Register as TCPs.

Historic Buildings and Structures

In general, resources must be more than 50 years old to be considered eligible for listing on the National Register. Lost Creek dam (historic resource PA-04-107 discussed above), was constructed in 1924; South Feather recommends that it is not eligible for listing on the National Register. The remaining structures associated with the project were constructed in the late 1950s and are not currently more than 50 years old.

Historic Properties Management Plan

South Feather prepared an HPMP for the project and filed it with the license application. This HPMP was designed to address current and future project-related effects to historic properties within the APE. In July 2006, South Feather provided a draft of the HPMP to the Plumas National Forest archaeologist for review and comment. No comments were received. On July 27, 2006, South Feather distributed a draft license application to participating agencies, tribes, and NGOs. On September 29, 2007, an addendum to the draft license application, including the HPMP was distributed. A single comment pertaining to cultural resources was provided by the Plumas National Forest on October 23, 2006, stating that the HPMP was being reviewed.

In the HPMP, South Feather proposes to appoint an HPMP coordinator and implement employee training. Additionally, the HPMP includes procedures for (1) monitoring cultural resource sites; (2) addressing unanticipated discoveries; (3) discovery of human remains; (4) emergency undertakings; (5) periodic reporting and meetings; (6) periodic review and revision to the HPMP; and (7) Native American

consultation. The HPMP also discusses potential project effects that identified resources may experience or are experiencing.

3.3.6.2 Environmental Effects

Continued operation of the South Feather Power Project without adequate protection measures could adversely affect properties that may be eligible for listing on the National Register. In particular, sites contained within reservoir fluctuation zones may be subject to lake-induced erosion. Archaeological sites within or near formal or dispersed recreational areas could be affected by both vehicle and pedestrian traffic; sites at Little Grass Valley reservoir are particularly susceptible to disturbance as a result of OHV traffic within the drawdown zone. Sites near recreational areas also could be subject to illicit artifact collection and/or other types of vandalism. Project O&M, including road grading and other activities, also could affect archaeological resources or the qualities of unevaluated hydroelectric system features that may become eligible for listing on the National Register in the near future. Finally, the use of or modifications to recreational facilities and hydroelectric system features could affect areas or plants of significance to Native Americans or could restrict their ability to access these traditional resources.

On March 6, 2009, the Forest Service submitted final terms and conditions for the project pursuant to section 4(e) of the FPA. Condition No. 23 specifies that South Feather file with the Commission a Heritage (Historic) Properties Management Plan for the purpose of protecting and interpreting historic properties within 1 year of license issuance. The HPMP would take into account project effects on National Register-eligible properties located on Forest Service lands, provide measures to mitigate effects, and provide for a monitoring program and management protocols. The Forest Service specified that any ground-disturbing project-related activities must cease in the immediate area should materials of cultural, historical, archaeological, or paleontological value be identified on Forest Service lands. South Feather would be required to notify the Forest Service and not resume work on ground-disturbing activity until appropriate evaluation of the find has been completed and South Feather has received written approval from the Forest Service. The Forest Service reserved the right to require South Feather to perform data recovery excavations and site preservation through the provisions found in the Archaeological Resources Protection Act, if deemed necessary.

Our Analysis

We concur with the APE developed by South Feather, in consultation with the SHPO. Project-related effects to archaeological resources around project reservoirs include erosion from fluctuating water levels and wave action, and accidental or deliberate disturbance of archaeological sites by recreationists or visitors. Archaeological sites along the six stream reaches included in the APE could be affected

by increased minimum flows, as well as supplemental stream flows for recreation or sediment pass-through, as well as project-induced recreation.

While we find the archaeological surveys conducted around project facilities to be adequate, there is no evidence in the record indicating that South Feather conducted surveys of the six project reaches. Archaeological surveys of these reaches would determine whether archaeological sites are present and whether project operation or project-related recreation activities pose a risk to these sites, indicating that management measures may be warranted.²⁷

South Feather provided the Forest Service with an HPMP for review. The HPMP was provided to the Commission as part of the final license application. The HPMP adequately identifies the APE, describes the cultural resource inventories that were conducted within the APE, identifies existing project-related effects that could occur on potentially significant cultural resources, and provides general management measures to resolve such effects. The HPMP also provides procedures for handling unanticipated discoveries and the proper treatment of human remains and sacred objects, if they are encountered. The HPMP provides protocols for emergency undertakings, periodic reporting and meetings, and appropriate review and revision of the HPMP based upon changing conditions over the period of a new license. However, our review of the HPMP reveals that it does not provide enough site-specific measures to ensure that project-related adverse effects on historic properties resulting from operation, maintenance, recreational, or other activities would be adequately addressed over the term of the new license. Missing elements include:

- a report on archaeological surveys in the six project stream reaches within the APE;
- National Register evaluation of archaeological sites that have been or are being adversely affected by project-related erosion, especially the 10 archeological sites located at Little Grass Valley reservoir, and including any discovered during survey of the stream reaches;
- a provision for evaluation of project features that may become eligible for listing on the Natural Register during the term of any new license issued for the project; and
- a more detailed discussion of Lost Creek dam regarding the structure's National Register status and measures to address potential adverse effects

²⁷ In some areas within the reaches, unsafe conditions may warrant using a stratified sample survey. Such sampling techniques are standard practice. Should a stratified survey be necessary, the California SHPO and the other involved parties should be consulted on the survey design prior to implementation of fieldwork to ensure that the APE will be adequately inventoried.

on this potentially eligible structure as a result of project operations and maintenance activities.

Implementation of the HPMP, with staff's additional measures, in consultation with the SHPO, Forest Service, participating Tribes, and the Commission would ensure that adverse effects on historic properties as a result of South Feather Power Project operation, maintenance, recreational or other activities would be addressed over the term of the new license. We anticipate that any new license issued for the project would include a condition to implement a Programmatic Agreement executed among the Commission, SHPO, and the Advisory Council. South Feather, the Forest Service and others would be invited to sign the Programmatic Agreement as concurring parties. The agreement would include a measure to implement the HPMP, including staff's additional measures.

3.3.7 Land Use and Aesthetic Resources

3.3.7.1 Affected Environment

Land Use Resources

The South Feather Power Project is located within the boundaries of the Plumas National Forest in Butte, Plumas, and Yuba counties. The total area within the project boundary is 3,838 acres. About 52 percent of the project land is located on United States-owned lands that are administered by the Forest Service (as part of the Plumas National Forest) and the BLM as public lands. State- and county-owned lands make up about 2 percent of the project lands, including the California Department of Parks and Recreation-managed Lake Oroville State Recreation Area. Approximately 46 percent of the project lands are privately owned. South Feather owns nearly 1,500 acres of land within the project boundary. Table 3-36 summarizes the acreage held by each major landowner.

Federal lands within the project boundary include BLM lands (about 10 acres within the Kelly Ridge Development) and Plumas National Forest lands managed by the Forest Service. More than 50 percent of the project lands are located within the Plumas National Forest. The Plumas National Forest Land and Resource Management Plan (LRMP), amended by the Sierra Nevada Forest Plan, provides management direction for the Plumas National Forest lands. The Sierra Nevada Forest Plan addresses the following five management areas: (1) old forest ecosystems and associated species, (2) aquatic, riparian, and meadow ecosystems and associated species, (3) fire and fuels management, (4) noxious weeds, and (5) lower Westside hardwood forest ecosystems. Table 3-37 summarizes management goals described in the LRMP for the Plumas National Forest.

Table 3-36. Land ownership within the project boundary. (Source: South Feather, 2007, as modified by staff)

Development	Land Ownership (acres)							% of Total
	Plumas National Forest	BLM	State	County	South Feather	Private	Total	
Sly Creek	1,823.1	0	0	0	1,202.6	140.1	3,165.8	82.2
Forbestown	39.3	0	0	0	2.5	22.9	64.7	1.7
Woodleaf	8.0	0	0	0	151.5	52.2	211.7	5.5
Kelly Ridge	104.4	10.6	85.1	2.7	145.1	80.5	411.2	10.7
Total	1,977.1	10.6	85.1	2.7	1,494.8	268.6	3,838.8	100
% Total	51.2	0.3	2	0.1	38.8	7.5	100	--

Table 3-37. Plumas National Forest management goals as described in the Plumas National Forest LRMP. (Source: South Feather, 2007, as modified by staff)

Area/Resource	Management Goal
Recreation Resources	Provide a wide range of developed and dispersed recreation opportunities that meet projected demand at the end of the planning period. Public uses take priority over uses of a semipublic nature, and these in turn take priority over private uses. Stress simpler, more natural recreation experiences over dense, sophisticated developments.
Visual Resources	Protect the most visually sensitive areas of the forest by placing the major roads, trails, streams, and areas of concentrated visitor use in scenic corridors and manage viewsheds.
Wilderness Areas	Maintain a lasting system of quality wilderness for public use and appreciation of the unique characteristics of wilderness, consistent with preserving its values.

Area/Resource	Management Goal
Wild and Scenic Areas	Manage the wild, scenic, and recreation rivers to preserve their free flowing characteristics and protect their outstandingly remarkable values.
Special Interest Areas	Preserve the integrity of the botanical, archaeological, geological, and recreational features for which the areas were established.
Range Resources	Maintain current levels of livestock grazing and take advantage of additional forage induced by even-aged timber management.
Timber Resources	Sustain a long-term yield of logs and other wood products by practicing the most intensive forms of timber management on the most productive sites. Increase this yield by application of high utilization standards and scientific silvicultural growth techniques. Harvest Christmas trees only where timber productivity is enhanced or maintained.
Riparian Areas	Favor riparian dependent resources and limit disturbance in all riparian areas including riparian and aquatic ecosystems, wetlands, stream banks, and floodplains.
Soil, Water, and Air Resources	Protect streams, lakes, wetlands and riparian vegetation that surround them. Establish a permanent streamside management zone to furnish shade, ground cover, and natural environmental elements, which maintain high water quality and enhance fish and wildlife habitat. Limit cumulative disturbing impacts on watersheds within the forest. Induce moderate increases in water yield by direct watershed improvement projects, meadow rehabilitation and expansion projects, and snowpack manipulation associated with timber harvest practices.
Wildlife, Fish, and Sensitive Plants	Provide a diversity of vegetation types and habitat to support viable populations of all fish, wildlife, and plant species. Maintain viability of species dependent upon specific forest features.

Area/Resource	Management Goal
Energy Resources	Facilitate permitting of hydroelectric and other new energy development that reasonably protects all resources.
Mineral Resources	Cooperate and participate with mineral lessees, claimants, and permittees in the development of mineral resources under the laws and regulation that govern them.
Lands	Seek optimum land ownership patterns by means of land adjustments in order to reduce problems related to intermingled private lands.
Fire Prevention	Provide for sufficient level of fire protection and treat natural and activity fuels to assure a continuous flow of projected outputs and amenities for the forest.
Transportation	Develop and maintain the forest transportation system for the through traveling public while providing safe, efficient routes for recreationists.
Facilities	Build and maintain fire, administrative and other facilities (non-recreation) to serve resource and support program needs. Make them functional, energy efficient, and attractive to the public. Remove or replace unsafe, obsolete facilities.

The lands around Sly Creek and Little Grass Valley reservoirs are primarily managed for maintaining recreation areas. Additional management prescriptions include bald eagle habitat, visual quality, and timber. Private lands surround Lost Creek dam and reservoir, and are classified as timber production zones. Part of the Woodleaf development and the Forbestown diversion dam would be managed under the Plumas National Forest minimal management prescription. Adjacent to the project boundary at the Forbestown development, are lands that are managed under the visual retention prescription, further discussed in below in aesthetic resources. Lands at the Kelly Ridge are managed for visual retention, timber, state recreation, public lands, and residential and light commercial uses.

In addition, lands of the Plumas National Forest are managed for fire suppression and prevention. Specific measures include (1) managing fuels to reduce high risk hazards and/or to facilitate cost-effective resource protection; (2) responding with appropriate suppression measures to all wildfires; (3) providing a timely suppression

response to wildfire with appropriate forces; and (4) using prescribed fire to maintain natural character of the area.

State-owned lands account for about 0.5 percent of land inside the project boundary and are managed by the California Department of Parks and Recreation as part of Lake Oroville State Recreation Area. County-owned lands within the project boundary account for only 2.7 acres located within the Kelly Ridge development.

Project facilities in Butte County include Sly Creek reservoir, powerhouse and dam; Lost Creek reservoir and dam; Woodleaf power tunnel, penstock and powerhouse; Forbestown diversion dam, power tunnel, penstock, and powerhouse; Ponderosa reservoir and tunnel; Miners Ranch reservoir and conduit; and Kelly Ridge power tunnel and powerhouse (see figure 2-1 for location of project facilities). Lands in Butte County are subject to the policies detailed in the Butte County General Plan. In Butte County, lands near the project are designated as “Timber Mountain” and “Grazing and Open Lands.” Timber Mountain is defined by areas used for forest management, harvesting, and processing of forest products, as well as animal husbandry, resource extraction, outdoor recreation, and public use. The Grazing and Open Land category is defined by areas used for animal husbandry and livestock grazing, as well as commercial forestry, recreation, and resource conservation.

Project facilities in Plumas County include Little Grass Valley reservoir, South Fork diversion dam and tunnel, and Slate Creek diversion dam and tunnel. Lands in Plumas County are subject to the policies detailed in the Plumas County General Plan. In Plumas County, land use designations include residential and resource production. Specifically, these include secondary suburban, rural development, and timber preserve land uses.

Project facilities in Yuba County include the inlet to the Slate Creek diversion and a small portion of the Sly Creek arm of Sly Creek reservoir. Lands in Yuba County are subject to the policies detailed in the Yuba County General Plan. In Yuba County, land designations include timber production, extractive industrial, public lands, mineral resources, timber/forest, and water resources.

South Feather owns the majority of private lands within and adjacent to the project boundary, with several parcels held by a timber company and residential/recreational communities. The privately owned lands account for about 1,763 acres, with South Feather owning nearly 1,495 acres within the project boundary. The majority of the non-South Feather private land is located around Little Grass Valley reservoir.

Aesthetic Resources

The South Feather Power Project is located in the Sierra Nevada mountain range. This part of the state is largely undeveloped and retains much of its natural character, with scattered rural residences and small communities located along major corridors.

The two larger project reservoirs, where the majority of recreation activities occur, Sly Creek and Little Grass Valley, are storage reservoirs that are slowly drawn down through summer and fall releasing water for power generation, irrigation, and consumptive purposes. Sly Creek reservoir can be drawn down in a typical water year by 100 to 102 feet, with an elevation drawdown of more than 50 feet from the early June to end of August timeframe. For Little Grass Valley, in a typical water year reservoir surface elevation fluctuates by 18 to 31 feet, with a drawdown of up to 20 feet during the early June to end of August period. These reservoir fluctuations result in exposed shorelines that influence the aesthetic views of the project shoreline area, particularly during the higher use recreation season.

Visual aesthetics management of project lands is guided by the general plans for Butte, Plumas, and Yuba counties which include goals and objectives associated with the protection of visual resources; and the Plumas National Forest LRMP. The Plumas National Forest LRMP provides standards and guidelines for the visual quality objectives (VQO) specified for each management area. VQOs are a measure of the degree of acceptable alteration permitted within the natural characteristic landscapes and are applied to all project proposals and activities on National Forest System lands. The VQOs prescribed by the Plumas National Forest LRMP for South Feather Power Project lands include:

Retention—The Retention VQO provides for management activities that are not visually evident. Under retention, activities may only repeat the form, line, color and texture frequently found in the characteristic landscape, but changes in their qualities of size, amount, intensity, direction and pattern should not be evident. The following project areas have a retention VQO: Little Grass Valley reservoir, Ponderosa reservoir, Sly Creek reservoir, and Lost Creek reservoir.

Partial Retention—The partial retention VQO allows for management activities that remain visually subordinate to the characteristic landscape. Activities may repeat the form, line, color, or texture common to the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape. Project areas that have a partial retention VQO include Little Grass Valley reservoir, Ponderosa reservoir, and Sly Creek reservoir.

Modification—Under a modification VQO, management activities may visually dominate the characteristic landscape. However, activities of vegetative and land-form alteration must borrow from naturally established form, line, color, or texture so

completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area character-type. The following project areas have a modification VQO: Little Grass Valley dam reach, South Fork diversion impoundment, South Fork diversion dam reach, SFFR/Lost Creek reach, Forbestown diversion dam impoundment, Forbestown diversion dam reach, Slate Creek diversion dam impoundment, Slate Creek diversion dam reach, and Lost Creek dam reach.

3.3.7.2 Environmental Effects

Fire Prevention and Response Plan

Recreation use at reservoirs and stream reaches, including at project recreation facilities and dispersed sites, could potentially pose a fire risk. In addition, hydroelectric operation along with the presence of project facilities such as generators, construction equipment, and transmission lines can contribute to fire danger in the project area.

South Feather proposes to file with the Commission, within 1 year of license issuance, a fire prevention and response plan that is approved by the Forest Service, and developed in consultation with appropriate state and local fire agencies. The plan would set forth in detail South Feather's responsibility for the prevention, reporting, control, and extinguishing of fires in the vicinity of the project resulting from project operation.

At a minimum the plan would address the following items:

1. Fuels Treatment/Vegetation Management: Identification of fire hazard reduction measures to prevent the escape of project induced fires.
2. Prevention: Availability of fire access roads, community road escape routes, helispots to allow aerial firefighting assistance in the steep canyon, water drafting sites and other fire suppression strategies. Address fire danger and public safety associated with project induced recreation, including fire danger associated with dispersed camping, existing and proposed developed recreation sites, trails, and vehicle access.
3. Emergency Response Preparedness: Analyze fire prevention needs including equipment and personnel availability.
4. Reporting: South Feather would report any project-related fires to the Forest Service within 24 hours.
5. Fire Control/Extinguishing: Provide the Forest Service a list of the locations of available fire suppression equipment and the location and availability of fire suppression personnel.

South Feather also proposes to fully cooperate with the Forest Service in the investigation of all project-related fires. South Feather would produce upon request all

materials and witnesses not subject to the attorney-client or attorney work product privileges, over which the South Feather has control, related to the fire and its investigation. South Feather would preserve all physical evidence, and give custody to the Forest Service of all physical evidence requested. The Forest Service would provide South Feather with reasonable access to the physical evidence and documents that it would require to defend any and all claims that may arise from a fire resulting from project operation, to the extent such access is not precluded by ongoing criminal or civil litigation.

The Forest Service specifies in Condition No. 21 that South Feather develop and implement a fire prevention, response, and investigation plan. The specified components of this plan are consistent with South Feather's proposed measures. However, the Forest Service specifies that South Feather also develop and implement an additional fuel treatment/vegetation management plan (Condition No. 22) to be approved by the Forest Service and filed with the Commission within 1 year of license issuance. The plan would include analysis of live and dead fuel loading and potential fire behavior within 300 feet of project features; treatments to be employed to reduce the hazard; implementation schedule; and provisions for the reassessment of hazard at 5 to 8 year intervals depending on regrowth of vegetation. Treatments extending onto adjacent National Forest System lands would be approved by the Forest Service, and when practicable, South Feather would coordinate implementation and accomplishment of hazard reduction activities with those of the Forest Service.

Our Analysis

The development of a fire prevention, response, and investigation plan that incorporates both the measures proposed by South Feather and specified by the Forest Service, as well as the components of the fuel treatment/vegetation management plan specified by the Forest Service, would provide the means for South Feather to develop and coordinate with the Forest Service effective fire management and prevention strategies. These strategies would include the identification of fire hazard reduction measures and public safety measures associated with project-induced recreation. The fire management and response plan also would provide the means for identifying and coordinating emergency response preparedness, reporting measures associated with fire management, and also would identify the cooperative roles and responsibilities of South Feather and the Forest Service in the investigation of fires on project lands.

Road Management

Some of the roads used to access project facilities for O&M purposes are Forest Service roads that are also used by the Forest Service for land management, and by the public for recreation.

The Forest Service specifies under Condition No. 28, that South Feather file with the Commission within 1 year of license issuance a road management plan that is

approved by the Forest Service. The Forest Service specifies that the road management plan should include: (1) identification of all Forest Service roads and unclassified roads on National Forest System lands needed for project access, including road numbers; (2) a map of all Forest Service Roads on National Forest System lands needed for project access, including digital spatial data accurate to within 40 feet, identification of each road by Forest Service road number; (3) a description of each Forest Service road segment and unclassified roads on Forest Service lands needed for project access, including termini; length; purpose and use; party responsible for maintenance; level of maintenance; structures accessed; location and status of gates and barricades, if any; ownership of road segment and underlying property; instrument of authorization for road use; and assessment of road condition; (4) provisions to consult with the Forest Service in advance of performing any road construction, realignment, or closure involving Forest Service roads or lands; and (5) preparation of a condition survey and a proposed maintenance plan subject to Forest Service approval annually beginning the first full year after the road management plan has been approved.

The Forest Service would require South Feather to obtain appropriate authorization (e.g., a special-use permit, road-use permit, or maintenance agreement) in accordance with the road management plan for use of all roads needed for project access. The plan would also identify South Feather's responsibility for road maintenance and repair costs commensurate with South Feather's use and project-induced use; specify road maintenance and management standards accepted by the Forest Service that provide for traffic safety; and minimize erosion and damage to natural resources.

Our Analysis

As specified by the Forest Service, the road management plan would improve road management throughout the project vicinity, protect natural resources, provide reasonable public access, clearly define maintenance responsibilities, assess road conditions, and enable an annual survey process. The road management plan would establish a forum for coordination of road maintenance activities between South Feather and the Forest Service and would identify South Feather's responsibilities for maintaining roads used for project O&M. In addition, the road management plan would identify measures to ensure that safety, maintenance, and rehabilitation measures associated with project roads are addressed in a consistent manner and so as not to adversely affect environmental resources.

Hazardous Materials

South Feather proposes to prepare, file, and implement a hazardous substance plan within 1 year of license issuance and at least 60 days before starting any activities the Forest Service determines to be of a land-disturbing nature on Forest Service land, file with the Commission a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup on Forest Service lands. At a

minimum, the plan would require South Feather to (1) maintain in the project area a cache of spill cleanup equipment suitable to contain any spill from the project; (2) 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 on Forest Service lands; and (3) inform the Forest Service immediately of the nature, time, date, location, and action taken for any spill on or affecting Forest Service lands.

Forest Service standard Condition No. 5 is consistent with South Feather's proposed hazardous substance plan, but includes an additional provision that South Feather provide an outline of its procedures for reporting and responding to releases of hazardous substances, including names and phone numbers of all emergency response personnel and their assigned responsibilities. Forest Service standard Condition No. 5 requires South Feather to obtain written approval of planned uses of pesticides, and South Feather must describe whether pesticide applications are essential for use on National Forest System lands, specific locations of use, specific herbicides proposed for use, application rates, dose and exposure rates, safety risk and timeframes for application. Exceptions to this schedule may be allowed only when unexpected outbreaks of pests require control measures that were not anticipated at the time the report was submitted. In such an instance, an emergency request and approval may be made. The condition also specifies that pesticide use must be excluded from National Forest System lands within 500 feet of known locations of California red-legged frog, mountain yellow-legged frog, or foothill yellow-legged frog.

Our Analysis

Preparation and implementation of a hazardous substance plan would help to ensure that spills of hazardous substances are promptly contained and cleaned up and minimize the potential extent of adverse environmental effects. Provision of an outline of its procedures for reporting and responding to releases of hazardous substances would facilitate coordination of control efforts in the event of a hazardous substance spill. The requirement to obtain Forest Service approval of any pesticide use would help to ensure that sensitive resources on National Forest System lands are protected.

Aesthetic Resources

Little Grass Valley Reservoir Levels

Project operation includes drawdown of reservoir elevations. Such drawdown can affect the visual quality of the reservoir and adjacent project lands.

South Feather proposes to maintain the water level at Little Grass Valley reservoir no lower than 5,022 feet msl through September 15 in all water years, except Dry water years; and in Dry water years to maintain Little Grass Valley reservoir as high as possible through Labor Day weekend.

The public submitted several letters, including a petition with more than 100 signatures, expressing concerns regarding elevations at Little Grass Valley reservoir mainly relating to recreation resources, but also pertaining to land use and aesthetic resources (see also section 3.3.5, *Recreation Resources*). Public concerns related to land use and aesthetic resources include damage to scenic views, and decrease in overall value of property around Little Grass Valley reservoir. An area of particular concern of the public is the potential additional and extended dewatering of the Pancake Bay area under the proposed project operation and related adverse effects on the aesthetic experiences currently provided in this portion of the reservoir.

Our Analysis

Under the proposed action, South Feather would maintain Little Grass Valley reservoir under existing conditions; however, drawdown at the reservoir would occur starting in mid-September rather than late-September, and during Dry years, in which the reservoir level would be maintained as high as possible through Labor Day.

Various individuals stated concerns regarding the potentially lower water surface elevations at Pancake Bay. South Feather conducted an assessment of the incidence and period of the inundation of Pancake Bay under (1) existing (no-action) conditions; (2) South Feather's alternative 4(e) condition; and (3) the Forest Service preliminary 4(e) condition/Cal Fish & Game's recommended flow regime, as further discussed in section 3.3.5, *Recreation Resources*. According to this assessment, under Below Normal water years the number of days where inundation would occur would be reduced by 4 days under the Forest Service/Cal Fish & Game flow regime; and reduced by about 2 days under South Feather's alternative 4(e) condition flows. Under Dry water years, the area would not be inundated under the Forest Service/Cal Fish & Game flow regime and the number of days where inundation would occur would be reduced by about 15 days under South Feather's alternative 4(e) condition, compared to existing conditions. The Forest Service modified the flows that it specified for the Little Grass Valley dam reach in its final 4(e) conditions filed on March 6, 2009. The flows specified in the final 4(e) condition for Below Normal and Dry years are reduced from the flows specified in the preliminary 4(e) condition, and average annual minimum flows in these water year types fall about mid-way between flows in South Feather's alternative 4(e) condition and flows recommended by Cal Fish & Game, so effects on water levels would fall about mid-way between the effects of the other two flow regimes.

Therefore, there could be short-term increased reduction in reservoir elevations, specifically in Below Normal water years, which would result in some potential minor adverse aesthetic effects due to longer duration of exposed shoreline areas, particularly in the more gentle sloping area of Pancake Bay. However, South Feather's alternative 4(e) condition (adopted in the staff alternative) would result in only an estimated 2 additional days when such lower elevation conditions would occur during Below Normal water years. Therefore, the reservoir area would continue to meet the retention

VQO management objective because these short-term periods of reservoir elevation drawdowns (with resultant exposed shoreline areas) already occur under existing conditions, and therefore, would not likely significantly alter the visual landscape.

Visual Management Plan

Aesthetic resources can be affected by project facilities and operation. Recreation facilities and project facilities, such as project powerhouses and substation facilities, can dominate views, creating contrast with the natural landscape.

The Forest Service specifies under Condition No. 27 that South Feather file a visual management plan 60 days prior to any ground-disturbing activity on National Forest System lands. The plan would address clearing, spoil piles, and project facilities such as diversion structures, penstocks, pipes, ditches, powerhouses, other buildings, transmission lines, corridors, and access roads; facility configuration, alignment, building materials, colors, landscaping, and screening; proposed mitigation and implementation schedule necessary to bring project facilities into compliance with LRMP direction; locating road spoil piles either in approved areas on National Forest System lands or to a location off Forest Service administered lands; removal of all visible non-native materials, including construction debris from pile surfaces on National Forest System lands; and stabilization and revegetation of all native material allowed to be left on National Forest System lands, including compliance with VQOs.

Our Analysis

The development and implementation of a visual resource protection plan, prior to ground-disturbing activities on project lands located within the Plumas National Forest would help to ensure such activities would not adversely affect aesthetic resources within the Plumas National Forest. South Feather proposes rehabilitation and replacement measures to most of the recreation areas on Little Grass Valley and Sly Creek reservoirs (see section 3.3.5, *Recreation Resources*). The visual resource protection plan would help to ensure that the enhancements at the recreation sites would be consistent with the management directions of the Plumas National Forest LRMP.

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, and the existing trout populations would not be enhanced as a result of increased minimum flows. The continued operation of existing South Feather facilities would continue to be of importance to water supply, recreation, generation of renewable energy, and minimization of atmospheric pollutants. The continued operation of the existing facilities under the no-action alternative would, on average, result in the annual generation of 498,472 MWh of clean energy.

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**Federal Energy
Regulatory
Commission**

**Office of
Energy
Projects**

June 2009

FERC/EIS-0225F

Final Environmental Impact Statement

SECTION 3 - ENVIRONMENTAL ANALYSIS



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

3.0 ENVIRONMENTAL ANALYSIS

In this section, we first describe the general environmental setting in the project vicinity and any environmental resources that could be cumulatively affected by relicensing the South Feather Power Project. Then, we address each affected environmental resource. For each resource, we first describe the affected environment—the existing condition and the baseline against which to measure the effects of the proposed project and any alternative actions—and then the environmental effects of the proposed project, including the proposed measures discussed in section 2.2.3. Unless otherwise identified, the source of our information is the license application for the project (South Feather, 2007). We provide citations for information obtained from other sources, including subsequent filings related to the project.

3.1 GENERAL SETTING

The project is located in the Sierra Nevada Mountain Range in northern California within Butte, Plumas, and Yuba counties and the Plumas National Forest. The project area originates at Little Grass Valley reservoir and occupies the SFFR canyon to its confluence with Lake Oroville. The project area also includes Lost Creek from Sly Creek reservoir to the confluence with the SFFR, and Slate Creek, a tributary to the North Yuba River, from Slate Creek diversion dam to the confluence with the North Yuba River. The maximum elevation of the project area is about 5,047 feet msl, the normal maximum water surface elevation of Little Grass Valley reservoir. In general, the area surrounding the project can be characterized as primitive, except at the lowest elevations, which is rural.

The project area experiences mild, dry summers and cool winters with significant snowfall in the higher elevations (above 4,000 feet msl) and extensive rain in the lower elevations. Since January 1935, the National Weather Service has maintained a monitoring station (Number 048606) about 0.5 mile southeast of the community of Strawberry Valley, just south of Sly Creek and Lost Creek reservoirs. The station is at an elevation of 3,808 feet msl, which is above the mid elevation of the project area. July air temperatures at Strawberry Valley range from an average maximum high of 84.3 degrees Fahrenheit (°F) to an average minimum low of 52.1°F. The average maximum temperature for January is 48.5°F while the average minimum temperature is 29.5°F. The annual average maximum and minimum temperatures for Strawberry Valley are 64.7°F and 39.3°F, respectively. Annual mean total precipitation at Strawberry Valley is 82.25 inches, most (67.5 percent) of which falls as snow from December through March.

The summer months only produce three percent of the total annual average precipitation. Spring and fall bring the remaining 29.5 percent of the precipitation to the area. Wind flow is generally moderate and from the west, causing air to rise as it passes over the Sierra Nevada.

The project lies in the northern portion of the Sierra Nevada Mountain Range. The Sierra Nevada lies almost entirely within California, extending into Nevada only

along the eastern shore of Lake Tahoe. More than 400 miles long and 60 to 80 miles wide, the Sierra Nevada is the longest continuous mountain range in the contiguous United States. The northernmost point is located a few miles south of Mt. Lassen, the southernmost peak of the Cascade Range. The southern terminus of the Sierra Nevada is Tehachapi Pass. The Sierra Nevada is a massive, northwesterly trending tilted fault block with asymmetric flanks.

Drainage of the western slope is predominantly westward by numerous rivers. The western slope of the Plumas National Forest drains southwesterly almost entirely into the Feather River. To the north of the Feather River drainage, on which the project is located, is the Lassen National Forest, which contains numerous smaller watersheds that drain directly into the Sacramento River. The Yuba River is the first major drainage to the south. The headwaters of these rivers, like those of the Feather River, are from snowpack in the glacially carved terrain.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (50 CFR §1508.7), an action may cause cumulative impacts on the environment if its impacts overlap in space or time with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time, including hydropower and other land and water development activities.

Based on information in the license applications, agency comments, other filings related to the project, and preliminary staff analysis, we identified the following resources that have the potential to be cumulatively affected by the continued operation of the South Feather Power Project, in combination with other activities: water quality, water quantity, and aquatic resources.

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. Because the proposed action would affect resources differently, the geographic scope for each resource may vary. For most fisheries and water resources, the geographic scope would extend from the headwaters of the SFFR, Lost Creek, and Slate Creek to the point downstream where the SFFR flows into Lake Oroville.

3.2.2 Temporal Scope

The temporal scope of our cumulative analysis in the EIS will include past, present, and future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope will look 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions.

The historical discussion will, by necessity, be limited to the amount of available information for each resource.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

Geologic Setting

The South Feather Power Project is located on the western slopes of the Sierra Nevada Mountain Range in northern California. The entire Sierra Nevada Mountain Range is about 400 miles long and runs south-southeast to north-northwest in the eastern portion of the state. Following a tilted fault block, the mountain range is experiencing uplifting along its eastern slopes; the average angle of the eastern slopes is about 25 degrees. This steep angle and uplift comes from sporadic seismic activity that has been building the mountain peaks to as high as 14,000 feet for the past 200 million years. Low levels of seismic activity currently continue in the watershed region along the main fault block and various smaller faults throughout the mountain range, and recent notable earthquakes have been centered in the Oroville area near the western portion of the SFFR watershed.

In contrast, the western slopes have an average angle of only 2 degrees, due to erosion and sediment transport from runoff traveling away from the fault block during the same period of time. Pleistocene-age glaciers carved deep canyons in the slopes, creating paths for waterways to travel westward. Multiple rivers and watersheds stem from snowpack in the higher mountain areas all along the western side of the mountain range, including the SFFR watershed. In this watershed, the average depth of the canyons that carry snowpack runoff is 1,000 feet.

Before uplifting in the area began, sedimentary depositions were the primary type of rock in the area. These rocks now exist as roof pendants in the region, consisting of quartzite, schist, marble, and other metamorphic rocks. The dominant underlying types of rock now include quartz monzonite, granite, and granodiorite. In the SFFR watershed, exfoliating massive granite exists as bedrock and is frequently exposed in the canyons and reservoir basins. The deep canyons and streambeds are also characterized by weathered bedrock as rock fragments, boulders, and cobble. Outside of the canyons and reservoir shorelines, terrain is generally broad and gently sloping with mostly tree vegetation. As flow travels westward through the project area, the terrain flattens significantly after passing Lake Oroville, where the watershed enters the relatively wide open Sacramento Valley.

Reservoir Shorelines

The majority of reservoir shorelines in the watershed are composed of bedrock, sand, and rock fragments up to the high-water surface elevations of the reservoirs. Water lines are visible along bedrock shorelines in many of the reservoirs when water levels are lowered, reflecting the various stages of operation in the reservoirs. Above the high-water line, tree vegetation dominates the shorelines and the landscape, much of which is evergreen. Similar vegetation also exists on rock outcroppings that form small islands in some of the reservoirs.

Miners Ranch reservoir differs in character from the other reservoirs; it is located closer to the wide open Sacramento Valley. Its shorelines are flatter and are characterized above the high-water surface elevation by shrub or grassy vegetation in an arid landscape. Substrate within the reservoir includes silt deposition and algae, in contrast to the rocky substrate generally found elsewhere in the watershed.

Reservoirs throughout the watershed are generally not considered to be at risk of shoreline erosion, because they are made up of bedrock and/or have gently sloping shorelines. A shoreline erosion study was conducted in 2004, because South Feather and the Forest Service identified sensitive reservoir resources that might be affected by shoreline erosion in Little Grass Valley and Sly Creek reservoirs. At the conclusion of the shoreline erosion study, all parties agreed that shoreline erosion was negligible, the potential for future erosion was small, and the specific resources of concern were not at risk due to shoreline stability and/or setback from the high-water shoreline. In a few isolated areas throughout the project, trees have fallen into the reservoirs to indicate that root structures may have been undermined, but these occurrences are infrequent. Shorelines are considered stable on all of the operating reservoirs. Residences exist along some of the shorelines, particularly in more gently-sloping areas, and unpaved roads and trails also run alongside the reservoirs in some areas. These unprotected areas have the potential to contribute sediment from surface erosion, although their surface area is negligible in comparison to the size of the watershed.

Alluvial deposits have accumulated in the reservoirs since operation began. These deposits are limited to deeper areas of the pools and are particularly concentrated near the dams and occasionally at inflow areas. South Feather studies show that all project reservoirs trap sediment at a denudation rate of less than 1 millimeter per year. Little Grass Valley reservoir accumulates the most sediment volume since it is the farthest upstream reservoir in the watershed, has one of the largest drainage areas, and has no upstream dams.

Mass wasting has occurred in limited areas associated with the project, such as areas where fill was placed or project features altered the path of runoff. For example, concentrated flow at the base of Lost Creek dam has caused a gully to develop and contribute sediment to the channels and reservoirs within the watershed. Mass wasting areas are also apparent that are not a result of project features. Some of the activity of

these features is suspended and some is active; however, mass wasting generally contributes more sediment to project waterways than surface erosion.

Project Reaches

Upstream of Ponderosa reservoir, stream channels in the project are generally carved into steep canyons that reach average depths of 1,000 feet and are frequently characterized by exposed bedrock. Peak streamflows, which typically occur from snowfall runoff, continue to carve the streambeds into bedrock, and channel substrate generally consists of gravel, boulders, bedrock, and various sizes of rock fragments. Channel gradients are also relatively steep, up to 10 percent in some localized areas. The steep gradients create fast-moving flow with waterfalls occurring in places, especially in tributaries that enter the reaches within the canyons or groundwater that emanates from canyon walls. Pooling does occur in some areas where boulders or fallen rocks have altered the course of the waterway, or where average gradient in a local area is as low as 1 percent.

The reaches upstream of Ponderosa reservoir are virtually all transport reaches, as channel substrate and gradient generally do not facilitate sediment deposition. Alluvial deposition does occur in the few areas where pools are present, and although sandbars are rare, vegetation encroaches where sandbars form or where streambanks are not as steep and sediment has accumulated. This is particularly true at diversion dams, where deposition and the resulting vegetative growth significantly change channel characteristics immediately upstream of the dams. Woody debris is also present and collects where stream gradients become flatter or obstructions prevent it from being transported further down the reaches. South Feather has studied LWD and found that it only influences channel morphology in localized areas within the project.

Downstream of Ponderosa reservoir, channel gradients are flatter as streamflow enters the human-made Miners Ranch tunnel and canal. The concrete-lined canal does not generally exhibit natural geomorphic changes, but does sustain some variable sediment deposition in the channel area as water flow changes with operation.

3.3.1.2 Environmental Effects

Continued operation of the South Feather Power Project could affect geology and soils in the watershed by affecting streamflow, sediment transport, and geomorphic characteristics of the stream channel. Because South Feather does not propose any changes in project operation that would have a substantial effect on geology and soils in the watershed, the proposed license measures are limited to addressing issues that have been observed during project operation in the current term of the license. Observed issues include erosion from bare surfaces, rockfalls, and mass wasting; reservoir sedimentation, effects on sediment supply, yield, and trapping; transport and trapping of LWD; impacts of fine sediment deposition in Lost Creek; and the trapping and passage of accumulated sediment at the Slate Creek diversion dam.

Continued operation of the project may influence the rate of erosion in the watershed and the trapping of sediment in project reservoirs. However, studies have shown that the few areas undergoing various forms of erosion are not substantial, and are not considered at risk during the term of a proposed new license. The accumulation of sediment in reservoirs since operation began is also considered unsubstantial, and is not expected to accelerate during the term of a proposed new license. Therefore, South Feather has not proposed any measures with regard to effects of project operation on erosion or reservoir sedimentation. South Feather proposes measures to address LWD, the accumulation of fine sediment in Lost Creek, measures to pass sediment through the Slate Creek diversion, and erosion and sediment control measures that are needed during construction of proposed recreational facilities.

Large Woody Debris

Much of the steep and confined channel network in the project area offers limited opportunity for LWD retention and associated long-term sediment storage within the bankfull channel perimeter. However, LWD may be retained locally in relatively lower gradient channel reaches that have reduced wood and sediment transport capacities or where valley and/or channel width narrows. In these locations, LWD may play a relatively important role in creating and maintaining aquatic habitat diversity.

LWD accumulates in project reservoirs during high flow events, and South Feather generally removes and burns LWD after flood events or when it affects project resources. Because LWD can benefit fish habitat, South Feather proposes to make a reasonable effort to annually return LWD that collects in the Little Grass Valley and Sly Creek reservoirs to the river below those structures. South Feather would allow LWD to pass through the Little Grass Valley, Sly Creek, and Lost Creek dam spillways during spill periods. If spills are not adequate to pass the LWD and South Feather collects the LWD from Little Grass Valley, Sly Creek, and Lost Creek reservoirs, it would consult with the Forest Service concerning alternative means and a schedule to return the LWD to the river.

Our Analysis

LWD contributes to productive aquatic ecosystems, and is an important component in the formation of complex aquatic habitat units and channel maintenance. LWD creates high flow velocity breaks and provides cover from predators, including trout. The velocity breaks created by LWD also retain and sort substrate to create gravel bars and spawning habitat for salmonids.

Although much of the steep and confined channel network in the project area offers limited opportunity for LWD retention, LWD may be retained locally in relatively lower gradient channel reaches that have reduced wood and sediment transport capacities or where valley and/or channel width narrows. Compared to reference reaches upstream of the impoundments, the number of LWD pieces per mile was considerably lower in the reaches downstream of Little Grass Valley dam on the SFFR and below Sly Creek dam

on Lost Creek. Passing LWD that accumulates in the Little Grass Valley and Sly Creek reservoirs to downstream reaches would increase the abundance of LWD in these reaches and provide a substantial benefit to trout habitat in areas where LWD is retained within the active stream channel.

Several factors suggest that the Slate Creek diversion dam does not reduce the abundance of LWD downstream of the diversion, including similar LWD size distributions observed in the reservoir and downstream study sites, indicating that LWD is effectively transported over the diversion dam during high flows, and the existence of a relatively large downstream source area capable of supplying LWD to the channel.

Lost Creek Geomorphic Flows

Lack of seasonal high flow events may contribute to the accumulation of fine sediment in spawning gravels, which may adversely affect trout spawning and incubation success and contribute to the encroachment of riparian vegetation into the stream channel. Sediment that originates from upstream watershed surface erosion, rockfalls, and mass wasting is generally retained behind structures, and sediment that originates in areas between structures is typically transported downstream in the channel reaches. Lost Creek, however, is a response reach that retains fine sediment that originates below Lost Creek dam, and this sediment may affect aquatic habitat.

To address these resource issues, South Feather proposes to provide supplemental streamflows to Lost Creek of at least 390 cfs for a continuous period of 24 hours, at least once every 4 water years. Supplemental streamflows would consist of controlled or uncontrolled spill over Lost Creek dam that would flush the reach of fine sediment.

Our Analysis

South Feather commissioned a study of Lost Creek in 1991 to evaluate the presence of fine sediment deposits and the flow levels necessary to mobilize streambed materials. The Forest Service identified specific objectives for high flows in the reach, and the current FERC license stipulates that minimum flow requirements be determined by conducting an instream flow study. The Forest Service identified two key objectives: (1) providing high flows to cleanse accumulated fine sediment from spawning gravels and (2) reducing the encroachment of riparian vegetation resulting from the accumulation of fine sediment.

The study concluded that supplemental streamflows would benefit habitat conditions in the reach and satisfy the Forest Service's objectives, so the existing license was amended to include flow releases. As a result, the current project license stipulates that flushing flows be released from Lost Creek dam at least once every 4 years. The flushing flows would be between 390 and 740 cfs, so that sediment fines are removed but gravel and cobble, that serve as spawning habitat, are mobilized only so far as to help displace accumulated fines. Larger flows might displace streambed material used for spawning. Study of the reach indicated that the fines were mobilized when the dam

spilled at least 390 cfs for at least 15 hours. South Feather proposes to continue flushing flows in Lost Creek by spilling flows of at least 390 cfs for 24 hours at least once every 4 years. Continuing periodic flushing would serve to enhance geomorphic characteristics in Lost Creek and protect aquatic habitat.

Sediment Pass-Through at Slate Creek

Accumulation of sediment upstream of the Slate Creek diversion dam interferes with operation of the low-level outlet used to release minimum instream flows, affects the operation of the diversion tunnel, and impedes the transport of spawning gravel into the reach downstream of the diversion. There are no dams upstream of the Slate Creek diversion that would affect sediment transport, so this diversion is particularly susceptible to sediment accumulation. During the current license term, the Slate Creek diversion dam was identified as a project structure where sediment collected to such a degree that operations and environmental conditions were adversely affected. Allowing sediment to continue to collect here would exacerbate those effects during the next license term.

South Feather is currently testing alternative methods of operation to facilitate the passage of sediment past the dam, and within 2 years of license issuance, proposes to file a report with the Commission that would describe the results of ongoing testing. A draft of the report would be provided to the Forest Service, the Corps, the Water Board, Cal Fish & Game, and any other appropriate resource agencies. The report would describe the objectives and results of the testing and proposed measures that would be implemented as part of the license, following approval by the Commission.

Our Analysis

Until 1986, Slate Creek diversion dam was operated to allow sediment to pass through a low-level outlet during high flows. This manner of operation maintained sediment transport processes and prevented accumulated sediment from affecting the operation of the minimum flow release and diversion structures. Past hydraulic mining upstream of the dam, and the breach of the upstream St. Louis debris dam in the 1950s, contributed to high delivery rates of aggraded sediment from the upstream reaches. The St. Louis debris dam is located about 1 mile upstream of Slate Creek diversion on land owned by the Forest Service.

Sediment pass-through activities were suspended from 1986 to 2002 because of resource agency concerns about effects on water quality from toxins that may have collected in the accumulated sediment. To determine if toxins had collected, sediment samples were evaluated for hazardous material content in various studies from 1994 to 2005. None of the studies identified hazardous concentrations of heavy metals, including mercury. Water quality was also studied upstream and downstream of the diversion, and hazardous levels of heavy metals or inorganic contaminants were not found, nor did the studies find low levels of dissolved oxygen or high turbidity. After a water quality monitoring plan was approved by regulatory agencies, South Feather attempted to resume sediment pass-through activities in 2002 under specific flow conditions, but it was

unsuccessful because of the armored sediment pile that had built up against the outlet's trashrack during the years in which sediment pass-through activities were suspended.

In 2005, 500 cubic yards of the accumulated sediment pile was removed by manual excavation. South Feather again attempted to resume sediment pass-through in 2006. Sediment was successfully passed through the structure, but testing was suspended because of concerns about abrasion damage to the diversion's outlet works. South Feather is currently testing new procedures to allow accumulated sediment to pass through Slate Creek diversion dam more frequently and in smaller volumes, and to time sediment pass-through to occur on the ascending limb of the hydrograph during storm events, so that both coarse and fine materials can be carried into the downstream reaches and enhance aquatic habitat. The Water Board reviewed these procedures and authorized an amended 401 water quality certificate on January 4, 2007, so that South Feather could test the new approach.

South Feather's proposal to file a report 2 years after new license issuance would allow the Commission to review the results of the current sediment pass-through efforts resumed in 2007. By then, it is expected that the new procedures would have been tested and the results documented, and any modifications would be proposed to the Commission. Continuing sediment pass-through and refining successful procedures would enhance downstream habitat by restoring sediment transport processes, and would improve the reliability of minimum flow releases and diversion operations by preventing further accumulation upstream of the dam.

Erosion and Sediment Control

Surface erosion and sediment runoff associated with construction activities could release sediment into project waterways and adversely affect environmental resources. South Feather proposes construction, including replacement or rehabilitation of project recreational facilities, which could lead to stream sedimentation, increased turbidity, and geomorphic effects if proper erosion and sediment control measures are not implemented as part of construction.

To minimize soil erosion and dust, and to protect water quality and minimize turbidity in streams and reservoirs, the Forest Service's Condition No. 8 would require South Feather to implement a soil erosion control and revegetation plan during construction of any facilities. South Feather would develop the plan for approval by the Forest Service, and then file it with the Commission at least 60 days before any construction disturbance or non-routine maintenance begins.

A complete plan would include drawings and descriptions of site conditions, proposed erosion and sediment control measures, proposed revegetation with native species, and a proposed monitoring and maintenance schedule. Appropriate control measures could include silt fence, sedimentation ponds, straw bales, diversion dikes or swales, and energy-dissipation structures. Proper implementation would prevent soils from exiting the construction area and entering undisturbed areas. Each site would be

stabilized when construction is complete, and proper post-construction monitoring would ensure that native species revegetate disturbed areas and that sediment does not mobilize via rills, wasting, or other means.

Our Analysis

Designing and implementing an appropriate soil erosion control and revegetation plan for construction activities would prevent the release of disturbed sediment into waterways, and therefore would prevent effects on water quality. Proper revegetation and post-construction monitoring would ensure that disturbed areas are restored with native species, and that gullying or other forms of erosion do not occur as a result of construction disturbance.

Although no measures are proposed to address reservoir sedimentation and the few areas of surface erosion (including mass wasting and rockfalls), studies, site visits, and discussions conclude that these issues do not present significant risk during the term of the proposed license. Alluvial sediments are likely to continue to be deposited in project reservoirs, and some erosion is likely to continue in a small number of areas. However, we conclude that reservoir sedimentation and erosion throughout the project do not require measures to be taken to prevent adverse effects on environmental resources, and no unavoidable adverse effects would result from proposed project operation.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

3.3.2.1.1 Water Quantity

Water Storage and Hydrology

The South Feather Power Project includes two major storage reservoirs and six smaller reservoirs and diversion pools with little or no seasonal storage capacity. Key characteristics of the five project reservoirs, including surface area, length, width, depth, fluctuation, and releases, are described below.

Little Grass Valley reservoir has a maximum surface area of 1,650 acres at full pool, is 3.45 miles long, has a maximum width of 4,611 feet, and a maximum depth of about 179 feet near the dam. In a typical year the reservoir surface elevation fluctuates by about 31 feet. Water is normally released into the SFFR via three low-level outlets and the dam spillway.

Sly Creek reservoir has a surface area of 619 acres at full pool, is about 2.52 miles long, has a maximum width of about 1,918 feet, and a maximum depth of about 241 feet near the dam. The reservoir shoreline is about 12.2 miles long. In a typical year, the reservoir water surface elevation fluctuates by about 102.5 feet. Water is normally

released into Lost Creek reservoir through the Sly Creek powerhouse or via the pressure relief valve that bypasses the powerhouse.

Lost Creek reservoir has a maximum a surface area of 137 acres at full pool, is about 1.46 miles long, has a maximum width of about 1,118 feet, and a maximum depth of about 99.5 feet near the dam. The reservoir shoreline length is about 5.75 miles. In a normal year, the reservoir water surface elevation fluctuates by about 14.6 feet. Water is normally released into Lost Creek through three low-level outlets or to the Woodleaf powerhouse on the SFFR through the Woodleaf power tunnel.

Ponderosa reservoir has a surface area of 103 acres at full pool, is about 1.7 miles long, has a maximum width of about 727 feet, and a maximum depth of about 130 feet near the dam. The reservoir shoreline is about 4.1 miles long. In a typical year, the reservoir water surface elevation fluctuates by about 11.5 feet. Water is conveyed from Ponderosa dam to the Miners Ranch reservoir via the Miners Ranch conduit; spills at the dam, when they occur, pass into Lake Oroville. There is also one low-level outlet that can be used to make releases into Lake Oroville.

Miners Ranch reservoir, which is located off-stream, has a surface area of 48 acres at full pool, is about 0.5 mile long, has a maximum width of about 932 feet, and a maximum depth of about 50 feet near the dam. The reservoir shoreline is about 1.8 miles long. In a typical normal water year,¹² the reservoir water surface elevation fluctuates by about 9.0 feet. Water is normally released into Bangor canal through the Miners Ranch dam low-level outlet, to the Miners Ranch treatment plant through a set of pumps, and to Kelly Ridge powerhouse through the Kelly Ridge power canal and tunnel.

Table 3-1 shows physical characteristics of each reservoir and diversion pool, and figure 3-1 shows seasonal trends in water storage in the major storage reservoirs. Figures 3-2 and 3-3 show annual variations in water levels at the two storage reservoirs, Little Grass Valley and Sly Creek, respectively. Tables 3-2 through 3-7 provide regulated and unregulated flow statistics for each of the four bypassed reaches. By removing the effects of changes in storage within the reservoirs, the unregulated flow statistics show an approximation of the inflows to each reservoir.

¹² Water year types (from water year DWR estimate of total unimpaired runoff type in the Feather River at Oroville in acre-feet) are defined as: Dry: less than or equal to 2,400,000; Below Normal: greater than 2,400,000 and less than 4,000,000; Above Normal: greater than or equal to 4,000,000 and less than Normal 7,100,000; and Wet: greater than or equal to 7,100,000.

Table 3-1. Reservoir and diversion pool characteristics. (Source: South Feather, 2007)

Dam	Elevation (feet)			Storage capacity (acre-feet)		
	Normal Maximum (msl)	Normal Minimum (msl)	Difference	Normal Maximum	Normal Minimum	Difference
Little Grass Valley reservoir	5,046	4,935.6	110.4	89,800	90	89,710
South Fork diversion pool	3,557	3,540.5	16.5	87	0	87
Slate Creek diversion pool	3,552	3,535	17	0 ^a	0	0
Sly Creek reservoir	3,527	3,377	150	64,338	5,678	58,660
Lost Creek reservoir	3,283	3,270	13	5,361	3,692	1669
Forbestown diversion pool	1,783	1,763	20	352	239	113
Ponderosa reservoir	960	947	13	4,177	2,534	1643
Miners Ranch reservoir	890	878	12	896	417	479

^a The Slate Creek diversion pool originally had a storage capacity of 643 acre-feet, but the impoundment's current storage capacity is negligible due to sedimentation.

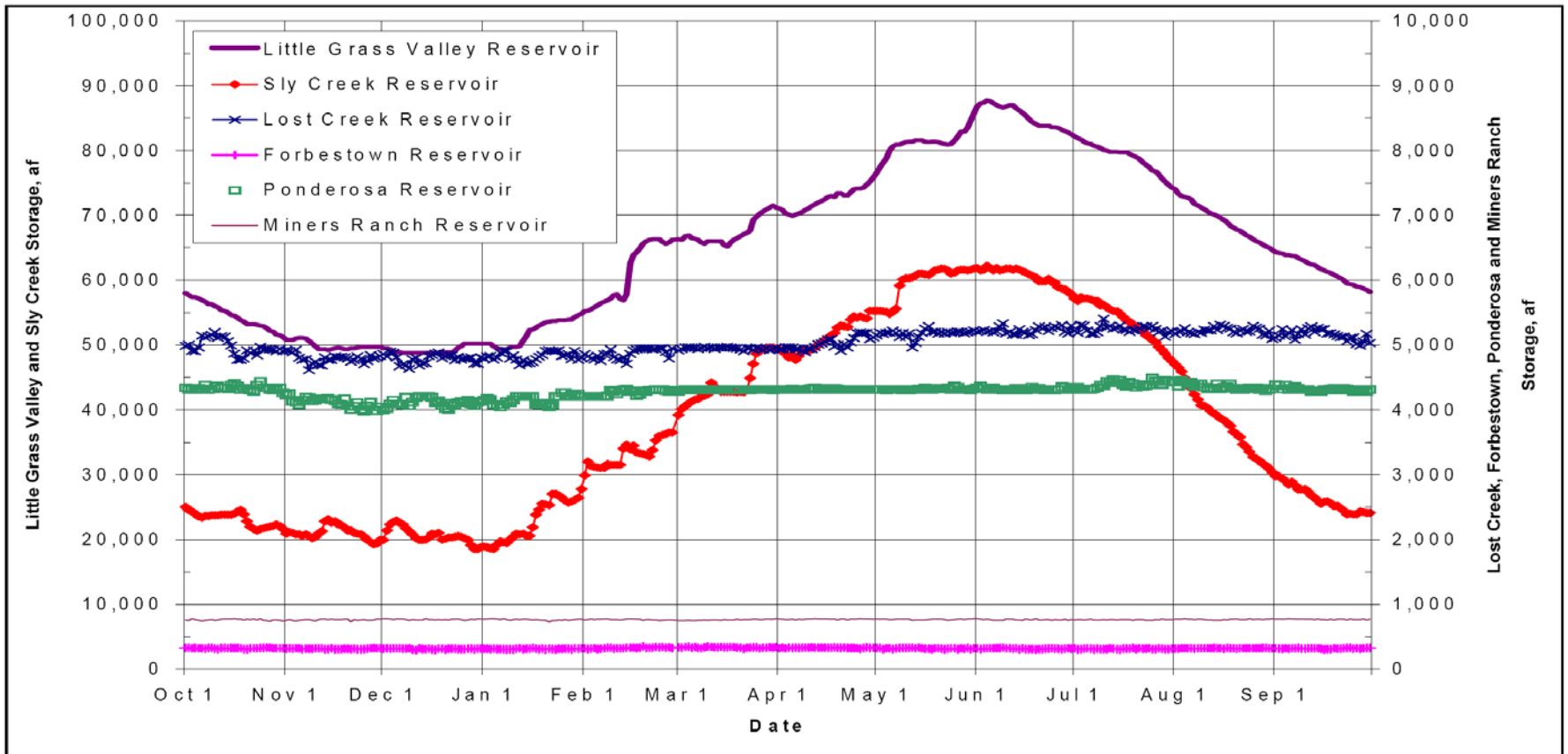


Figure 3-1. Median daily reservoir storage for South Fork Power Project reservoirs, 1973 through 2001. (Source: South Feather, 2007)

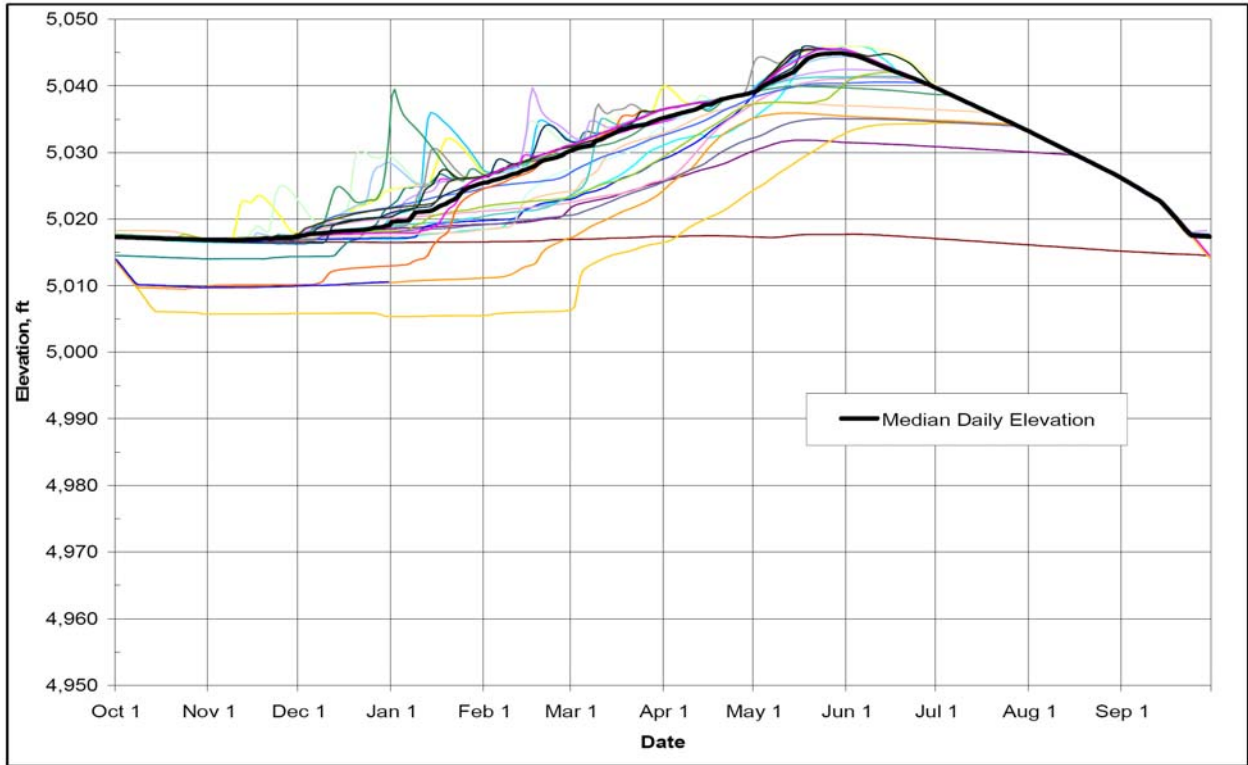


Figure 3-2. Little Grass Valley reservoir water surface elevations for 1973 through 2000. (Source: South Feather, 2007)

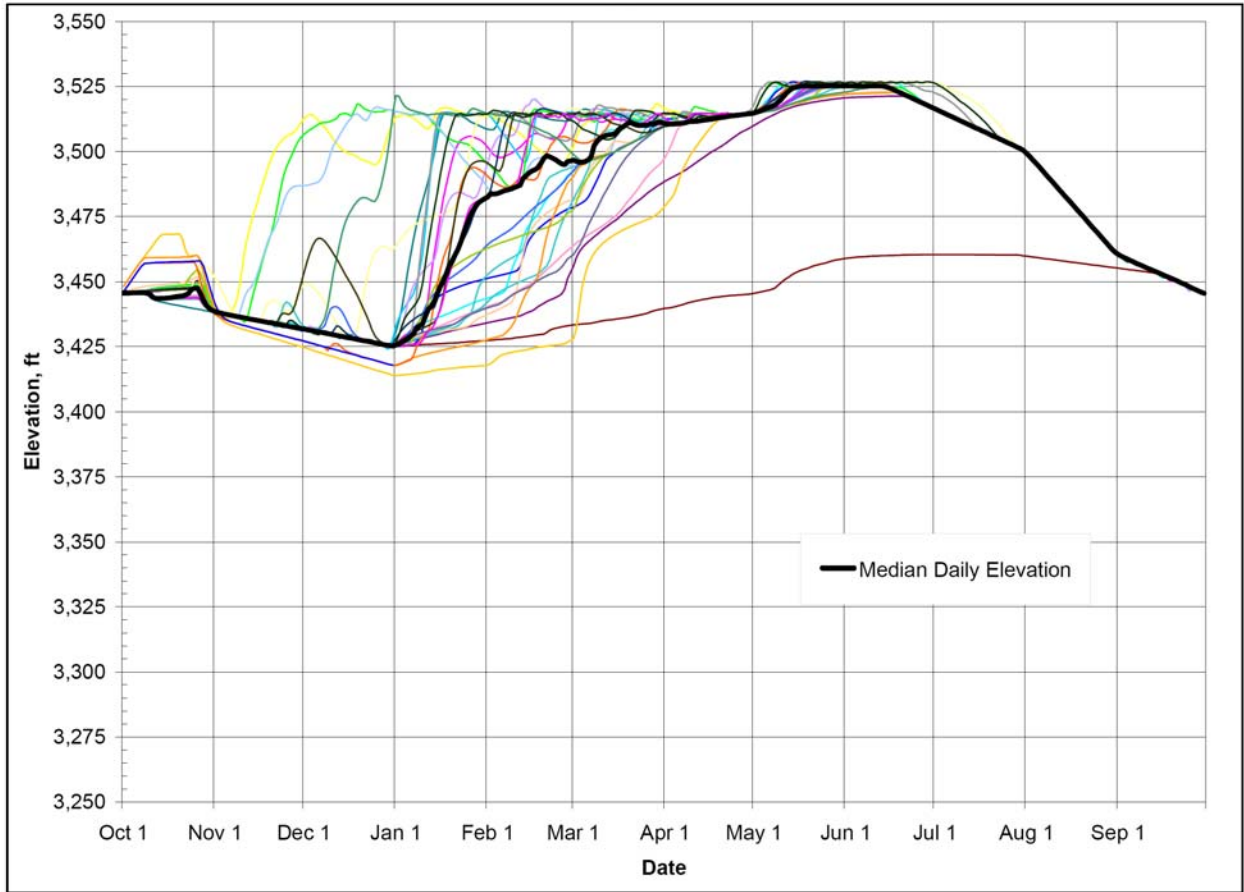


Figure 3-3. Sly Creek reservoir water surface elevations for 1973 through 2000.
 (Source: South Feather, 2007)

Table 3-2. Estimated unregulated streamflows below Little Grass Valley dam at USGS gage no. 11395030. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	13	65	109	168	182	220	224	251	107	20	7	7	114
Max.	524	2743	4319	7590	6680	3947	1593	2482	958	241	30	148	7590
Min.	3	2	2	4	6	7	9	15	3	2	2	2	2
90% Exc.	3	5	8	11	19	61	97	41	11	6	4	3	5
80% Exc.	4	6	11	17	31	84	130	65	15	7	4	4	6
50% Exc.	6	10	26	58	87	140	200	208	37	12	6	5	27
20% Exc.	11	49	116	205	218	261	308	410	156	23	9	7	177
10% Exc.	19	139	260	385	348	431	360	512	315	37	12	8	305

Table 3-3. Regulated streamflows below Little Grass Valley dam at USGS gage no. 11395030. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	100.1	89.2	71.3	86.3	103.6	114.7	91.1	133.8	103.9	109.0	124.9	151.9	106.6
Max.	484.0	1580.0	3510.0	5420.0	5200.0	1670.0	1040.0	2930.0	760.0	484.0	568.0	509.0	5420.0
Min.	4.2	2.2	2.2	1.9	1.9	1.8	3.2	2.5	3.9	3.2	3.2	5.7	1.8
90% Exc.	8.7	4.2	4.4	5.0	4.8	6.4	7.3	9.5	6.6	6.3	8.5	41.0	6.0
80% Exc.	13.0	5.3	6.4	7.6	7.2	9.2	8.5	12.0	9.3	11.0	13.0	55.0	9.3
50% Exc.	81.0	55.0	12.0	13.0	14.0	21.0	20.0	29.0	54.0	101.0	117.0	118.0	54.0
20% Exc.	175.0	167.0	129.0	164.0	182.0	199.0	208.0	230.0	167.0	199.0	205.0	238.0	193.0
10% Exc.	198.0	223.0	236.0	216.0	244.2	261.0	254.0	353.0	307.0	236.0	240.2	302.0	251.0

Table 3-4. Estimated unregulated streamflows below Slate Creek diversion dam at USGS gage no. 11443300. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	24	123	209	328	371	462	390	370	152	36	14	12	207
Max.	1000	5232	7720	12100	10583	5466	5486	4734	984	400	58	283	12100
Min.	5	5	5	7	11	18	18	28	6	4	3	3	3
90% Exc.	6	10	15	21	35	127	144	63	20	11	7	6	9
80% Exc.	8	11	22	33	61	175	192	100	28	13	8	7	12
50% Exc.	11	20	49	107	180	309	331	284	66	22	12	10	50
20% Exc.	20	93	221	396	442	553	543	601	226	43	18	14	314
10% Exc.	36	264	500	759	779	866	669	802	425	70	22	16	530

Table 3-5. Regulated streamflows below Slate Creek diversion dam at USGS gage no. 11443300. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	15	62	132	196	220	245	183	165	42	12	11	10	107
Max.	668	4650	7710	12100	10500	5370	5350	3890	984	36	33	53	12100
Min.	5	5	1	6	1	4	7	6	6	3	3	3	1
90% Exc.	6	8	9	9	9	10	11	10	10	9	7	6	8
80% Exc.	8	10	10	11	11	11	11	11	11	10	8	7	10
50% Exc.	10	11	11	12	12	19	13	12	11	11	11	10	11
20% Exc.	13	15	19	169	236	362	410	341	16	12	13	12	25
10% Exc.	16	54	261	455	502	615	567	572	33	16	14	14	291

Table 3-6. Estimated unregulated streamflows below Lost Creek dam at gage no. 11396000. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	12	48	89	139	158	193	137	97	45	17	8	7	79
Max.	247	1271	3751	5879	3856	2259	1666	862	202	120	30	137	5879
Min.	3	3	3	4	6	9	9	9	4	2	2	2	2
90% Exc.	4	6	9	12	19	42	35	29	12	7	4	4	6
80% Exc.	5	7	12	18	30	73	53	37	16	8	5	4	7
50% Exc.	7	11	26	55	90	144	121	71	33	13	7	6	26
20% Exc.	11	49	100	190	203	250	196	150	70	24	11	8	119
10% Exc.	18	113	190	316	341	365	253	208	97	34	13	10	196

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Table 3-7. Regulated streamflows below Lost Creek dam at gage no. 11396000. (Source: Staff, based on flow data from license application for water years 1973 to 2001)

Statistic	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Yearly
Mean	4	3	48	52	96	103	57	43	45	4	4	5	38
Max.	100	44	2650	4490	3300	2250	1410	1530	954	170	15	218	4490
Min.	0	0	0	0	0	0	0	0	0	0	0	0	0
90% Exc.	1	0	0	1	1	1	1	1	1	1	1	1	1
80% Exc.	1	1	1	1	1	1	1	1	1	1	1	1	1
50% Exc.	2	3	3	4	4	4	6	5	5	5	5	5	4
20% Exc.	5	4	5	6	20	189	9	9	8	6	6	6	7
10% Exc.	8	6	6	74	316	351	293	86	10	9	9	9	11

Consumptive Use

South Feather's Miners Ranch water treatment plant, located on the northwest side of Miners Ranch reservoir, was constructed and placed into service in 1981. It draws water directly from the Miners Ranch reservoir immediately upstream from the inlet to the Kelly Ridge tunnel. Average annual withdrawals total 5,768 acre-feet, with the months of May through September constituting the peak delivery season. The Miners Ranch treatment plant has the capacity to deliver 14.5 million gallons per day (MGD), about 22.4 cfs. The average daily demand is 5.3 MGD (about 8.2 cfs).

South Feather's Bangor canal, a non-project feature receiving water from Miners Ranch reservoir, serves irrigation water along the canal and the Bangor water treatment plant. This facility has an average daily demand of 0.018 MGD (about 0.03 cfs). With the addition of water supplied to irrigators, annual consumptive use on the Bangor canal averages 8,813 acre-feet.

South Feather's Palermo canal, a non-project feature, distributes an average of 7,340 acre-feet to customers from Oroville dam at a maximum rate of 40 cfs. The canal uses inflows from Sucker Run Creek and spilled flows from Ponderosa dam.

North Yuba Water District operates the Forbestown water treatment plant, which receives water from the project's Woodleaf power tunnel, delivered via South Feather's Forbestown ditch, a non-project feature. North Yuba Water District has a contractual right to request delivery of up to 3,700 acre-feet of water annually into the Forbestown ditch for its irrigation customers and for the Forbestown water treatment plant, and additional quantities of water can be taken into the Forbestown ditch, up to 15,500 acre-feet per calendar year, subject to reimbursement to the project for foregone power generation revenues.

3.3.2.1.2 Water Quality

Like many other headwater streams of the Sierra Nevada, tributaries of the SFFR generally have excellent water quality. Below Little Grass Valley reservoir, the SFFR gains water as it flows downstream and is joined by Bear, Lost, and Oroleve creeks before flowing into Ponderosa reservoir. With the possible exception of legacy contamination from historic gold mining activities, contaminants responsible for lower water quality are generally associated with agricultural activities and residential areas that primarily occur outside the project area and in lower elevation areas.

Water Quality Standards

The Central Valley Regional Water Quality Control Board (CVRWQCB) adopted a basin plan in 1994, which was revised in 1998 and 2001, for the Sacramento River and its tributaries. The basin plan formally designates existing and potential beneficial uses and water quality objectives. No modification to the basin plan has been specifically developed for the SFFR within the project area.

The basin plan designates beneficial uses for Lake Oroville and the mainstem of the Feather River from the fish barrier dam to the Sacramento River. Because Lake Oroville is a large surface water impoundment and includes no riverine sections, the Water Board stated in its October 25, 2006, comments on South Feather's draft license application that it is more appropriate to apply to the SFFR the uses for the Feather River from the fish barrier dam to the Sacramento River. The beneficial uses of the Feather River from the fish barrier dam to the Sacramento River are municipal and domestic supply, irrigation, water contact recreation and canoeing and rafting, other non-contact water recreation, warm freshwater habitat, cold freshwater habitat, migration and spawning of coldwater aquatic organisms, and wildlife habitat. In addition, the Water Board indicates that hydropower generation is an existing beneficial use and should also apply to the SFFR. Table 3-8 lists water quality objectives specified in the basin plan to protect these beneficial uses.

No sections of the SFFR, Lost Creek, or Slate Creek in the vicinity of the project are included on the most recent California 303(d) list and Total Maximum Daily Load (TMDL) priority schedule.

Monitoring studies conducted by South Feather found minor exceedances of water quality objectives for several constituents, but no adverse effects on beneficial uses. The observed exceedances are summarized as follows.

Chemical Constituents. With the exception of one unexpectedly high arsenic value in the Slate Creek diversion dam reach, human health based criteria were not exceeded during 2004. Low levels of other inorganic and trace metal constituents in samples collected throughout the study area demonstrate generally high water quality typical of many snow-melt fed river systems of the Sierra Nevada.

Dissolved Oxygen. Periods of hypoxia occur seasonally in the deeper portions of Little Grass Valley, Ponderosa, and Lost Creek reservoirs. However, metalimnetic, epilimnetic and downstream dissolved oxygen levels remained above the 7 mg/L standard at all times, and the observed periods of anoxia in deeper portions of these reservoirs had no apparent effect on beneficial uses.

Tastes and Odor. Periods of anoxia in project reservoirs may be associated with releases of taste and odor compounds such as iron and manganese. Iron and manganese exceeded secondary maximum contaminant levels (MCLs) upstream of Ponderosa reservoir and downstream of the Slate Creek diversion dam in August 2004. Sampling showed iron concentrations up to three times higher in the hypolimnion than in the epilimnion of Ponderosa reservoir, suggesting that anoxic conditions in Ponderosa reservoir may alter oxidation/reduction conditions sufficiently to affect downstream levels of these constituents. However, given no history of taste and odor complaints from municipal water users, these effects appear to be minor.

Table 3-8. Water quality objectives to support designated uses in SFFR in the project area. (Source: CVRWQCB, 1998)

Water Quality Objective	Description
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.
Biostimulatory Substances	Water shall not contain biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Specific trace element levels are given for certain surface waters, none of which include the waters in the vicinity of the Project. Electrical conductivity (at 25°C) shall not exceed 150 micromhos/cm (90 percentile) in well-mixed waters of the Feather River from the Fish Barrier dam at Oroville to Sacramento River. 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.
Color	Water shall be free of discoloration that causes a nuisance or adversely affects beneficial uses.
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. Specific dissolved oxygen water quality objectives below Oroville dam are 8.0 mg/L from September 1 to May 31, for Feather River from Fish Barrier Dam at Oroville to Honcut Creek. When natural conditions lower dissolved oxygen below this level, the concentrations shall be maintained at or above 95 percent of saturation.
Floating Material	Water shall not contain floating material in amounts that cause a nuisance or adversely affect beneficial uses.

Water Quality Objective	Description
Oil and Grease	Water shall not contain oils, greases, waxes or other material in concentrations that cause a 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.
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.
Pesticides	Waters shall not contain pesticides or a combination of pesticides in concentrations that adversely affect beneficial uses. Other limits established as well.
Radioactivity	Radionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.
Sediment	The suspended sediment load and suspended-sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes a nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.
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.
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 temperature does not adversely affect beneficial uses. Increases in water temperatures must be less than 2.8°C above natural receiving-water temperature.

Water Quality Objective	Description
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analysis indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests as specified by the Regional Water Quality Control Board.
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.

Toxicity. In addition to an unexpectedly high arsenic level found in Slate Creek during an October 2004 storm event, the low levels of alkalinity and hardness found throughout the study area act to increase the toxicity of other trace metals, including lead; concentrations of which were slightly in excess of California Toxics Rule (CTR) criteria in Sly Creek and Little Grass Valley reservoirs. Lead was also found above the detection limit and Criterion Continuous Concentrations (CCC) criteria in Little Grass Valley reservoir following a storm event in October 2004, with measured levels at downstream locations in the Little Grass Valley dam, South Fork diversion dam, and SFFR/Lost Creek reaches above CCC criteria, but below the laboratory detection limit. With the exception of one additional sample in excess of CTR 1-hour criteria for silver at the Forbestown diversion dam in August 2004, low levels of other inorganic and trace metal constituents in samples collected throughout the study area do not exceed CTR criteria and are consistent with the generally high water quality typical of snow-melt fed river systems of the Sierra Nevada. Although results indicate that consistent low-level exceedances of lead criteria occur in Sly Creek reservoir and potential associations with stormwater runoff at other locations, no connection to project O&M is evident.

Water Temperature. Because the basin plan does not provide a numerical temperature water quality objective other than limitation of warming to less than 5°F (2.8°C) that is applicable to hydroelectric project relicensing, South Feather assumed that the cold freshwater habitat beneficial use was considered to be supported if the mean daily water temperature remained below 20°C, which is generally considered to be near the upper limit of the optimal temperature range for rainbow trout. Moyle (2002) states that the optimal temperatures for growth of rainbow trout are around 15 to 18°C, and Behnke (1992) reports that other fish species may gain a competitive advantage over trout as water temperatures approach 21°C. Although warmwater fish typical of

transition zone or Sierran foothill fish assemblages (e.g., Sacramento pikeminnow, sucker, and hardhead) can abide warmer waters (25 to >30°C), these species are fairly tolerant of a wide temperature range and can experience optimum growth temperatures that overlap with those of more typical coldwater fish (e.g., trout). Most streams in which hardhead occur have summer temperatures in excess of 20°C, and optimal temperatures appear to be between 17 and 28°C (Moyle, 2002). As the basin plan does not specify numerical limits for the warm freshwater habitat beneficial use, the presence of warmwater tolerant species (e.g., hardhead) was used to determine whether the basin plan's warmwater beneficial use designation could be appropriately applied to a given reach or subreach.

Cold supporting reaches. Daily mean water temperatures in the Little Grass Valley dam reach did not exceed 20°C at any time. Although the South Fork diversion dam reach did exceed the 20°C threshold at the most downstream site, exceedances were rare and the maximum daily mean water temperature was not far above the 20°C threshold. Similarly, although the two sites in the SFFR/Lost Creek reach had mean daily water temperatures that exceeded 20°C for a combined total of 6, 13, and 9 days in July 2004, 2005, and 2006, respectively, the maximum daily mean water temperature measured was only 21.5°C. In the Lost Creek dam reach, only one daily mean water temperature measured higher than 20°C over the 2004 to 2006 study period (20.3°C) in July 2005, just upstream of the confluence with the SFFR. Because of the short duration of temperatures in excess of 20°C, these reaches were considered supportive of basin plan designated beneficial uses related to cold freshwater habitat.

Warm supporting reaches. Exceedances of 20°C mean daily water temperature objectives occurred in June through August in each year of monitoring throughout the length of the Forbestown diversion dam reach below the migration barrier waterfall at SFFR RM 3. However, the observed temperature exceedances are not necessarily an indication of project-related impairments. The Forbestown diversion dam reach is located at elevations 981 to 1,703 feet msl, corresponding to the lower Sierra Nevada foothills transition zone. The typical historic (unregulated) hydrograph of the Sierra Nevada Range was snowmelt driven, with mid- to late summer months in the foothills transition zone supporting low flows and warmer water temperatures. Without the influence of cold hypolimnetic releases from Little Grass Valley, Sly Creek, and Lost Creek reservoirs, the Forbestown diversion dam reach most likely did not provide water temperatures at or below 20°C in this reach during the mid to late summer.

Non-supporting reaches. Over the entire Slate Creek diversion dam reach, exceedances of 20°C mean daily water temperatures occurred from June through September. Review of Slate Creek diversion flows over the 29 years of record indicate that diversions are typically discontinued by mid-June in Dry water year types, prior to increases in water temperatures above the 20°C threshold. However, in Normal and Wet water year types Slate Creek diversions can continue into July, when upstream water temperatures are higher. Although the Slate Creek diversions are typically discontinued or much reduced during time periods when water temperatures exceed the 20°C

threshold, project operation may have some effect on summer water temperatures immediately below the Slate Creek diversion dam and on support of designated cold freshwater habitat. In the lower portion of the reach, water temperatures in July are likely to exceed 20°C threshold regardless of project operation.

3.3.2.1.3 Aquatic Biota

Streams and reservoirs in the project area support fisheries for rainbow, brown, and brook trout, and a transitional warmwater fish assemblage in the lower elevation portions of the project area. In this section we describe the aquatic habitats and aquatic biota within project-area waters.

Important and Special Status Fish Species

Rainbow and brown trout support important recreational fisheries in the project area. Hardhead is both a California Species of Concern and a Forest Service Sensitive Species. Three federally listed salmonid species (winter-run Chinook salmon [endangered], Central Valley spring-run Chinook salmon [threatened], and California Central Valley steelhead [threatened]) may have occurred in the project area prior to the construction of the DWR's Oroville dam and the Oroville Project's fish barrier dam, located about 5 miles downstream of Oroville dam. NMFS has designated the Feather River downstream from the fish barrier dam as critical habitat for the Central Valley spring-run Chinook and California Central Valley steelhead ESUs.

Coastal rainbow trout are the trout species native to most west-side watersheds, and were historically found below an elevation of 4,900 feet, but have been introduced throughout the western Sierra Nevada including most of the project area. Rainbow trout spawn in the spring, although the specific spawning time is influenced by factors such as the genetic strain of the fish, water temperature, and period of daylight. Spawning usually occurs in gravel riffles or gravel pockets of small streams. Females excavate a nest, or "redd," in the gravel and, after spawning, cover the eggs with gravel. After hatching, the fry remain in the gravels until their yolk sacs are absorbed. The fry then venture into open water, feeding on plankton and aquatic macroinvertebrates. As they mature, they begin to feed on aquatic and terrestrial insects, and large trout also feed on fish and crayfish.

Brown trout are an introduced species in California, and occur mainly in low- to mid-elevation ranges. Brown trout spawn in the fall, although the specific spawning time is influenced by factors such as the genetic strain of the fish, water temperature, and period of daylight. Spawning usually occurs in gravel riffles or gravel pockets of small streams. Despite differences in timing, the spawning and rearing characteristics of brown trout are similar to rainbow trout. Brown trout can be found in tributaries, rivers, lakes, and reservoirs. Adults generally remain near the bottom of pools, while juveniles can be found in riffles as well as in pools. Brown trout prefer temperatures below 20°C, and have high growth rates at water temperatures between 12 and 20°C (Moyle, 2002). Brown trout compete with other trout species for resources.

Hardhead are a large, native minnow that is generally found in undisturbed areas of larger low- to middle-elevation streams (elevation between 30 to 4,760 feet in the Sacramento and San Joaquin watersheds). Its range extends from the Kern River in the south to the Pit River in the north. Hardhead inhabit areas that have clear, deep pools with sandy, gravel/boulder substrates and slow water velocities (less than 0.05 feet/second). Hardhead co-occur with Sacramento pikeminnow and usually with Sacramento suckers, and tend to be absent from streams where introduced species, especially centrarchids, predominate. Hardhead have been identified in Ponderosa reservoir through fish population surveys and in the SFFR immediately above Ponderosa reservoir. Adults spawn and juveniles rear in the Forbestown bypassed reach, but they have not been documented upstream of the fish migration barrier 1.8 miles upstream of Ponderosa reservoir.

Chinook salmon (both fall- and spring-run) were historically abundant in the Feather River watershed prior to the start of construction of Oroville dam in 1961. Fall-run Chinook salmon were less abundant and less widely distributed than the spring-run, and spawned primarily in the mainstem river. Spring-run Chinook salmon ascended all four branches of the Feather River (West Branch, North Fork, Middle Fork, and South Fork) above Oroville, with the longest migrations up the North Fork. Spring-run Chinook salmon migrations up the SFFR were limited by low summer flows caused by water diversions at the Forbestown and Palermo canals. Yoshiyama et al. (2001) states: "Before the diversions of the stream, spring-run salmon may have ascended to the vicinity of Forbestown, near the present upper limit of the South Fork arm of Lake Oroville." However, the historic distribution of anadromous fish in the SFFR may have been extended by a fish ladder and impoundment at Enterprise dam (prior to filling of Lake Oroville), which could have provided access for anadromous fishes as far upstream as the natural barriers documented by Chandler (1952). This estimate is corroborated by observation of an anadromous fish (steelhead or salmon) in the SFFR about 1 mile downstream of Carlyle Mine, near the current Ponderosa dam (Chandler, 1952).

Prior to construction of Oroville dam, Cal Fish & Game surveyed the SFFR in connection with its recommendations regarding construction of the South Feather Power Project (Chandler, 1952). The purpose of the survey was to establish the upstream extent of anadromous fish use. A pedestrian survey of the reach identified two barriers: a low flow barrier (cascade with an 8 foot drop) about 1.1 miles upstream of Ponderosa reservoir's current normal maximum water surface elevation, and a main barrier about 2.05 miles upstream of Ponderosa reservoir's normal maximum water surface elevation. The main barrier was reported as "about 15 feet high" with a deep pool at the base. Chandler noted that heavy mining occurred throughout the SFFR and patches of gravel were uncommon, particularly between Ponderosa reservoir and the lower migration barrier. Based on available spawning habitat, Cal Fish & Game personnel estimated that approximately 26 spawning pairs of salmon could be accommodated below and 130 pairs could be accommodated above the lower barrier (Chandler, 1952).

Benthic Macroinvertebrates

Benthic macroinvertebrates are listed as Forest Service Management Indicator Species for aquatic species in the Plumas National Forest. During sampling conducted at three locations in SFFR during fall 1986, a total of 43 invertebrate groups and subgroups of six different taxa were identified (most often to genus). Insects comprised 39 of 43 groups, with typical mountain stream insects such as mayflies, stoneflies, caddisflies, and midges dominant. Other invertebrates included oligochaetes, nematodes, crustaceans, and gastropods. Invertebrate densities were 27 to 283 organisms per square-foot. The diversity and densities of invertebrates were similar in all SFFR sample sections and were slightly lower than in less developed streams, but are not atypical for a developed Sierra Nevada stream like the SFFR. South Feather did not find the two special-status aquatic macroinvertebrates that have a potential to occur in the project area (the amphibious and golden-horned caddisflies, both federal species of concern). Neither of these species has been documented to occur in the project area.

Reservoir Fish

In total, 16 different species (not including trout hybrids) have been documented in project reservoirs (table 3-9). During sampling conducted in the fall of 2004, South Feather observed 12 species in the reservoirs, including three species (California roach, carp, and speckled dace) that had not been previously documented. Four species (channel catfish, golden shiner, hitch, and tui chub) that were observed in project reservoirs historically were not observed during the 2004 surveys.

Table 3-9. Fish species documented in the South Feather Power Project reservoirs.^a
(Source: South Feather, 2007)

Species	Little Grass Valley Reservoir	Ponderosa Reservoir	Sly Creek Reservoir	Lost Creek Reservoir
brown bullhead	●○			
brown trout	●○	●○	●○	●○
California roach			○	○
carp				○
channel catfish		●	●	
golden shiner	●		●	
green sunfish			●○	
hardhead		●○		
hitch			●	
kokanee	○		●	

Species	Little Grass Valley Reservoir	Ponderosa Reservoir	Sly Creek Reservoir	Lost Creek Reservoir
rainbow trout	●○	●	●○	●○
Sacramento pikeminnow		●○		
Sacramento sucker		●○		
smallmouth bass	○	●○		
speckled dace			○	
trout hybrids	●		●	
tui chub			●	

- ^a ○ Species documented during 2004 surveys.
● Species documented historically.

Little Grass Valley Reservoir. Historically, brown trout, rainbow trout, brown bullhead, and golden shiner have been documented in Little Grass Valley reservoir. Species captured in 2004 that had not been previously documented included kokanee and smallmouth bass. Rainbow trout and brown trout were the more abundant species, representing 54 percent of the total catch. Both species were distributed evenly around the reservoir and were captured in both shallow and deeper waters (from near-surface, to 100-foot depth). Brown bullhead was captured almost entirely within two nets along the north shore of the reservoir and within approximately 1 mile of the SFFR inflow. Smallmouth bass were captured almost entirely along the north shore of the reservoir within 1 mile of the Black Rock Creek and the SFFR inflows. All trout, kokanee, and smallmouth bass captured were adults. Brown bullhead was the only species captured as both juveniles and adults.

Sly Creek Reservoir. Historically, brown trout, channel catfish, golden shiner, green sunfish, hitch, kokanee, rainbow trout, and tui chub have been documented in the reservoir. In 2004, brown trout, green sunfish, and rainbow trout were again captured. In addition, California roach and speckled dace were also documented in the reservoir. Historical reports of channel catfish, golden shiner, hitch, kokanee, and tui chub in Sly Creek reservoir were not confirmed by the capture of any of those species in the 2004 survey. California roach was the most abundant species, representing 72 percent of the total catch followed by brown trout which represented 12 percent of the captured fish. California roach and green sunfish were evenly distributed in shallow waters around the reservoir. Brown trout and rainbow trout were evenly distributed in both shallow and deeper waters around the reservoir (from near surface to 100-foot depths). Only a single speckled dace was captured in 2004. All brown trout and speckled dace captured and the

majority of rainbow trout captured were adults. California roach were captured as both juveniles and adults and green sunfish were captured only as juveniles.

Lost Creek Reservoir. Brown trout and rainbow trout were historically documented in the reservoir. In addition to those species, California roach and carp were captured in the reservoir during the 2004 surveys. California roach was the most abundant species, representing 79 percent of the fish captured, followed by brown trout. Rainbow trout and California roach were captured only in shallow water habitats. Brown trout were evenly distributed around the reservoir in both deep and shallow waters (from near-surface to 50-foot depths). Brown trout and carp were all captured as adults. Rainbow trout and California roach were captured as both juveniles and adults.

Ponderosa reservoir. Fish species that occur in Ponderosa reservoir include brown trout, rainbow trout, channel catfish, hardhead, Sacramento pikeminnow, Sacramento sucker, and smallmouth bass. During sampling in 1998 and 2001, Sacramento sucker was the dominant species captured followed by Sacramento pikeminnow, hardhead, brown trout, and smallmouth bass. In September 2004, Sacramento sucker was the dominant species, followed by hardhead. Hardhead, Sacramento pikeminnow, and smallmouth bass were distributed throughout the reservoir in both shallow and deeper waters. Only one brown trout was captured in the reservoir. With the exception of brown trout, both juveniles and adults of all species were captured.

Miners Ranch Reservoir. South Feather states that it is unaware of any aquatic surveys in this reservoir, but expects fish populations to be similar to those in Ponderosa reservoir because of the hydrologic connection between the two reservoirs via Miners Ranch conduit. Fish species expected to occur include rainbow trout, brown trout, channel catfish, hardhead, Sacramento pikeminnow, Sacramento sucker, and smallmouth bass. Because the reservoir provides domestic water supply, it is closed to fishing.

Stream Fish Populations

During 2004-2006 surveys, South Feather sampled all project reaches and reference reaches with similar habitat characteristics selected for comparison of fish populations. During the 2004 to 2006 surveys, nine species were identified, including three (kokanee, smallmouth bass, and hitch) that were not previously documented. Rainbow and brown trout were the dominant species throughout most of the study area, and many sites within the study area were composed exclusively of trout. Trout were the only species observed in the upper reaches of the SFFR and in Lost Creek. Between the rainbow and brown trout populations, the dominant species has fluctuated over time throughout the study area.

There is a natural upstream migration barrier about 1.8 miles upstream of Ponderosa reservoir that prevents many transitional and warmwater species from moving above this location. Below this barrier, the species composition expands to include more transitional zone species (including hardhead, Sacramento sucker, and Sacramento

pikeminnow), several of which are presumed to migrate upstream from Ponderosa reservoir. The species composition in Slate Creek follows a similar pattern, with the fish composition in the upper elevations of Slate Creek includes rainbow trout and speckled dace, whereas the lower section of Slate Creek includes transition zone species as well as one warmwater species (smallmouth bass). The lower section of Slate Creek also contains migratory species from New Bullards Bar reservoir (including transition zone species and kokanee) which could migrate up to a natural upstream migration barrier located approximately 4.6 miles upstream of the North Yuba River confluence.

The species distribution pattern observed in the project area follows the temperature regime of the study area. Trout generally dominated in most of the reaches, while transitional warmwater species dominated in the warmer downstream, lower elevation reaches. Water temperature at all sampling locations followed an overall seasonal pattern of generally rising temperatures from March through July, and generally decreasing temperatures from August through October. Between March and September 2004, mean daily water temperatures increased from a range of 5 to 8°C at upper elevation sites to a range of 17 to 21°C at lower elevations. The mean daily temperature in the Lost Creek dam reach also increased downstream with the maximum daily temperature of 19.0°C recorded near the SFFR confluence in July. The species composition in Lost Creek was exclusively trout, with historical records including speckled dace and California roach. Within the Forbestown diversion dam reach water temperatures as high as 24.5°C were recorded just above Ponderosa reservoir, and this section of stream was composed primarily of transitional zone species such as hardhead and Sacramento pikeminnow. The mean daily temperature in the Slate Creek diversion dam reach reached a maximum mean daily temperature of 22.1°C in July near the lower end of the reach, and this lower section supports transitional zone species as well as warm water fish.

SFFR – Trout Dominated Sites. The fish species composition in the SFFR was exclusively trout in the upper watershed, changing to transitional zone species (e.g., hardhead and Sacramento pikeminnow) in the lowermost portion of the river above Ponderosa reservoir. Trout-dominated reaches in the SFFR include the Little Grass Valley dam reach, the South Fork diversion dam reach, and the SFFR/Lost Creek reach.

The Little Grass Valley dam reach extends 9.1 miles from the base of Little Grass Valley dam at elevation 4,842 feet msl, to the maximum water surface elevation of the South Fork diversion dam impoundment at elevation 3,557 feet msl. The reach has an average gradient of 2.7 percent. Boulder and cobble are the dominant substrate types, and South Feather's habitat surveys indicated that spawning gravel is available in moderate amounts, occurring primarily in the middle portion of the reach. The abundance of LWD was estimated at 30 pieces per mile, with most of the larger pieces occurring in the lower and middle sections of the reach. One permanent fish migration barrier exists in the middle of the reach.

The South Fork diversion dam reach extends 9.4 miles from the base of the South Fork diversion dam at elevation 3,499 feet msl to the confluence with Lost Creek at elevation 1,952 feet msl. The reach has an average gradient of 3.1 percent, boulder and cobble were the dominant substrate, and South Feather found that spawning gravel was less available in this reach than in any other reach in the study area. Most of the gravel occurred within the lower half of the reach. The majority of fish cover was provided by boulders. Ground mapping indicated a LWD frequency of 24.5 pieces per mile, with the majority of the larger pieces observed in the middle portion of the reach. One potential barrier to fish migration was identified in the lower section of the reach

The SFFR/Lost Creek reach extends 1.0 mile from the Lost Creek confluence at an elevation of 1,952 feet msl to Forbestown reservoir at an elevation of 1,783 feet msl. The reach has an average gradient of 3.2 percent, is highly confined with boulder and bedrock bank substrate, and the majority of the reach was confined and shallow. Spawning gravel and fish cover analyses were not conducted for this short reach. LWD was observed at approximately two pieces per mile through aerial videography, although this method typically underestimates LWD frequency compared to ground mapping. No permanent fish barriers were observed during aerial videography mapping.

The average trout biomass from 1993 to 2006 in the SFFR at trout dominated sites ranged from 27 to 90 pounds per acre, and the average number of catchable trout per mile ranged from 55 to 1,536 trout per mile. All sites in the four project reaches in the SFFR (Little Grass Valley dam, South Fork diversion dam, SFFR/Lost Creek, and Forbestown diversion dam) supported trout populations with a higher average trout biomass and density of catchable trout than other populations found in stream sections of similar size in the Sierra Nevada Mountains (24 pounds per acre observed by Gerstung, 1973). Although Platts and McHenry (1988) reported higher levels of biomass in Sierran streams, most of the streams included in this reference were small streams less than 24 feet wide. South Feather used data from Gerstung (1973) for streams that were between 25 and 40 feet wide, which is closer to the average width of 39 feet for the project reaches, and would provide a better representation of potential trout biomass in streams that are comparable in size to the project bypassed reaches.

Forbestown Diversion Dam Reach. The Forbestown diversion dam reach is the 5.5-mile-long section of the SFFR from the base of the Forbestown diversion dam at elevation 1,703 feet msl to the normal high water line of Ponderosa reservoir at elevation 961 feet msl. The reach has an average gradient of 2.6 percent. More than half of the 114 pools surveyed in the reach were greater than 4 feet deep, and the dominant substrate types were boulder and bedrock. There was 190 square feet per mile of suitable spawning gravel, which was distributed throughout the reach in small patches. The majority of fish cover was provided by boulders; LWD was observed at a frequency of 12 pieces per mile during ground mapping. The larger pieces of LWD were evenly distributed with pieces observed throughout the reach. Cascades formed three permanent barriers to upstream fish migration in this reach. All three cascades occurred in the lower

half of the reach, with the lowermost barrier occurring 1.8 miles upstream from Ponderosa reservoir.

Fish populations in the Forbestown diversion dam reach included transitional zone species (Sacramento pikeminnow, hardhead, and Sacramento sucker), hitch, and both rainbow and brown trout. Sacramento pikeminnow, hardhead, and Sacramento sucker were typically the numerically dominant species, and composition varied between years.

Slate Creek Diversion Dam Reach. Slate Creek diversion dam reach extends 9.1 miles from the base of the Slate Creek diversion at elevation 3,492 feet msl to the confluence with the North Yuba River at an elevation of 1,975 feet msl. Slate Creek has an average gradient of 3.3 percent, and boulder is the dominant substrate type. South Feather estimated that this reach contained 316 square feet of spawning gravel per mile, occurring primarily in the lower end of the reach. Most of the reach was shallow and confined with bedrock and gravel bank substrates. Cover suitable for fish was absent from most of the reach, and no significant quantities of LWD were mapped via aerial or ground mapping. The larger pieces of LWD that were mapped using aerial video were distributed evenly throughout the reach. The aerial video mapping identified two cascades that are potential barriers to fish migration.

The fish species composition in Slate Creek consisted of rainbow trout and speckled dace in the upper watershed, changing to transitional zone (e.g., Sacramento pikeminnow) and warmwater species (e.g., smallmouth bass) in the lowest section of the river near the North Yuba River confluence. Average trout biomass from 1993 to 2005, at trout-dominated sites ranged from 24 to 28 pounds per acre, and the average number of catchable trout ranged from 248 to 304 trout per mile.

Lost Creek Dam Reach. The Lost Creek dam reach is the 3.9-mile-long section of Lost Creek extending from the base of Lost Creek dam at elevation 3,170 feet msl to its confluence with the SFFR at elevation 1,952 feet msl. The river has an average gradient of 5.8 percent, and boulder and bedrock were the dominant substrates. The abundance of spawning gravel was estimated at 255 square feet per mile. Fish cover was not present in most of the reach, and LWD was documented at 5.7 pieces per mile. Two barriers to upstream fish migration were identified from ground mapping, with a third barrier identified elsewhere in the reach from the aerial video.

Fish sampling indicated that the fish population in Lost Creek is exclusively trout. The average trout biomass from 1993 to 2005 ranged from 12 to 38 pounds per acre. Overall, the age class distribution of trout in the Lost Creek reference reach included moderate recruitment of YOY and a consistent low abundance of 1+ and 2+ age groups with few older age classes (3+ and older). Downstream of Lost Creek dam, there was a higher recruitment of YOY trout, yet still a low abundance of 1+ and 2+ age fish and fewer older age classes (3+ and older). The age class composition varied by year, showing lower recruitment in 1996 and 2005, and a high recruitment in 1999.

3.3.2.2 Environmental Effects

Minimum Flows

Flow regulation at Little Grass Valley and Sly Creek reservoirs and diversion of water to the project powerhouses affect aquatic biota and recreational opportunities in five riverine reaches. These reaches are the Little Grass Valley dam, South Fork diversion dam, and Forbestown diversion dam reaches of the SFFR, Slate Creek below the Slate Creek diversion, and Lost Creek below Lost Creek reservoir.

In its final license application, South Feather proposed a minimum flow regime for each of the project reaches that varies by month for four water year types. In all cases the proposed flows are equal to or greater than the flows that are required in the current project license.

Cal Fish & Game filed a 10(j) recommendation and the Forest Service filed a preliminary 4(e) condition specifying seasonal flow regimes for each water year type for each reach. South Feather also filed an alternative 4(e) condition specifying minimum flows that were in many cases consistent with the Forest Service's 4(e) flows, and in most other cases were intermediate between the flows proposed in the license application and the Forest Service's 4(e) flows. The Forest Service filed its final 4(e) conditions on March 6, 2009. The Forest Service adopted South Feather's alternative 4(e) flows for Above Normal, Below Normal, and Wet water year types in the Lost Creek reach, and reduced their flows to be more consistent with South Feather's alternative 4(e) condition in several other reaches.

South Feather proposes that the instantaneous flow releases be allowed to deviate below the specified minimum flow releases by up to 10 percent or 3 cfs, whichever is less. The Forest Service specifies that the instantaneous flow be at least 80 percent of the specified mean daily flow for minimum flows less than or equal to 10 cfs, and at least 90 percent of the specified mean daily flow for minimum flows greater than 10 cfs. The Forest Service also specifies that if mean daily flows fall below the specified flow release, that South Feather begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release, and that credit for additional releases not exceed 20 percent of the instantaneous amount. South Feather's alternative 4(e) condition is consistent with the Forest Service's 4(e) condition except that it does not include the 20 percent limit on credit for additional releases.

Cal Fish & Game also filed a 10(j) recommendation that water surface elevations at Little Grass Valley and Sly Creek reservoirs be maintained as high as possible to protect beneficial uses of the reservoirs, while recognizing the need for protection of ecological resources, power production, and consumptive water supply.

Our Analysis

In the draft EIS, we analyzed the effect of alternative flow regimes on habitat for adult rainbow trout (as represented by modeled weighted usable area [WUA]), water

temperature suitability for rainbow trout, hardhead, and amphibians, and effects on water levels in Little Grass Valley reservoir. Our analysis of effects on fish habitat included consideration of static WUA values associated with each minimum flows, as well as South Feather's habitat time series analysis, which included incorporation of accretion flows within each reach and comparison of habitat availability under each of the proposed flow regimes with monthly WUA availability under proposed flows with unimpaired flows for four water year types.

In their comments on the draft EIS, Cal Fish & Game provided additional information on the trout lifestages and other parameters (wetted perimeter, hydrology, and temperature), that were given priority in developing their recommended flow regime for different seasons and water year types in each reach. During the 10(j) meeting held on March 24, 2009, Commission staff agreed to expand our analysis to include consideration of the additional information that Cal Fish & Game filed in their comments on the draft EIS. We have revised our analysis in this section to include this new information, and also to reflect changes in the flows specified by the Forest Service in their final 4(e) condition.

One of the concerns raised by both Cal Fish & Game and Forest Service in their comments on the draft EIS was the methodology that South Feather used in its habitat time series analysis. Both agencies commented that integrating the hydrologic input over each reach to account for accretion flows did not allow effects on habitat close to the dams to be evaluated. They both also expressed concern that the analysis was based on monthly average flows determined for specific water year types from a 30-year record, since discretionary releases made to meet downstream water needs in portions of a month could mask the effects of lower flows that occurred in other portions of the month or in other years. We do not agree with the agencies' objection to integration of accretion flows, which is an appropriate method to determine the effect of a given flow release on habitat over the length of a reach. However, we do agree that averaging flows over time within and between years could obscure adverse effects associated with the lowest flows that occur during specific time period, because large changes in flow releases occur when South Feather adjusts flows to meet changes in consumptive demands in downstream portions of the project. As a result, we have refocused our analysis on the habitat conditions that would be provided under the minimum flows identified for each reach under each recommendation or condition.

To assess effects of alternative flow regimes on the habitat available to different lifestages of rainbow trout, we used WUA/flow and wetted area relationships provided by South Feather in Exhibit E for the Little Grass Valley, South Fork diversion, Forbestown and Slate Creek bypassed reaches, and WUA/flow relationships¹³ from the Lost Creek instream flow study that South Feather filed with its alternative 4(e) condition. These

¹³ The Lost Creek flow study did not provide information on the relationship between flow and wetted area.

relationships do not account for accretion flows that occur within each reach, and as a result they represent a conservative estimate of the habitat that would be provided under each flow regime. We converted the WUA values for each reach to determine the percentage of the maximum WUA that occurred under the full range of simulated flows. Appendix C contains tables that show the percent of maximum WUA and wetted area values determined for each lifestage, reach, flow regime, month, and water year type (tables C-1 through C-20). For all reaches except for Slate Creek, we then compiled summary tables that present average annual values of each parameter (table 3-10), the percentage change in each parameter compared to the flow regimes included in the current license (table 3-11), and the percentage change between South Feather's alternative 4(e) flow regime and Cal Fish & Game's 10(j) flows and the Forest Service's final 4(e) flows (table 3-12). We did not include Slate Creek in the summary tables, because the flows recommended by Cal Fish & Game and specified by the Forest Service for this reach are consistent with South Feather's alternative 4(e) flows. We also did not include fry habitat, because this lifestage is not likely to limit trout populations in the project area, and Cal Fish & Game and the Forest Service did not consider fry habitat to be limiting when they developed their flow regimes. The lifestages and ecological objectives that Cal Fish & Game and Forest Service placed priority on in developing their flow regimes are summarized in table 3-13.

Table 3-10. Average annual minimum flow, wetted area, and percent of maximum WUA for trout juvenile, adult, and spawning lifestages under five flow regimes.

Parameter	Flow regime	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Flow (cfs)	Current license	8	8	5	5	8	8	5	5	8	8	5	5	7	7	7	7	6
	SF FLA	10	16	16	9	20	18	16	9	13	12	12	5	7	7	7	7	11
	SF Alt 4(e)	32	17	13	11	36	22	16	14	36	22	16	14	16	16	14	12	19
	FS final 4(e)	36	26	17	14	36	26	17	17	36	26	17	14	18	16	14	12	21
	Cal F & G	36	27	22	19	42	30	25	21	43	37	24	22	21	21	18	15	26
Wetted area (1,000 sq ft)	Current license	23.8	23.8	22.6	22.6	19.0	19.0	17.9	17.9	28.4	27.6	26.8	26.8	NA	NA	NA	NA	23.0
	SF FLA	24.9	26.1	26.1	24.2	22.3	21.7	21.2	19.3	28.6	28.5	28.3	26.8	NA	NA	NA	NA	24.8
	SF Alt 4(e)	28.4	26.6	25.5	25.3	23.9	22.4	21.3	21.0	31.1	30.0	29.3	29.0	NA	NA	NA	NA	26.1
	FS final 4(e)	29.3	28.2	26.5	26.0	23.9	23.1	21.5	21.5	31.1	30.4	29.3	29.1	NA	NA	NA	NA	26.6
	Cal F & G	29.3	28.0	27.2	26.7	24.6	23.2	22.3	22.0	31.8	31.6	29.9	29.8	NA	NA	NA	NA	27.2
Juvenile trout WUA (% of maximum)	Current license	37%	37%	29%	29%	57%	57%	49%	49%	65%	65%	58%	58%	75%	47%	47%	47%	51%
	SF FLA	45%	54%	54%	41%	79%	74%	71%	59%	72%	72%	71%	58%	47%	47%	47%	47%	59%
	SF Alt 4(e)	66%	59%	50%	48%	86%	79%	73%	71%	86%	83%	78%	76%	68%	68%	66%	63%	70%
	FS final 4(e)	73%	69%	57%	54%	86%	82%	74%	74%	86%	86%	79%	77%	71%	68%	66%	63%	73%
	Cal F & G	73%	66%	60%	58%	90%	81%	76%	75%	90%	92%	81%	81%	63%	71%	70%	68%	75%
Adult trout WUA (% of maximum)	Current license	18%	18%	13%	13%	33%	33%	26%	26%	36%	36%	29%	29%	51%	22%	22%	22%	27%
	SF FLA	22%	31%	31%	21%	56%	52%	48%	35%	45%	45%	43%	29%	22%	22%	22%	22%	34%
	SF Alt 4(e)	44%	34%	26%	24%	67%	57%	49%	46%	67%	58%	51%	48%	43%	43%	40%	37%	46%
	FS final 4(e)	51%	45%	32%	29%	67%	62%	50%	50%	67%	63%	52%	49%	48%	43%	40%	37%	49%
	Cal F & G	51%	43%	38%	35%	73%	62%	55%	53%	74%	73%	58%	57%	67%	49%	46%	42%	55%

Parameter	Flow regime	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Spawning WUA (% of maximum)	Current license	39%	39%	33%	33%	44%	44%	36%	36%	41%	41%	36%	36%	96%	68%	68%	68%	47%
	SF FLA	51%	80%	80%	71%	87%	93%	85%	77%	41%	46%	53%	36%	84%	68%	68%	68%	68%
	SF Alt 4(e)	82%	80%	69%	63%	90%	92%	89%	85%	83%	89%	84%	81%	96%	96%	97%	94%	86%
	FS final 4(e)	86%	90%	85%	80%	90%	92%	89%	89%	83%	88%	85%	81%	95%	96%	97%	94%	89%
	Cal F&G	86%	89%	91%	91%	92%	94%	93%	95%	84%	90%	94%	94%	92%	92%	96%	98%	92%

Table 3-11. Percentage change from existing conditions for minimum flow, wetted area, and WUA for trout juvenile, adult, and spawning lifestages under five flow regimes.

Parameter	% change from current conditions	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Flow (cfs)	SF FLA	33%	109%	213%	83%	160%	144%	213%	78%	70%	63%	135%	0%	0%	0%	0%	0%	81%
	SF Alt 4(e)	326%	128%	152%	127%	384%	194%	213%	177%	384%	194%	213%	177%	131%	131%	109%	79%	195%
	FS final 4(e)	384%	251%	230%	183%	384%	251%	230%	230%	384%	251%	230%	183%	169%	131%	109%	79%	230%
	Cal F & G	384%	263%	338%	282%	461%	305%	395%	315%	469%	396%	380%	345%	212%	212%	168%	120%	315%
Wetted area (1,000 sq ft)	SF FLA	5%	10%	16%	7%	17%	14%	18%	8%	4%	3%	6%	0%	NA	NA	NA	NA	9%
	SF Alt 4(e)	20%	11%	13%	12%	26%	18%	19%	18%	13%	9%	9%	8%	NA	NA	NA	NA	15%
	FS final 4(e)	23%	18%	17%	15%	26%	22%	20%	20%	13%	10%	10%	9%	NA	NA	NA	NA	17%
	Cal F & G	23%	17%	20%	18%	30%	22%	25%	23%	15%	15%	12%	11%	NA	NA	NA	NA	19%
Juvenile trout WUA	SF FLA	21%	45%	85%	40%	39%	30%	43%	20%	12%	12%	21%	0%	-37%	0%	0%	0%	21%
	SF Alt 4(e)	77%	58%	70%	64%	50%	38%	48%	43%	34%	28%	34%	31%	-10%	42%	39%	33%	42%

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Parameter	% change from current conditions	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
	FS final 4(e)	96%	86%	95%	84%	50%	44%	49%	49%	34%	33%	35%	32%	-5%	42%	39%	33%	50%
	Cal F & G	96%	76%	106%	99%	57%	42%	53%	51%	40%	42%	40%	40%	-16%	49%	46%	42%	54%
Adult trout WUA	SF FLA	25%	73%	129%	55%	72%	58%	84%	36%	27%	26%	47%	0%	-56%	0%	0%	0%	36%
	SF Alt 4(e)	150%	90%	96%	83%	105%	75%	90%	79%	89%	64%	74%	65%	-15%	92%	80%	64%	80%
	FS final 4(e)	188%	153%	144%	119%	105%	89%	94%	94%	89%	76%	77%	67%	-5%	92%	80%	64%	95%
	Cal F & G	188%	145%	185%	163%	122%	90%	113%	104%	108%	106%	97%	94%	32%	118%	105%	89%	116%
Trout Spawning WUA	SF FLA	31%	108%	147%	118%	96%	110%	135%	112%	0%	13%	48%	0%	-13%	0%	0%	0%	57%
	SF Alt 4(e)	113%	108%	113%	92%	104%	107%	145%	136%	103%	116%	137%	128%	0%	41%	42%	37%	95%
	FS final 4(e)	122%	132%	162%	146%	104%	107%	147%	147%	103%	115%	139%	128%	-1%	41%	42%	37%	104%
	Cal F&G	122%	131%	180%	180%	108%	113%	157%	162%	105%	121%	164%	164%	-4%	35%	40%	43%	114%

Table 3-12. Percentage change from alternative 4(e) flow regime for minimum flow, wetted area, and WUA for trout juvenile, adult, and spawning lifestages under five flow regimes.

Parameter	% change	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
Flow (cfs)	FS final 4(e)	14%	54%	31%	25%	0%	19%	5%	19%	0%	19%	5%	2%	17%	0%	0%	0%	13%
	Cal F & G	14%	59%	74%	68%	16%	38%	58%	50%	18%	68%	53%	61%	35%	35%	28%	23%	44%
Wetted	FS final 4(e)	3%	6%	4%	3%	0%	3%	1%	2%	0%	1%	0%	0%	NA	NA	NA	NA	2%

Parameter	% change	Little Grass Valley				South Fork Div.				Forbestown Div.				Lost Creek Div.				Average
		WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	WET	AN	BN	DRY	ALL
area (1,000 sq ft)	Cal F & G	3%	5%	7%	6%	3%	4%	5%	5%	2%	5%	2%	3%	NA	NA	NA	NA	4%
Juvenile trout WUA	FS final 4(e)	11%	18%	15%	12%	0%	5%	1%	4%	0%	4%	1%	1%	6%	0%	0%	0%	5%
	Cal F & G	11%	12%	21%	21%	5%	3%	4%	5%	4%	11%	5%	7%	-7%	4%	6%	7%	7%
Adult trout WUA	FS final 4(e)	15%	33%	24%	20%	0%	8%	2%	8%	0%	8%	2%	1%	12%	0%	0%	0%	8%
	Cal F & G	15%	29%	46%	44%	9%	9%	12%	14%	10%	26%	14%	18%	55%	14%	14%	15%	21%
Trout spawning WUA ^a	FS final 4(e)	4%	12%	23%	28%	0%	0%	1%	5%	0%	-1%	1%	0%	-1%	0%	0%	0%	4%
	Cal F&G	4%	11%	32%	46%	2%	3%	5%	11%	1%	2%	11%	16%	-4%	-4%	-1%	4%	9%

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^a Spawning WUA based on March through May to coincide with spawning period for rainbow trout.

Table 3-13. Summary of rainbow trout lifestages and ecological objectives used by Cal Fish & Game and Forest Service to develop minimum flow regimes for the South Feather Power Project. (Source: Staff)

Species/Lifestage or ecological objective	Time period/season	
	Cal Fish & Game	Forest Service
Macroinvertebrate production (wetted perimeter)	June through March	Late summer and early fall
Rainbow rearing	Adults: April through June Juveniles: June through March	Late spring through early fall
Rainbow trout spawning	April and May	Spring through early summer
Channel maintenance	Not specified	High flow period of spring
Retain natural hydrograph ecological cues, buffer flow changes	Year-round	Year-round, declining hydrograph in late spring to and early summer important to provide cues for trout and amphibian reproductive behavior
Water temperature control	July and August in the Forbestown reach	Late summer and early fall

Although Cal Fish & Game and the Forest Service identified different seasons in which they placed priority on macroinvertebrate production, as shown in table 3-13, this objective was given priority by one or both of the agencies in every month of the year. Although the agencies indicate that they used wetted perimeter relationships for riffles to identify “break-points” in the wetted area versus flow relationship, information to determine the area of riffle habitat under the full range of recommended flows was not available. To assess effects of each flow regime on macroinvertebrate production, we used the flow versus wetted area relationships for the entire reach that was provided in Exhibit E. Although we agree with the agencies that riffle habitats typically provide the highest rate of invertebrate production, some production occurs in all wetted areas and the relationship of flow to the total wetted area likely exhibits a similar relationship as the

relationship of flow to wetted riffle habitat. Based on the average annual wetted areas that we calculated, the amount of wetted area is relatively stable over the range of flows that we evaluated, which extended from the flows in the current license up to the highest flow regime that we evaluated. The average gains in wetted area (across all reaches and water year types) compared to the minimum flows in the current license were 9 percent for the flows proposed in the license application, 15 percent for the flows included in South Feather's alternative 4(e) condition, 17 percent for the Forest Service's final 4(e) flows, and 19 percent for Cal Fish & Game's 10(j) (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 2 percent increase in wetted area, and Cal Fish & Game's 10(j) flows provided an average 4 percent increase in wetted area (table 3-12). The average increase in flow compared to the existing license condition was 81 percent for the flows proposed in the license application, 195 percent for South Feather's alternative 4(e) flows, 230 percent for the Forest Service's 4(e) condition, and 315 percent for Cal Fish & Game's 10(j) recommendation (table 3-11).

For juvenile and adult rearing lifestages, Cal Fish & Game placed priority on one of these lifestages in every month of the year, while the Forest Service placed priority on these rearing lifestages from late spring through early fall. Seasonal changes in rearing habitat for each lifestage, reach, water year type and flow regime are provided in appendix C, tables C-1 through C-20. The average gains in rearing WUA for juvenile trout (across all reaches and water year types) compared to the minimum flows in the current license were 21 percent for the flows proposed in the license application, 42 percent for the flows included in South Feather's alternative 4(e) condition, 50 percent for the Forest Service's final 4(e) flows, and 54 percent for Cal Fish & Game's 10(j) (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 5 percent increase WUA for juvenile trout, and Cal Fish & Game's 10(j) flows provided an average 7 percent increase in WUA for this lifestage (table 3-12). For adult rearing WUA, the average gains compared to the minimum flows in the current license were 36 percent for the flows proposed in the license application, 80 percent for the flows included in South Feather's alternative 4(e) condition, 95 percent for the Forest Service's final 4(e) flows, and 116 percent for Cal Fish & Game's 10(j) flows (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 8 percent increase WUA for adult trout, and Cal Fish & Game's 10(j) flows provided an average 21 percent increase in WUA for this lifestage (table 3-12).

For trout spawning, Cal Fish & Game placed priority on this lifestage in April and May, and Forest Service placed priority on this lifestage in the spring through early summer. Based on the timing of trout spawning identified in Exhibit E, we assessed spawning habitat from March through May. Appendix C, tables C-1 through C-20 show spawning habitat WUA for each reach, water year type, and flow regime. The average gains in spawning WUA (across all reaches and water year types) compared to the minimum flows in the current license were 57 percent for the flows proposed in the

license application, 95 percent for the flows included in South Feather's alternative 4(e) condition, 104 percent for the Forest Service's final 4(e) flows, and 114 percent for Cal Fish & Game's 10(j) flows (table 3-11). Compared to South Feather's alternative 4(e) condition, Forest Service's final 4(e) flows provided an average 4 percent increase in spawning WUA for trout, and Cal Fish & Game's 10(j) flows provided an average 9 percent increase in WUA for this lifestage (table 3-12).

The Forest Service identified channel maintenance functions including maintenance of spawning gravel quality and preventing riparian encroachment as one of its priorities in determining minimum flows in the spring high flow period. Although the flows proposed by South Feather in its license application did not provide for higher minimum flows during the high flow months of April and May, all three of the other flow regimes (South Feather's alternative 4(e), Forest Service's final 4(e), and Cal Fish & Game's 10(j)) all provide for substantial increases in minimum flow releases during this time period. Although minimum flows recommended or specified by the agencies are higher than those that are included in South Feather's alternative 4(e) condition in some reaches and water year types, these differences are small in relation to the magnitude of spill flows that occur in most years, and as a result we conclude that the higher minimum flow releases provided in the agency flow regimes would not provide a detectable improvement in channel maintenance functions.

Both agencies identified ecological objectives of retaining a natural hydrograph to provide ecological cues, and of buffering the effects of flow changes by providing higher minimum base flows. Although it is difficult to quantify the benefits that are associated with providing a more natural flow regime, we note that the flow regimes included in South Feather's alternative 4(e) condition reflect the natural flow regime much more closely than the flows that are included in the existing license and the flows that were proposed in the license application. We agree with the agencies that providing higher minimum flows serves to buffer adverse effects associated with sudden increases or decreases in river flow, and that the higher minimum flows provided in the agency flow regimes would provide some increase in buffering capacity by reducing the potential for biota being flushed downstream during flow increases or stranded during reductions in flow. We note, however, that the flows included in South Feather's alternative 4(e) condition are substantially higher than the minimum flows that are provided in the current license, and as a result would provide a substantial amount of protection compared to the existing flow regime.

Cal Fish & Game also identified an objective of maintaining water temperatures below the 20°C coldwater standard specified in the Basin Plan throughout the 3.5-mile-long section of the Forbestown reach that is upstream of a barrier to the upstream migration of transition species, which is located at RM 3.8, and the Forest Service identified controlling water temperatures as an objective that was considered in developing their flow recommendations for the late summer and early fall.

Modeling of water temperatures in the Forbestown reach conducted by South Feather indicates that increasing minimum flows during the summer month would help to maintain water temperatures in compliance with the 20°C standard throughout the length of the reach upstream of the migration barrier. South Feather's alternative 4(e) condition would increase the minimum flow in July from 5 to 10 cfs in dry years, from 10 to 15 cfs in below normal and above normal years, and from 10 to 19 cfs in wet years. South Feather's SNTTEMP modeling indicates that increasing minimum flow releases from 5 to 10 cfs in dry years would reduce water temperatures by approximately 2°C in July (figure 3-4), which should provide a substantial benefit to trout populations. Increasing minimum flow releases from 10 to 15 cfs in below normal and above normal years would also provide a benefit by reducing water temperatures by about 1°C.

Although the higher releases recommended by Cal Fish & Game would likely provide even more favorable summer water temperatures for trout, these flows may reduce maximum summer water temperatures to levels that are below the optimal range for hardhead, which prefer summer water temperatures in excess of 20°C (Moyle, 2002). Although these lower temperatures may not affect the length of the reach that is used by hardhead, they would reduce habitat suitability.

Higher summer flow releases that would occur downstream of each of the project's larger storage reservoirs under the flows recommended by Cal Fish & Game and specified by the Forest Service would likely extend the length of the reaches below each reservoir where invertebrate diversity and production is reduced by the influence of coldwater outflows and increased thermal stability. This would likely have an adverse effect on trout production in the reaches downstream of Little Grass Valley and Lost Creek reservoirs. Higher flow releases in the Little Grass Valley dam reach would likely also reduce trout production by reducing water temperatures to levels that are below optimal for rearing rainbow trout. Water temperatures in this reach are already below optimum ranges identified by the Forest Service (figure 3-5), and increased deepwater releases from the reservoir would likely depress water temperatures throughout the length of the reach. Reduced water temperatures associated with the higher flows recommended by Cal Fish & Game and specified by the Forest Service in the South Fork diversion dam and Forbestown reaches would likely reduce habitat suitability for FYLF by reducing water temperatures.

In its filing of its alternative 4(e) conditions, South Feather noted that the higher flows specified by the Forest Service during the spring months in Lost Creek would depress water temperatures below optimal levels for rainbow trout and for FYLF breeding. Temperature monitoring conducted by South Feather in 2004 and 2005 indicate that water temperatures directly below Lost Creek dam did not rise to levels within the 9 to 14°C range identified by the Forest Service as being optimal for rainbow trout spawning until May in both years (figures 3-6 and 3-7).

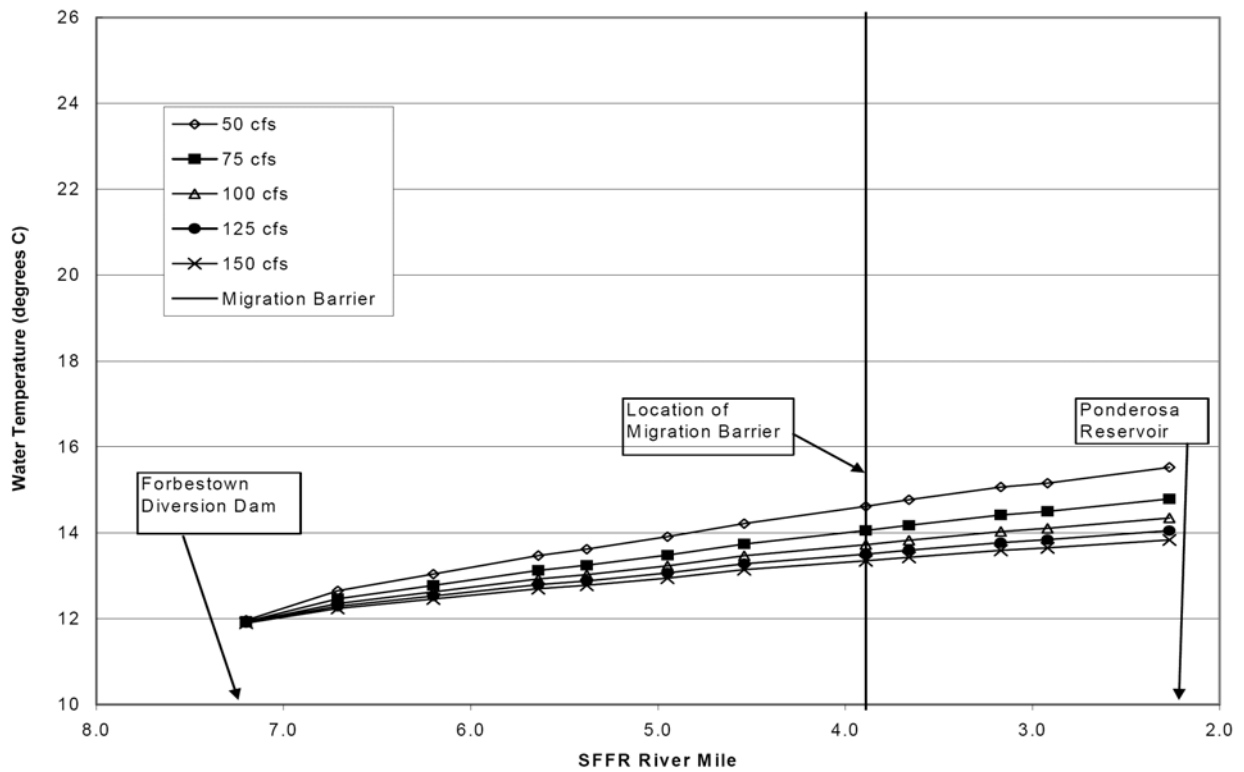
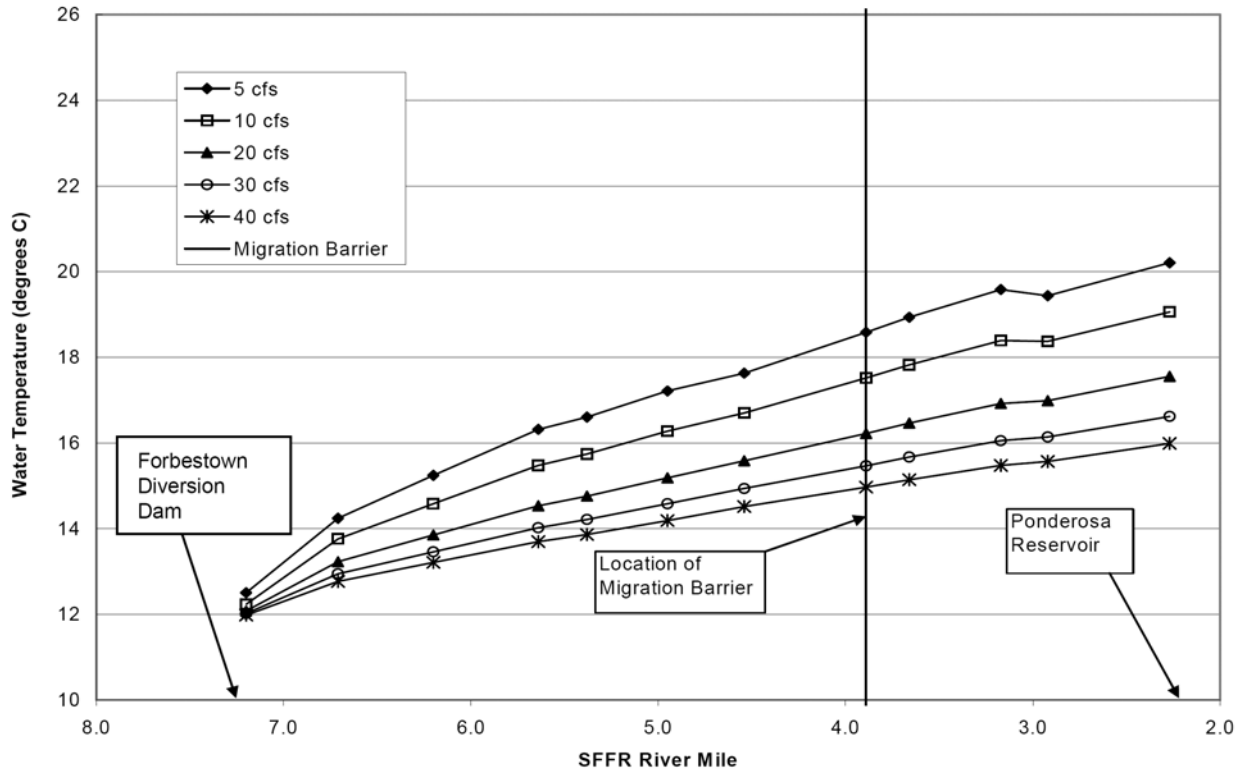


Figure 3-4. Modeled water temperatures in the Forbestown reach on June 25 under a range of release flows. (Source: South Feather, 2007)

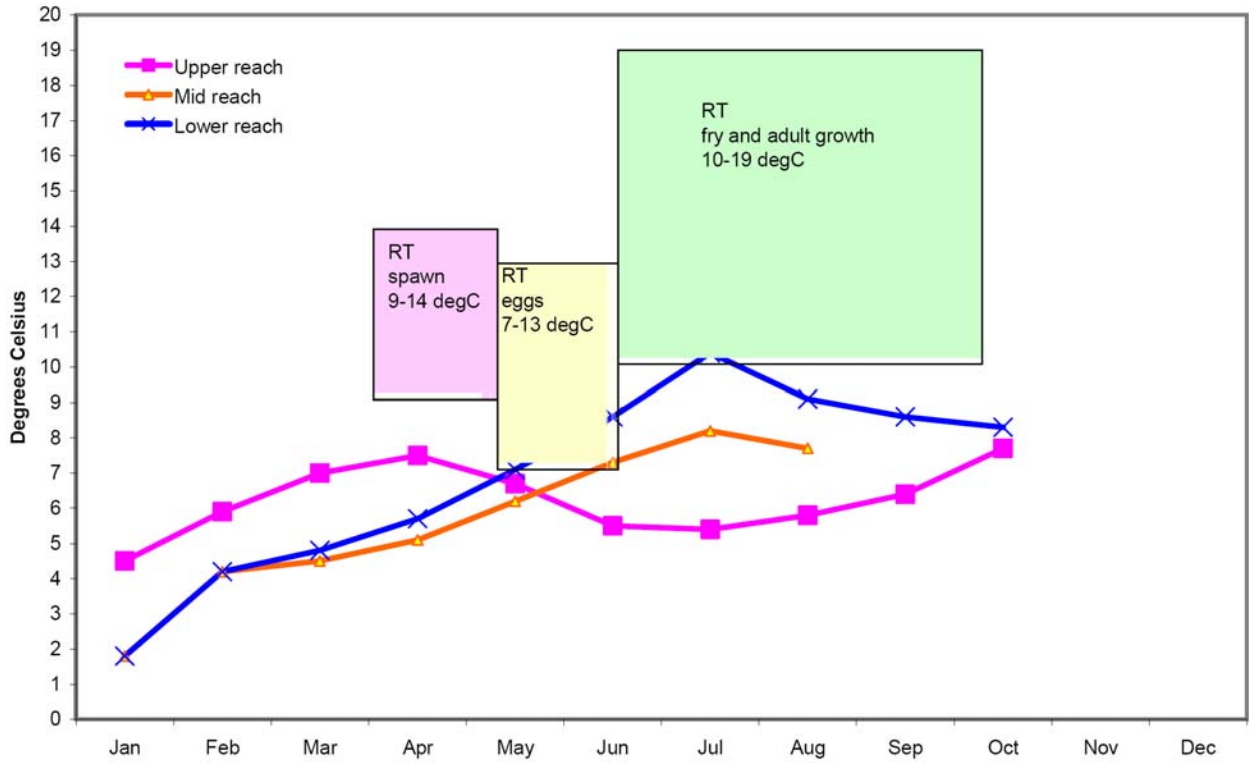


Figure 3-5. Mean daily water temperatures measured in 2005 in the Little Grass Valley dam reach and temperature preference ranges identified by Cal Fish & Game. (Source: Cal Fish & Game, 2008)

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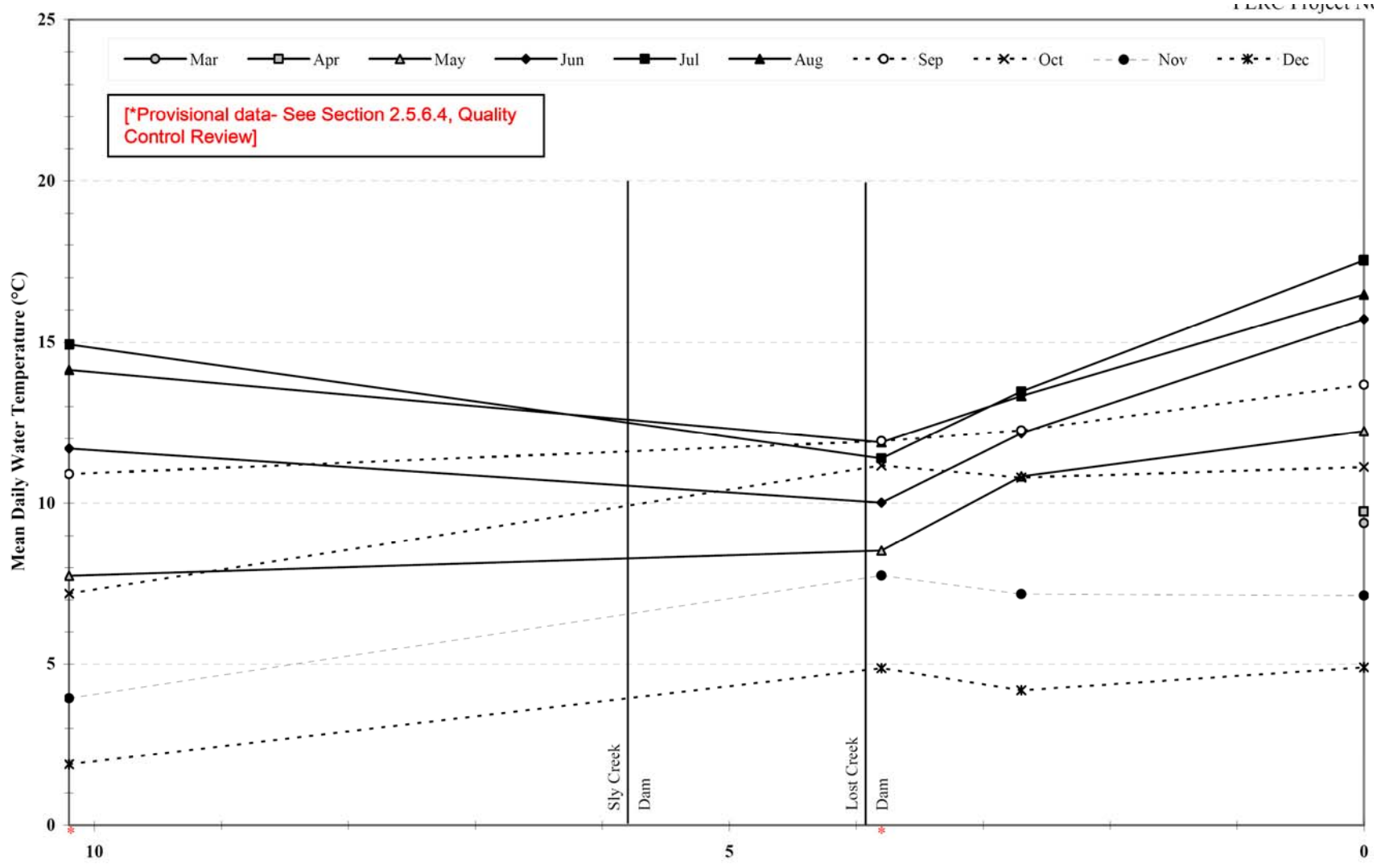


Figure 3-6. Seasonal temperature trends by river mile in Lost Creek in 2004. (Source: South Feather, 2007)

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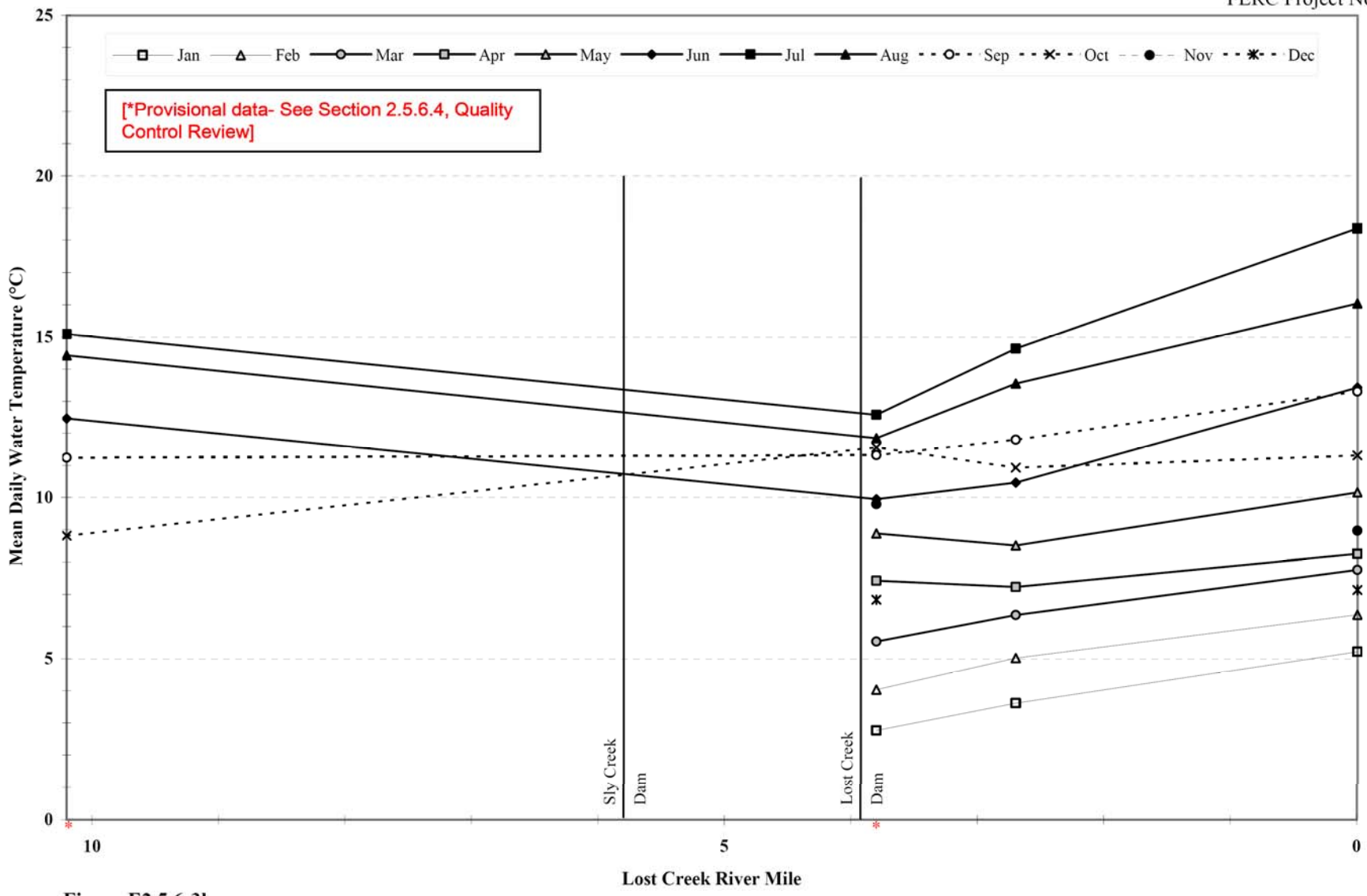


Figure 3-7. Seasonal temperature trends by river mile in Lost Creek in 2005. (Source: South Feather, 2007)

Similarly, water temperatures directly downstream of the dam did not rise above the 12°C threshold required for FYLF breeding in any month during 2004, and did not rise above 12°C until August in 2005, and never rose above this level at this location in 2004. Because higher flows would increase water depth and reduce travel time, they would reduce the rate that water warms as it moves through the reach in the spring and summer months. As a result, it is likely that the higher flows recommended by Cal Fish & Game and specified by the Forest Service would delay the attainment of water temperatures suitable for rainbow trout spawning and for FYLF breeding in downstream portions of the reach, where differences in water temperature under the two flow regimes would be the most substantial.

The higher minimum flows recommended by Cal Fish & Game and specified by the Forest Service for the reach below Little Grass Valley dam would cause Little Grass Valley reservoir to be drawn down to lower levels in the summer and to not fill to as high a level as currently occurs, particularly during Below Normal and Dry water years. Figure 3-8 shows simulated water levels that South Feather filed with its alternative 4(e) recommendation comparing water levels that would occur under current operation, Forest Service's preliminary 4(e) flows (which are the same as Cal Fish & Game's recommended flows for this reach) and South Feather's alternative 4(e) flows based on hydrology from 1973 through 2000. Similar effects on reservoir surface area are also apparent, as figure 3-9 shows. These reduced water levels and surface area could cause some adverse effects on bald eagle foraging and on reservoir aesthetics and recreation, as discussed in sections 3.3.3, *Terrestrial Resources*, and 3.3.6, *Recreation Resources*). The average drawdown from full pool in Below Normal and Dry water years under each of these flow regimes are summarized in tables 3-14 and 3-15, respectively. The flows specified by the Forest Service in their final 4(e) condition are lower than the flows that they prescribed in their preliminary 4(e) condition, and would have less effect on water levels, but would still have greater effects than South Feather's alternative 4(e) condition.

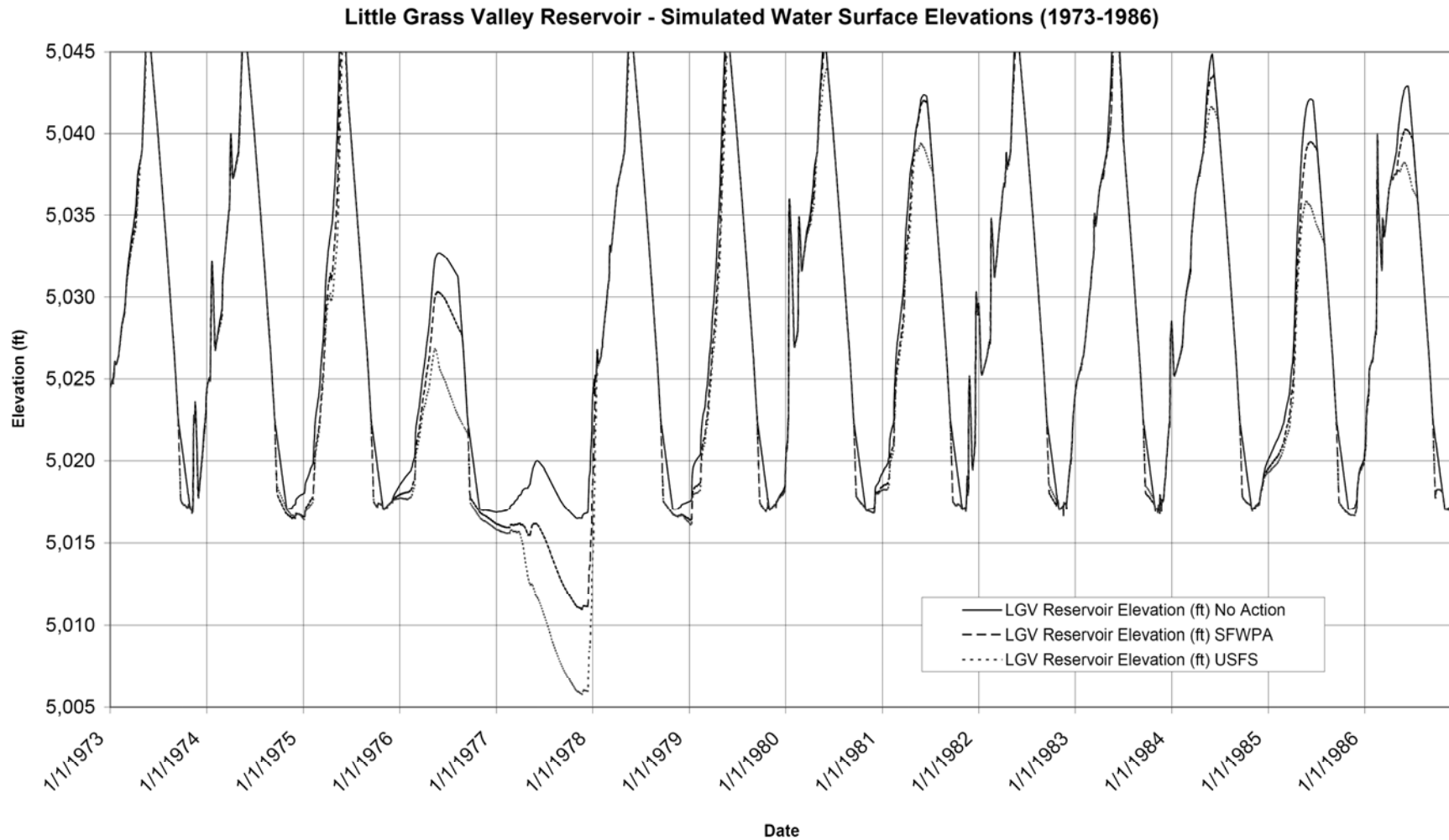


Figure 3-8. Simulated water surface elevations in Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service's preliminary 4(e) flows, and South Feather's alternative 4(e) proposed flows. (page 1 of 2) (Source: South Feather, 2008)

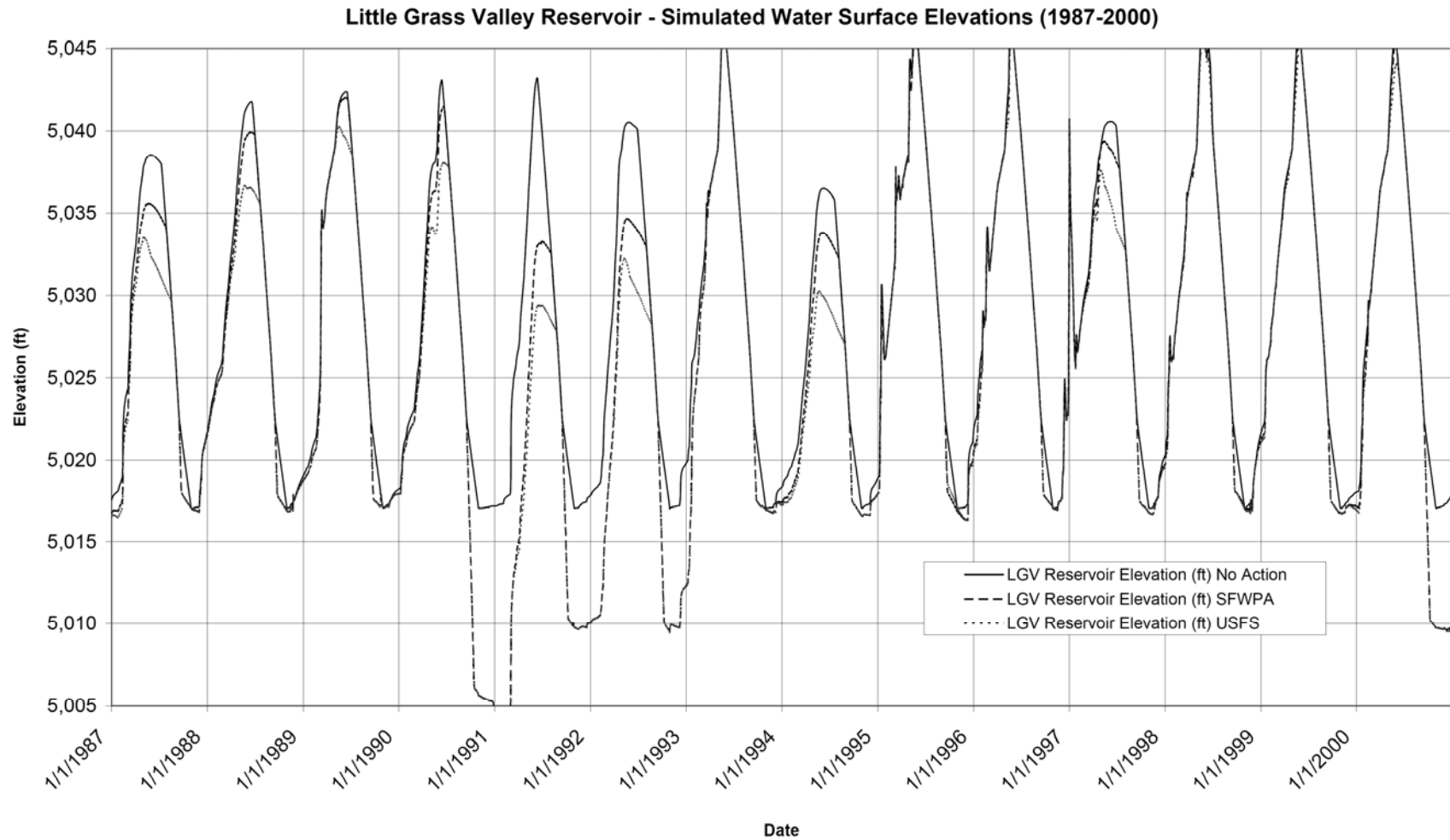


Figure 3-8. Simulated water surface elevations in Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service's preliminary 4(e) flows, and South Feather's alternative 4(e) proposed flows. (page 2 of 2) (Source: South Feather, 2008)

Little Grass Valley Reservoir - Simulated Water Surface Areas (1973-1986)

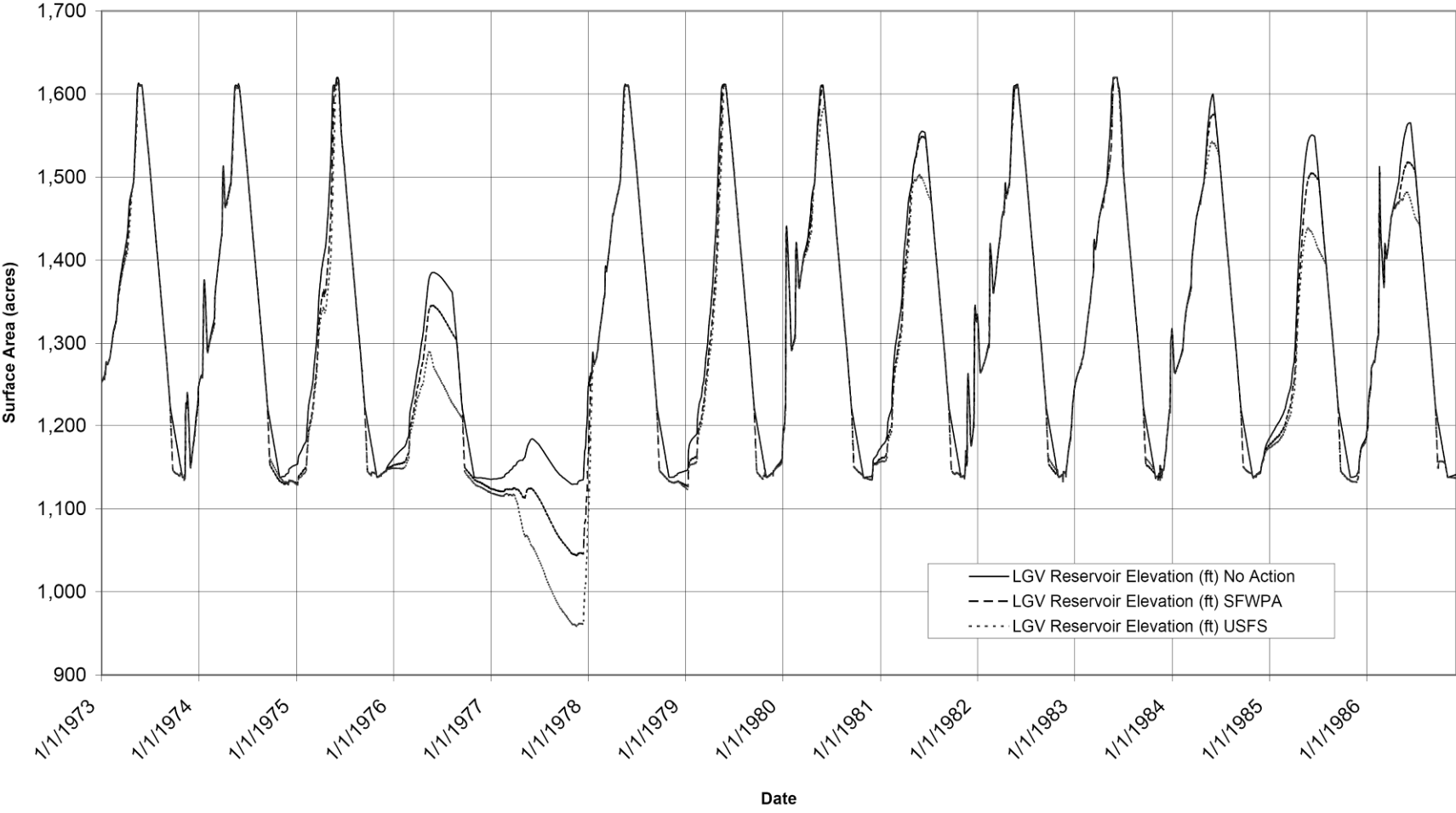


Figure 3-9. Simulated surface area of Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service’s preliminary 4(e) flows, and South Feather’s alternative 4(e) proposed flows. (page 1 of 2) (Source: South Feather, 2008)

Little Grass Valley Reservoir - Simulated Water Surface Areas (1987-2000)

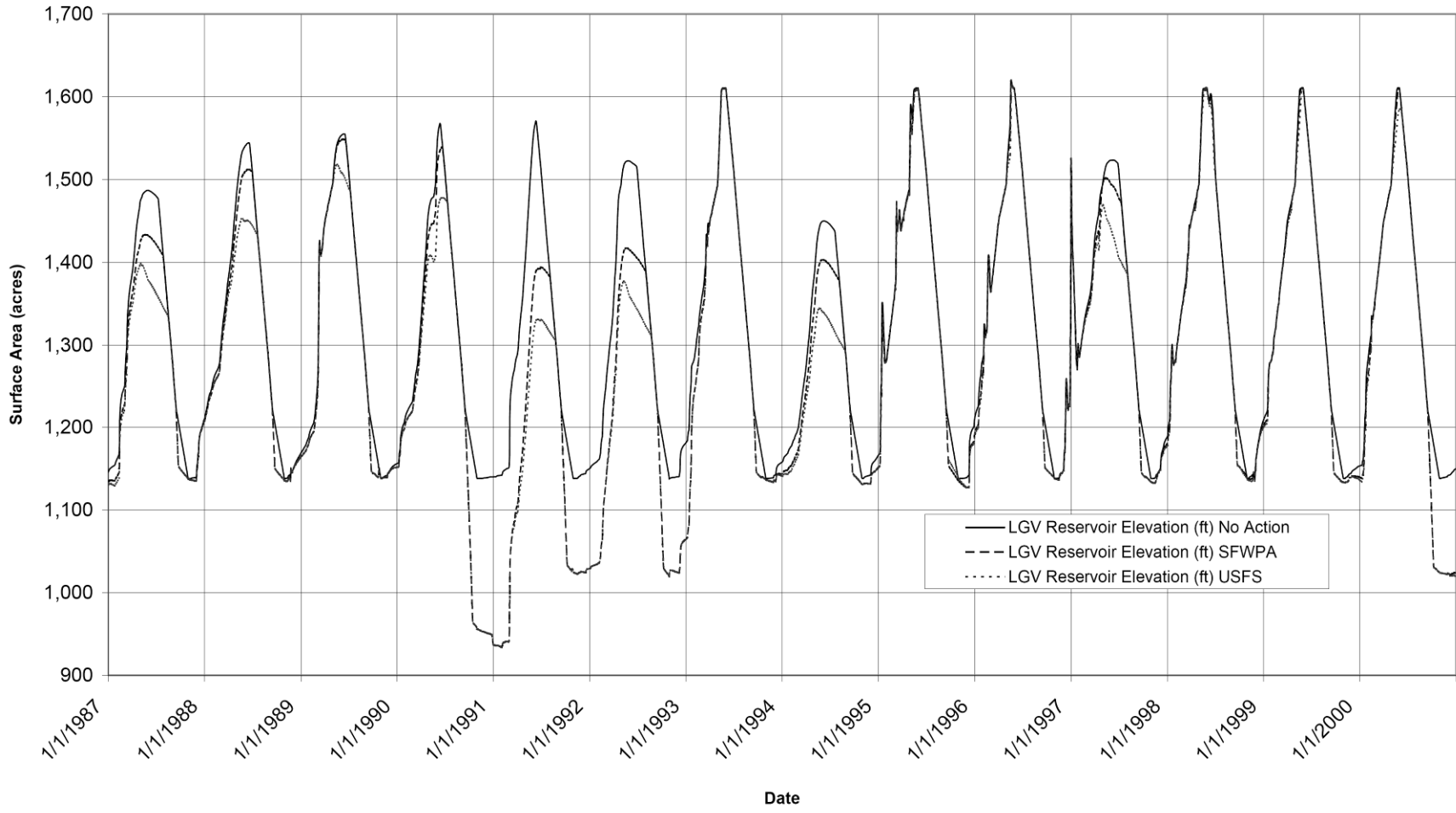


Figure 3-9. Simulated surface area of Little Grass Valley reservoir from 1973 to 2000 under current operation, Forest Service’s preliminary 4(e) flows, and South Feather’s alternative 4(e) proposed flows. (page 2 of 2) (Source: South Feather, 2008, South Feather May 14, 2008, EPAAct filing)

Table 3-14. Comparison of Little Grass Valley drawdown from normal full pool (feet) for current operation, Cal Fish & Game’s 10(j) minimum flows, Forest Service’s 4(e) minimum flows, and South Feather’s alternative 4(e) minimum flows (adopted into staff alternative), in below normal water years. (Source: South Feather, 2008b, May 29, 2008, reply comments)

Month	No-action Alternative	South Feather’s Alternative Condition	Forest Service’s Preliminary 4(e) Condition No. 18, Part 1	Cal Fish & Game’s 10(j) Rec. 1
May 31 (Memorial Day)	-2.5	-3.3	-5.5	-5.5
July 4 (Independence Day)	-6.4	-6.4	-8.0	-8.0
August 1	-12.3	-12.3	-12.3	-12.3
September 1 (Labor Day)	-19.3	-19.3	-19.3	-19.3
September 15	-23.0	-23.2	-23.2	-23.2

Table 3-15. Comparison of Little Grass Valley drawdown from normal full pool (feet) for current operation, Cal Fish & Game’s 10(j) minimum flows, Forest Service’s 4(e) minimum flows, and South Feather’s alternative 4(e) minimum flows (adopted into staff alternative), in **Dry water years**. (Source: South Feather, 2008b, May 29, 2008, reply comments)

Month	No-action Alternative	South Feather’s Alternative Condition	Forest Service’s Preliminary 4(e) Condition No. 18, Part 1	Cal Fish & Game’s 10(j) Rec. 1
May 31 (Memorial Day)	-8.9	-12.9	-16.6	-16.8
July 4 (Independence Day)	-10.3	-13.3	-17.0	-17.2
August 1	-14.4	-15.5	-18.8	-18.9
September 1 (Labor Day)	-20.5	-21.1	-22.2	-12.3
September 15	-23.7	-24.5	-25.2	-25.2

Ramping Rates

Rapid changes in streamflow have the potential to strand and kill young fish and macroinvertebrates (Bradford et al., 1995; Hunter, 1992; Huntington, 2004), and may also cause adverse effects on amphibians including FYLF. Because each of the powerhouses discharge into reservoirs or diversion pools, peaking operation of the South Feather Power Project does not cause flows or water levels in riverine reaches to fluctuate. However, upramping and downramping would occur occasionally when spill flows end and when flow releases proposed for geomorphic purposes and to support whitewater recreation are implemented.

South Feather does not propose to implement any ramping rates except when geomorphic flow releases are made into Lost Creek (see section 3.3.1, *Geology and Soils*), when South Feather intends to make a good faith effort to ramp up to the supplemental streamflow at a rate of no more than 400 percent of the previous mean daily streamflow as measured at USGS gage no. 11396000, and to ramp down from the supplemental streamflow at a rate of no more than 50 percent of the previous mean daily streamflow as measured at USGS gage no. 11396000. These ramp rates are consistent with the 1997 license order that revised minimum flow requirements in Lost Creek.

Cal Fish & Game filed a 10(j) recommendation that would require ramping rates to be limited to 0.5 foot per hour during increase and decreases in flow to minimize the potential for causing stranding of fish.

Our Analysis

South Feather did not conduct any analyses of the potential for fish stranding to occur in the project reaches. However, because each of the powerhouses discharge into reservoirs or forebays, the riverine sections within the project area are not subject to daily flow fluctuations caused by load following operations. There is, however, some potential for fish stranding at times when flows are reduced when spill flows end and when proposed flow releases to provide whitewater boating opportunities or geomorphic flows come to an end. In these cases, implementing the 0.5 feet/hr ramping rate recommended by Cal Fish & Game would help to limit the potential for stranding of fish and macroinvertebrates. Although ramping rates as low as 0.2 feet/hour are frequently recommended in riverine reaches at many hydroelectric projects, the potential for fish stranding at the project is limited by the low frequency of flow changes in the riverine reaches affected by project operation and the relatively high gradient and confined channel present in many of the reaches.

Flow Monitoring, Determination of Water Year Type, and Water Management during Extended Drought Conditions

South Feather proposes to monitor compliance with minimum flows using existing USGS flow gages in each reach. On the SFFR, these are USGS flow gage no. 11395030 for the Little Grass Valley dam reach, USGS flow gage no. 11395200 for the South Fork

diversion dam reach, and USGS flow gage no. 11396200 for the Forbestown diversion dam reach. On Lost and Slate creeks, these are USGS flow gage no. 11396000 for the Lost Creek dam reach and USGS flow gage no. 11413300 for the Slate Creek diversion dam reach.

Cal Fish & Game filed a 10(j) recommendation and the Forest Service filed an identical 4(e) condition specifying that South Feather operate and maintain existing gages, under USGS supervision, that are needed to determine the river stage and minimum streamflow below Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam. The condition also specifies that any modification of these gage facilities that may be necessary to measure the new minimum streamflow releases be completed within 3 years after issuance of a new license, that flows be documented in publicly available and readily accessible formats, that flow data be subject to QA/QC review by South Feather before it is made available to USGS for review and publication on the internet. The condition further specifies that the flow values (generally 15-minute recordings) used to construct the 24-hour average flows be made available to the resource agencies upon request.

The Forest Service also filed preliminary 4(e) conditions specifying the methodology that would be followed to determine the water year type that would guide the implementation of minimum flows, and to consult with stakeholders to develop an operating plan to manage flows during drought conditions. Forest Service filed revised 4(e) conditions that superseded each of these measures, and South Feather indicated in its reply comments that it did not object to either of these revised measures, which we now consider to be part of South Feather's licensing proposal.

To determine water type, the revised 4(e) condition specifies that South Feather use the forecast of unimpaired runoff in the Feather River at Oroville that is provided in DWR Bulletin 120 report each month from February through May. A wet water year would be defined as having a forecast greater than or equal to 7.1 million acre feet (MAF), an Above Normal water year would be defined as having a forecast greater than or equal 4.0 MAF, but less than 7.1 MAF, a Below Normal water year would be defined as having a forecast greater than 2.4 MAF¹⁴ or equal to but less than 4.0 MAF, and a Dry water year would be defined as having a forecast less than or equal to 2.4 MAF.

¹⁴ The wording of the revised 4(e) condition as filed defines a Below Normal water year as "greater than 2.4 MAF or equal to but less than 4.0 MAF" and an Above Normal water year as "greater than or equal to 4.0 MAF but less than 7.1 MAF" which is unclear as to whether 4.0 MAF would be considered to be a Below Normal or an Above Normal water year. We have assumed that the intent was to define the Below Normal year as being "greater than 2.4 MAF but less than 4.0 MAF."

Each February through May, South Feather would determine the water year type based on the Bulletin 120 water year forecast and would operate for the month based on that forecast. The May forecast would be used to establish the final water year type for the remaining months of the water year. South Feather would provide notice to the Forest Service, the Commission, and other interested governmental agencies of the final water year type determination within 30 days of making the determination. The water year types from February through April would apply from the 15th day of the month in which DWR issues Bulletin 120 to the 14th day of the next month. From May 15 to October 14, the water year would be based on DWR's Bulletin 120 issued in May. From October 15 through February 14, the water year type would be based on DWR's Full Natural Flow record issued in October.

To address the potential need to modify operation during drought conditions, the revised Forest Service 4(e) condition specifies that by March 15 of the second or subsequent Dry water year, South Feather would notify the Forest Service and other interested governmental agencies of South Feather's drought concerns. By May 1 of the same year South Feather would consult with representatives from the Forest Service and other interested governmental agencies to discuss operational plans to manage the drought conditions. If the parties specified above agree on a revised operational plan, South Feather may begin implementing the revised operational plan as soon as it files documentation of the agreement with the Commission. If unanimous agreement is not reached, South Feather would submit the revised proposed plan that incorporates as many agency issues as possible to the Commission, as well as both assenting and dissenting comments, request expedited approval, and implement the proposed plan until directed otherwise by the Commission.

Our Analysis

Funding the continued O&M of the USGS gages in each of the affected reaches, including any modifications that may be required to accurately measure minimum flows or ramping rates that are included in a new license, would help to ensure that these gages remain functional and can be used to effectively monitor compliance with flow-related measures included in the license. Funding the operation of the gages also would help to ensure that flow data continues to be available to other water users in the basin and to the general public. Provision of flow data recorded at 15-minute intervals to the agencies upon request would help to verify compliance with any instantaneous flows and ramping rates that are included in the license.

Specifying the methodology for determining water year type would be an essential requirement for determining compliance with minimum flows under the new license, and the methodology specified by the Forest Service and agreed to by South Feather would fulfill this requirement.

Identifying the specific procedures that would be followed if deviation from license conditions is needed during drought conditions will expedite water management

decisions that may be needed to protect beneficial uses including water diversions for municipal and agricultural uses. The approach specified by the Forest Service provides an efficient approach to allow needed changes in project operation to occur in a manner that would allow the Commission to promptly address any agency concerns that were not fully addressed in the proposed temporary operating plan.

Yuba River Reopener

Diversion of water from Slate Creek reduces the volume of water that is contributed to the North Yuba River via Slate Creek. The Yuba County Water Agency operates the Yuba River Development Project (FERC No. 2246), which is associated with New Bullards Bar reservoir on the North Yuba River and Englebright Lake on the Yuba River. The Yuba County Water Agency recommends that the Commission reserve authority to require South Feather to make reasonable provisions for modifying project facilities or operation as necessary to mitigate or avoid cumulative effects identified in any environmental analysis of the Yuba River Development Project. They indicate that this reservation would be applicable in the context of any relicensing or license amendment proceeding involving the downstream Yuba River Development Project.¹⁵

Our Analysis

We include analysis in this document of the cumulative effects of relicensing the South Feather Power Project on water resources, including the effects of measures that would reduce the project's contribution to cumulative effects on water resources in the Yuba River basin. Under the National Environmental Policy Act, it would be appropriate to analyze and address any cumulative effects that may be associated with future changes in the operation of the Yuba River Development Project in the proceeding that addresses the effects of those changes in operation of the Yuba River Development Project

Water Temperatures Downstream of Kelly Ridge Powerhouse

The Kelly Ridge powerhouse discharges into the Thermalito diversion pool, part of the Oroville Project, just downstream of the tailrace of the Oroville Project's Hyatt pump-generating powerhouse. The combined flow from these powerhouses (up to 261.8 cfs from the Kelly Ridge powerhouse and up to about 16,000 cfs from the Hyatt powerhouse) proceeds downstream to the Oroville Project's Thermalito diversion dam, where DWR can either (1) pump the water back up into Lake Oroville, using the Hyatt powerhouse's reversible turbines; (2) pass the water through the Thermalito diversion dam powerhouse into the Oroville Project's low flow channel; (3) divert the water through the Oroville Project's Thermalito power canal into Thermalito forebay from where it flows through the Thermalito powerhouse and into the Thermalito afterbay, from where it can be (a) pumped back into Lake Oroville through the Thermalito and Hyatt

¹⁵ The license for the Yuba River Development Project expires on March 31, 2016.

powerhouses; (b) released into the Feather River downstream of the afterbay (known as the high flow channel); or (c) diverted directly into the Sutter Butte canal, Western lateral, Richvale canal, and Western canal. Cal Fish & Game withdraws about 110 cfs at the Thermalito diversion dam for use at the Feather River Fish Hatchery, located along the low flow channel (figure 3-10).

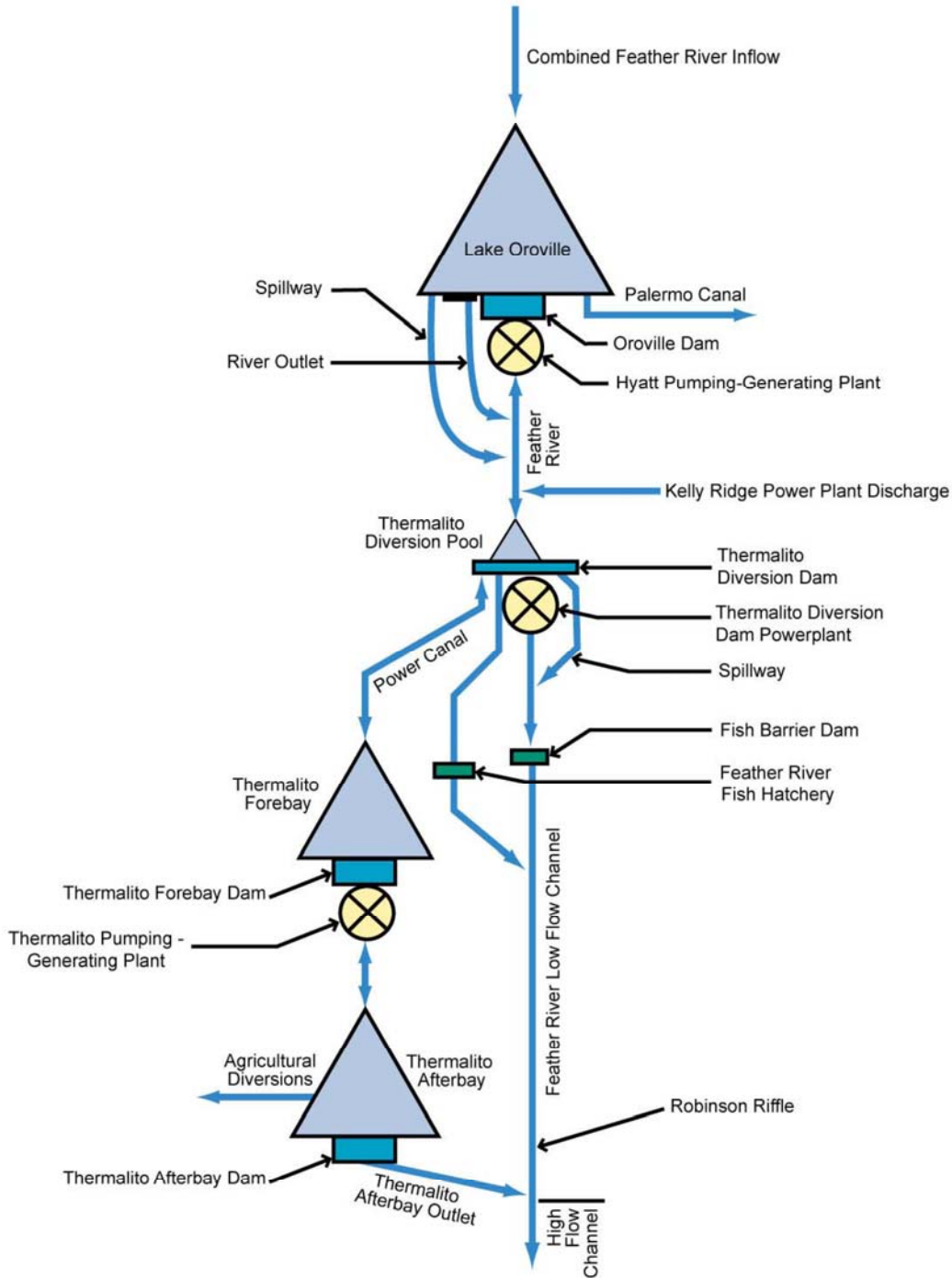


Figure 3-10. Oroville Facilities flow diagram. (Source: Reclamation, 2008)

The Feather River Fish Hatchery, a project facility of DWR's Oroville Project (FERC No. 2100) was built during construction of the Oroville Project as mitigation for Oroville dam's blocking of anadromous fishes to spawning areas upstream of the dam site and for the project's impacts on flow regime.¹⁶ Cal Fish & Game operates the hatchery in conjunction with DWR and spawns about 9,000 to 18,000 salmon and 2,000 steelhead annually, producing 8 million fall-run Chinook salmon, 5 million spring-run Chinook salmon, and 400,000 steelhead (NMFS, 2004, cited in FERC, 2007). The spring-run Chinook and steelhead stocks reared at the hatchery are considered by NMFS to be part of the Central Valley spring-run Chinook salmon and the California Central Valley steelhead ESUs, both of which are listed as threatened by NMFS. The spring-run Chinook stock is listed as endangered by the state of California.

Generation flows from the Kelly Ridge powerhouse can influence water temperatures in the upper portion of the Thermalito diversion pool and, to a lesser degree, points downstream, including potentially the Feather River Hatchery intake. This influence is greatest when the Hyatt powerhouse is shut down, intermediate at normal summer Hyatt powerhouse releases of 4,000 – 8,000 cfs, and likely negligible at flows of 10,000 cfs and above, as the proportion of total flow contributed by the Kelly Ridge powerhouse decreases. The difference in water temperature between Kelly Ridge powerhouse flows and Hyatt powerhouse flows is greatest during the summer and is due to the fact that Kelly Ridge flows originate as warm surface withdrawals from Miners Ranch reservoir, while Hyatt flows come from a deep, cool water intake in Lake Oroville. Although Hyatt summer releases are cool, the water subsequently warms as it resides in the Thermalito diversion pool, the Thermalito forebay, and the Thermalito afterbay.

Other aspects of Oroville Project operation besides Hyatt powerhouse flows can influence the effects that Kelly Ridge powerhouse generation flows have on downstream water temperatures. DWR can regulate the temperature of water released from Lake Oroville using the existing multi-level Hyatt intake structure, which is capable of withdrawing water from a wide range of depths. Cold water can also be released through the river outlet at the dam, which draws water at a depth between 90 and 350 feet, depending on the reservoir elevation. Pumpback operation at Hyatt and Thermalito powerhouses and the surface elevation of Lake Oroville can also affect downstream water temperatures. South Feather has limited capability to adjust the temperature of its releases at the Kelly Ridge powerhouse, although some reduction in water temperatures may be possible by drawing down Miners Ranch reservoir to its minimum operating pool

¹⁶ Mean monthly flows through the low flow channel are now 5 to 38 percent lower than pre-dam levels, and total flow is presently lower than historical levels during February through June, but higher July through January. Mean monthly water temperatures in the low flow channel are 2 to 14°F cooler during May through October and 2° to 7°F warmer during November through April (Sommer et al., 1983).

or by operating Kelly Ridge powerhouse at its maximum capacity, both of which would reduce residence time and warming that occurs in Miners Ranch reservoir.

Under the Oroville Relicensing Settlement Agreement, DWR committed to meet certain water temperature targets at Robinson Riffle in the low flow channel and at the Feather River Fish Hatchery. The temperature targets are designed to protect listed steelhead and Chinook salmon at the hatchery and in the Feather River downstream from the hatchery fish barrier dam. Meeting temperature requirements sometimes dictates the timing of pumping and generation operations at the DWR's Oroville facilities (DWR, 2005), both historically and under the Settlement Agreement.

To ensure the Oroville Project would consistently meet the proposed flow and temperature objectives contained in the Settlement Agreement, DWR proposed to study the feasibility of making structural modifications, which, at a minimum, would include one of the following: (1) Palermo canal improvements, (2) Hyatt intake extensions, (3) replacement of the river valves with valves specifically designed to incrementally control water releases, (4) construction of a diversion canal around or through the Thermalito afterbay, and (5) construction of an alternative outlet to the Thermalito afterbay. DWR has committed to implementing one or more facility modifications or other actions that the feasibility study suggests are most effective in terms of meeting low and high flow temperatures. Before physically modifying the facility, DWR would perform a comprehensive reconnaissance study, in consultation with resource agencies, and prepare both a feasibility report and an implementation plan for modifying the facility to improve temperature conditions in the low flow and high flow channels and allow DWR to meet other water resource obligations (e.g., anadromous fish needs, flood control, recreational needs, water deliveries). The study plan, feasibility report, and implementation plan as well as documentation of consultation would be filed with the Commission within 3 years of license issuance. During the interim period, DWR would attempt to meet the temperature objectives at the fish hatchery through either (or in combination) releases from the river outlet at the base of Oroville dam, eliminating pump-back operations, or removing stoplogs at the Hyatt intake structure (FERC, 1997).

Because, under some conditions, generation at the Kelly Ridge powerhouse can incrementally increase water temperatures in the upper portion of the Thermalito diversion pool and can potentially affect DWR's selection of an operational strategy for meeting the Settlement Agreement water temperature targets, several agencies proposed recommendations pertaining to downstream water temperatures in this proceeding.

DWR, NMFS, and the State Water Contractors and Metropolitan Water District (SWC/MWD) recommend requiring South Feather to curtail or cease power generation at the Kelly Ridge powerhouse when the temperature of water released from the powerhouse exceed specified values (table 3-16). SWC/MWD recommends limiting discharges to 100 cfs when these temperatures are exceeded, while DWR and NMFS recommend that no water be discharged from the powerhouse. Cal Fish & Game recommends that South Feather take all reasonable actions including curtailing releases

from the powerhouse to conform with temperatures specified in the Oroville Settlement Agreement, which includes the Cal Fish & Game temperatures in table 3-16 and also attainment of the following maximum temperatures in the low flow channel downstream of the Hyatt powerhouse: 56°F from January through April, 56 to 63°F for May 1-15, 63°F from May 16 through August 31, 63 to 58°F from September 1-8, 58°F from September 9-30, and 56°F from October 1 to December 31.

Table 3-16. Maximum temperature criteria¹⁷ recommended by DWR, Cal Fish & Game, NMFS, and SWC/MWD for guiding Kelly Ridge powerhouse operations. (Source: Staff)

Date	DWR, Cal Fish & Game	NMFS	SWC/MWD
September 1 – 30	56°F (13.3°C)	58°F (14.4°C)	59°F (15.0°C)
October 1 – May 15	55°F (12.8°C)	56°F (13.3°C)	58°F (14.4°C)
May 16 – 31	59°F (15.0°C)	63°F (17.2°C)	62°F (16.7°C)
June 1 – 15	60°F (15.6°C)	63°F (17.2°C)	63°F (17.2°C)
June 16 – August 15	64°F (17.8°C)	63°F (17.2°C)	67°F (19.4°C)
August 16 - 31	62°F (16.7°C)	63°F (17.2°C)	65°F (18.3°C)

Our Analysis

South Feather monitored water temperature at several locations in the summers of 2005 – 2007. During 2007, water temperature was monitored at the following locations in the flow path leading to Kelly Ridge powerhouse (listed upstream to downstream): (1) Miners Ranch conduit inlet below Ponderosa dam (MRC 6.2); (2) Miners Ranch tunnel inlet (MRC 0.0); (3) Miners Ranch reservoir inlet (MRR); 4) Miners Ranch water treatment plant laboratory; and (5) Kelly Ridge powerhouse. Mean daily water temperature at Kelly Ridge powerhouse ranged from 13.0°C on April 22 to about 22.3°C on August 31 (sampling dates April 1 – September 16, 2007) (figure 3-11). The monitoring also showed that water temperature increases from the inlet to Miners Ranch reservoir to Kelly Ridge powerhouse ranged from about 1.0° to about 3.0°C (figure 3-12). The greatest differences occurred in July and August, suggesting that these increases are likely due to seasonal heating of water as it resides in Miners Ranch reservoir.

¹⁷ DWR, NMFS, and SWC/MWD recommend that these temperature criteria be applied to outflows from the Kelly Ridge powerhouse, while Cal Fish & Game’s criteria would be applied at the intake to the Feather River Hatchery.

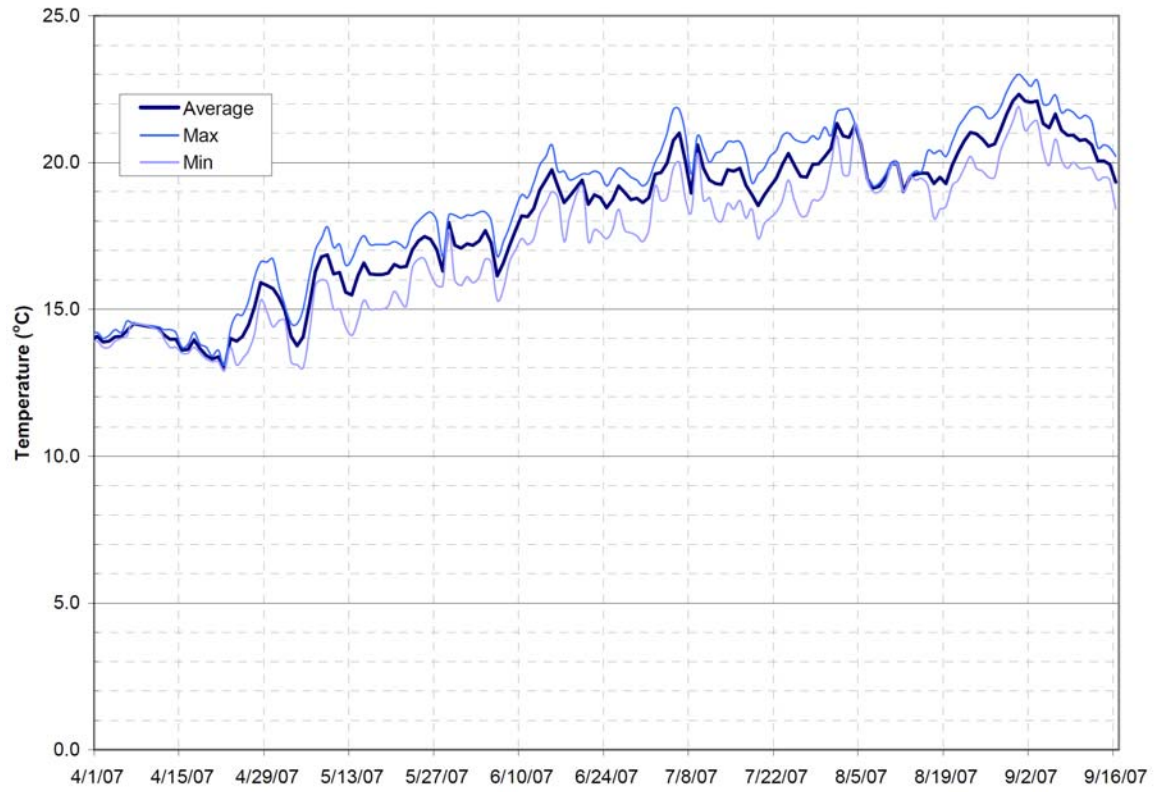
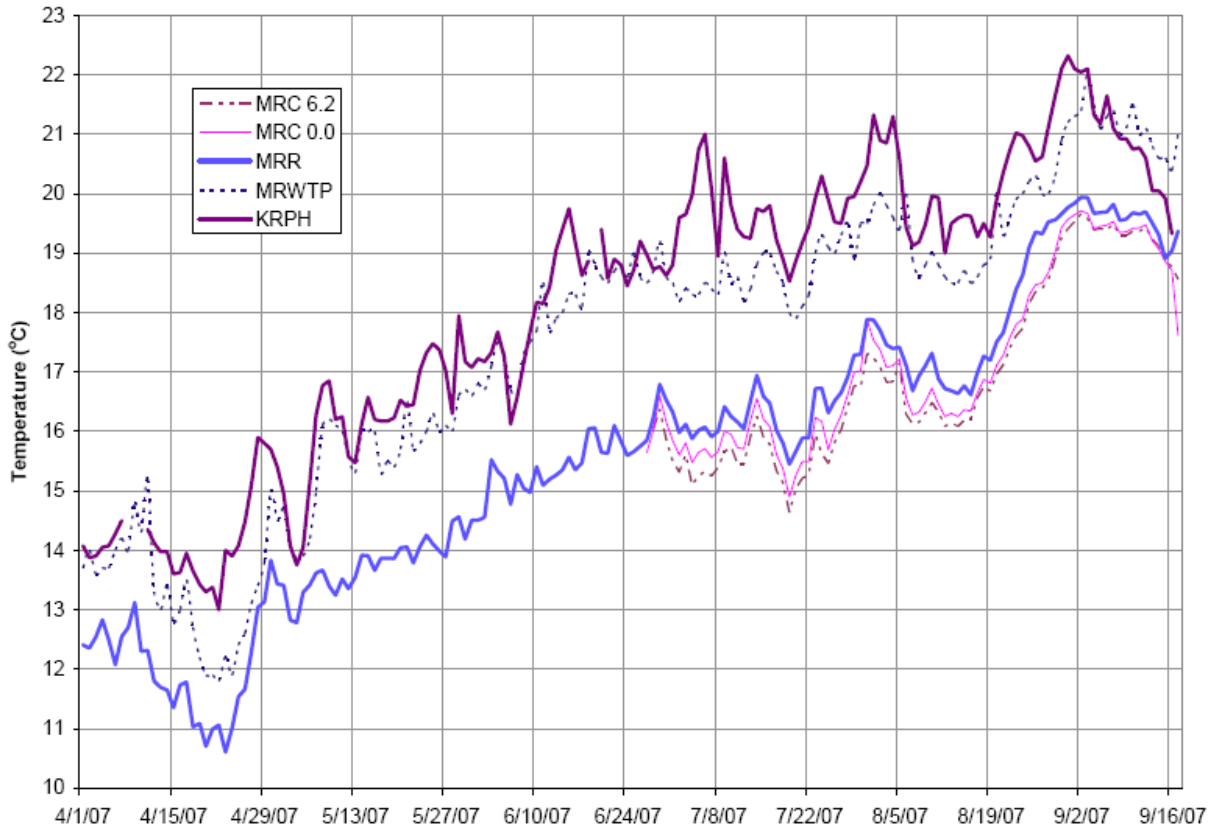


Figure 3-11. Daily average, maximum, and minimum water temperatures (°C) collected at Kelly Ridge powerhouse in 2007. (Source: Stillwater Sciences, 2007)



Note: MRC 6.2 = entrance to Miners Ranch conduit; MRC 0.0 = downstream end of Miners Ranch conduit; MRR = inlet to Miners Ranch reservoir; MRWTP = Miners Ranch water treatment plan; and KRPH = Kelly Ridge powerhouse.

Figure 3-12. Daily average temperatures (°C) collected at locations from the inlet of Miners Ranch conduit downstream through Kelly Ridge powerhouse in 2007. (Source: Stillwater Sciences, 2007)

Although the maximum quantity of water contributed to the Thermalito diversion pool from the Kelly Ridge powerhouse is small in comparison to the maximum flows from the Hyatt powerhouse (261.8 cfs versus up to 16,000 cfs, respectively), the projects are not always operated at maximum flow, and, in fact, depending on water year, among other factors, Hyatt powerhouse is shut down during the evening and early morning hours.¹⁸ To assess the effects of discharges from Kelly Ridge powerhouse on water temperatures in the Thermalito diversion pool, DWR monitored water temperatures at the discharge from Kelly Ridge powerhouse and at locations in the Thermalito diversion pool approximately 1,000 feet upstream and downstream from the powerhouse during the

¹⁸ DWR letter to the Commission dated February 11, 2008.

period from August 2 through September 14, 2008.¹⁹ DWR reported that, during this time period, the average water temperature downstream of the powerhouse was 0.94°F warmer than the temperature measures upstream of the powerhouse, and the maximum instantaneous temperature difference was 14.08°F on August 30 at 11:45 PM. For temperatures measures at the discharge of the Kelly Ridge powerhouse, water temperatures were on average 2.54°F higher than they were at the upstream location, and the maximum instantaneous difference was 11.58°F. Although DWR did not provide information on the average outflows from the Hyatt powerhouse during the monitored time period, they report that Hyatt releases were less than 2,000 cfs more than half of the time, and less than 231 cfs 27 percent of the time. Based on information obtained from DWR's website (<http://cdec.water.ca.gov/selectQuery.html>, accessed April 8, 2009), we estimate that the average outflow from Oroville reservoir during this time period was 3,507 cfs. Outflows from Kelly Ridge powerhouse during this time period averaged 237 cfs, or 6.3 percent of the combined outflow from Oroville and Kelly Ridge powerhouse.

As noted above, DWR's sampling location for the 13,350 acre-foot diversion pool was located only about 1,000 feet downstream of the Kelly Ridge powerhouse, and more than 5 miles upstream of the water temperature compliance points located at the fish hatchery and at Robinson Riffle. While this location is well suited to show differences between Hyatt and Kelly Ridge releases, it is of minimal value in demonstrating the effects of Kelly Ridge releases on water temperature in the vicinity of the water temperature compliance points and downstream anadromous fishes.

We note that even in the worst-case scenario of no releases from Oroville's Hyatt powerhouse and 24 hour-per-day maximum generation at Kelly Ridge, the small volume of Kelly Ridge powerhouse releases compared to the volume of the diversion pool, Kelly Ridge releases displace only 3.89 percent of the water in the diversion pool on a daily basis. As such, we consider it unlikely that Kelly Ridge releases have an appreciable effect on water temperature in the main body of the diversion pool or points downstream.

Nonetheless, shutdown of the Kelly Ridge powerhouse during periods when the temperature of powerhouse outflows is high and Hyatt powerhouse releases are low, as has been done in the past, could be one method to help DWR meet its downstream temperature objectives and would forestall the need for DWR to make additional cool water releases from Lake Oroville to meet temperature targets. Excess water not passed through the Kelly Ridge powerhouse may need to be spilled into Lake Oroville at the Ponderosa dam, depending on inflow to Ponderosa reservoir, its elevation at the start of the shutdown, the length of the shutdown, and the magnitude of consumptive deliveries from Miners Ranch reservoir. This would provide up to 31,149 acre-feet of water²⁰ that

¹⁹ DWR letter to the Commission dated March 24, 2009.

²⁰ Based on a 60-day shutdown at Kelly Ridge's maximum capacity of 261.8 cfs.

would then be available to DWR for generation, consumptive water supply, or for meeting downstream environmental objectives, which could include DWR's temperature objectives, or water quality objectives further downstream, including the Bay-Delta. Of course, this approach would preclude South Feather from realizing the benefits of using this water for generation.

Periodic shutdown of the Kelly Ridge powerhouse at critical times may also assist DWR with meeting its temperature objectives during the interim before DWR identifies and implements the structural modifications to improve temperature control discussed above. Improving compliance with the temperature objectives identified in the Oroville Settlement Agreement could benefit anadromous fish by reducing the potential for stress and mortality of adult broodstock, eggs, or juvenile salmon and steelhead caused by exposure to high water temperatures.

However, shutting down or reducing flows through the Kelly Ridge powerhouse may result in increased warming of Miners Ranch reservoir, which may exacerbate downstream temperature problems when generation resumes at Kelly Ridge powerhouse. In their comments on the draft EIS, SWC/MWD noted that this adverse effect could be minimized by drawing Miners Ranch reservoir down to its minimum operating level before flows from Kelly Ridge powerhouse are reduced, and re-charging the reservoir with colder water from the Miners Ranch conduit prior to resuming full generation. Although we agree that this practice has the potential to reduce the volume of water in the reservoir that would be subject to warming during the period when Kelly Ridge outflows are curtailed or discontinued, the reservoir retains almost half of its normal volume at its minimum operating level of 878 feet (the intake to the Miners Ranch Treatment Plant) and this water would be subject to warming during the period in which outflows from Kelly Ridge are curtailed.

In their comments on the draft EIS, SWC/MWD recommend that installation of temperature control curtains in Miners Ranch reservoir to direct outflows from the Miners Ranch conduit to the powerhouse intake be considered as a means to reduce the amount of warming that occurs as water passes through the reservoir. Similarly, Cal Fish & Game note that a pipeline could be used for the same purpose, as has been proposed at the DeSabra-Centerville Project (FERC Project No. 803). Both these approaches would limit mixing with warmer water in the reservoir and would likely provide some reduction in the temperature of water that is discharged from Kelly Ridge powerhouse. Some degree of warming during passage through Miners Creek reservoir would still occur, however, so these approaches would likely be less effective than shutdown of the Kelly Ridge powerhouse as a means to assist with meeting the downstream water temperature objectives. Another drawback of temperature curtains is that they have a limited lifespan. Although the operational lifespan of temperature curtains is affected by site-specific conditions, operational experience with temperature curtains installed by Reclamation at Whiskeytown reservoir indicates that a lifespan of 15 or more years is possible.

Another alternative for reducing the temperature of outflows from Kelly Ridge powerhouse could be to increase Kelly Ridge powerhouse releases. This would decrease residence time in Miners Ranch reservoir, which would reduce reservoir water heating and hence the temperature of Kelly Ridge powerhouse releases. Operation of Kelly Ridge powerhouse at a continuous 261.8 cfs would deplete 519 acre-feet of the total maximum storage of Miners Ranch reservoir of 896 acre-feet in a 24-hour period. Continuing South Feather's average historical deliveries for consumptive deliveries would remove an additional 40 acre-feet per day, further decreasing residence time and reducing Miners Ranch reservoir temperatures during the summer. Increasing Kelly Ridge powerhouse flows in this manner could, however, negatively impact other resources, particularly lake levels.

Regardless, however, of any actions South Feather may take to reduce the temperature of Kelly Ridge powerhouse releases, it is ultimately the operation of the Oroville Project that determines whether any such reductions will be conveyed to DWR's downstream compliance points and ultimately provide a benefit for anadromous fishes.

As discussed in the next section, making real-time information on Kelly Ridge powerhouse flows and water temperatures available to DWR could help DWR in its decision-making process for managing its operations to comply with its temperature objectives more efficiently.

Water Temperature Monitoring

South Feather proposes to install and maintain a continuous water temperature monitor at the USGS gage downstream of the Slate Creek diversion dam and, to enhance the ability of Slate Creek to support trout, to cease diversions from Slate Creek whenever the mean daily water temperature is greater than 20°C for three consecutive days between June 1 and September 15. South Feather also proposes to install continuous temperature monitors in the downstream ends of the South Feather diversion dam and Forbestown reaches to provide information needed to ensure that whitewater flow releases do not occur during the FYLF breeding season. South Feather also monitors water temperatures at the Miners Ranch water treatment facility.

Cal Fish & Game recommends that South Feather monitor water temperatures in the SFFR immediately above the fish passage barrier in the Forbestown reach to demonstrate whether the recommended flows in the Forbestown reach are adequate to reduce temperatures to below 20°C. Cal Fish & Game also recommends that South Feather install and maintain continuous water temperature monitors at RM 8.9 on Slate Creek, at RM 28.3 on the Little Grass Valley dam reach of the SFFR, at RMs 8.1 and 9.1 on the South Fork diversion dam reach, and at the Kelly Ridge powerhouse. The monitors would be used to record water temperatures at one-hour intervals from May 1 through September 15 annually, and the data would be provided to Cal Fish & Game and other interested agencies in a technical report within 6 months following completion of each sampling effort.

NMFS recommends that South Feather maintain a temperature monitoring station in Miners Ranch reservoir at the Kelly Ridge intake and provide temperature data at 15-minute intervals in a format that is available to the public.

Our Analysis

Water temperature data collected from the proposed monitoring site on Slate Creek would provide information that would be needed to implement South Feather's proposed flow regime for Slate Creek, which includes shutdown when daily average water temperatures exceed 20°C for three consecutive days. Ceasing diversion under these conditions would benefit trout populations in Slate Creek downstream of the diversion, and would ensure the project has no adverse effects on the beneficial use of supporting coldwater aquatic life.

South Feather's proposal to monitor water temperatures at the downstream ends of the South Feather diversion dam and Forbestown reaches would provide information that would help to ensure that the release of whitewater boating flows do not adversely affect FYLF breeding. NMFS' proposal to monitor water temperatures at the Kelly Ridge powerhouse would help to identify time periods when project operations may be adversely affecting water temperatures downstream of the powerhouse. The temperature data, along with flow information would assist DWR and South Feather in coordinating their projects' operation to meet DWR's obligation to achieve temperature objectives specified under the Oroville Settlement Agreement while meeting system needs for the quantity and timing of hydroelectric generation and consumptive water supply.

Cal Fish & Game's proposal to monitor water temperature data at five additional locations and to provide annual technical reports summarizing monitoring results would help to document any changes in water temperatures that occur under the minimum flow regimes that are implemented in a new license. However, we note that the water temperature and fish population monitoring studies conducted by South Feather and filed with its license application indicate that the existing minimum flow releases under the current license support healthy trout populations, as indicated by biomass levels that are generally comparable to or greater than the reference sites and other streams of comparable size in the region, and that these populations would be enhanced if instream flows are increased in the next license.

Daily mean water temperatures in the Little Grass Valley dam reach did not exceed 20°C at any time. Although water temperatures measured in the South Fork diversion dam reach did at times exceed 20°C in the lower end of the reach, exceedances were rare and the maximum daily mean water temperature was not far above the 20°C threshold. The average biomass of trout in the reach (table 3-17) exceeded the biomass found at the upstream reference reach and also the average biomass of 24 pounds per acre reported by Gerstung (1973) for streams of similar size (having average widths of 26 to 40 feet) in the region. Although the average trout biomass in the Forbestown reach was slightly below the mean biomass in the reference site (table 3-17), this site may be better

Table 3-17. Trout biomass in the SFFR reaches with comparisons to the SFFR reference reach. (Source: South Feather, 2007)

		Trout Biomass (lbs/acre)						No.	Site	Ref.	P
Site	Site	1993	1996	1999	2002	2005	2006	Years	Mean	Site	Value
Description	Name									Mean	
SFFR Reference Reach											
Above Little Grass Valley Reservoir	SFFR 32.9	–	21	42	46	21	16	5	29	–	–
Little Grass Valley Dam Reach											
At Bear Creek Confluence	SFFR 24.4	39	36	31	43	28	–	5	36	29	0.73
Above South Fork Diversion	SFFR 19.2	116	34	83	120	94	82	6	90	29	0.01
Reach Average		77	35	57	81	61	–	–	63	29	0.03
South Fork Diversion Dam Reach											
Below South Fork Diversion	SFFR 18.4	40	22	43	48	62	48	6	43	29	0.16
SFFR/Lost Creek Reach											
Above Forbestown Diversion	SFF R 8.2	35	15	44	25	37	–	5	31	29	0.81
Forbestown Diversion Dam Reach											
Below Forbestown Diversion	SFFR 7.2	47	21	35	17	14	–	5	27	29	0.18

described as a warmwater site, because it supports substantial populations of hardhead (table 3-18), a Forest Service species of concern. The average biomass in Lost Creek directly below the dam was lower than in the reference site (table 3-19), but the next site about 1 mile downstream had a biomass substantially higher than that of the reference site and of the average biomass reported by Gerstung (1973). Because each of the SFFR and Lost Creek reaches support healthy trout populations and this support would be improved with increased minimum flows, we see little benefit in conducting additional water temperature monitoring in these reaches.

We do, however, find that it would be beneficial to design a temperature monitoring program that would provide real-time information to DWR on the amount and temperature of water being released at the Kelly Ridge powerhouse or that would be released if operation of the powerhouse was resumed after a period of shutdown. This information could assist DWR in evaluating and implementing its various options for maintaining water temperatures at the Feather River fish hatchery and fish barrier dam specified in the Oroville Settlement Agreement. These options could include shutdown of the Kelly Ridge powerhouse with release of “excess” water into Lake Oroville from Ponderosa dam, as may be mutually agreed to with South Feather. It would likely be beneficial for South Feather to consult with DWR to determine the most appropriate location for the temperature monitoring data to be collected. We note that collection of water temperature data at the Kelly Ridge intake as recommended by NMFS may be a suitable monitoring location when diversions are occurring, but may not be the most suitable monitoring location at times when the Kelly Ridge powerhouse is not operating, because the temperature near the intake could change substantially after diversion is resumed.

Selective Withdrawal

Flows released from Little Grass Valley reservoir are drawn from deep in the reservoir, resulting in cool water temperatures in the SFFR downstream from the reservoir. Cal Fish & Game recommends that South Feather develop and implement a plan to allow water to be selectively withdrawn from the entire water column in Little Grass Valley reservoir so that the water temperature of release flows can be more closely matched to the optimum temperatures for trout.

Our Analysis

Water temperature in Little Grass Valley reach remains cold all year due to the low level release from Little Grass Valley reservoir. Cal Fish & Game has expressed concern that water temperatures in this reach are below optimum for rainbow trout growth, and that low temperatures may delay spawning, slow egg development, and result in lower overwinter survival, because trout would not attain as large a size. Figure 3-5 shows water temperatures measured in 2005 at three locations in the Little Grass Valley reach in relation to temperature preference ranges identified by Cal Fish & Game.

Table 3-18. Hardhead population data summary from the SFFR above Ponderosa reservoir (SFFR 2.1) in 1993, 2004, and 2005. (Source: South Feather, 2007)

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Year	Site/ Segment	Site Length (ft)	Site Aver age Width (ft)	Biomass (lbs/ac)	Biomass 95% CI	Density (No./ac)	Density 95% CI
ALL AGE CLASSES							
1993	Upper	201.0	26.4	9.8	+/-2.1	376.2	+/-81.3
	Lower	a	a	b	b	b	b
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	1.2	+/-0.3	383.7	+/-109.8
	Lower	113.0	44.3	1.7	+/-0.5	353.0	+/-103.1
	Site	297.5	45.6	1.4	+/-0.3	372.5	+/-77.3
2005	Upper	176.0	57.3	2.9	+/-0.3	887.1	+/-101.8
	Lower	108.2	45.6	5.1	+/-0.2	2,857.5	+/-107.6
	Site	284.2	51.9	3.6	+/-0.1	1,545.0	+/-62.8
YOUNG-OF-YEAR(<80 mm)							
1993	Upper	201.0	26.4	0.2	+/-0.1	35.8	+/-16.8
	Lower	a	a	b	b	b	b

Year	Site/ Segment	Site Length (ft)	Site Average Width (ft)	Biomass (lbs/ac)	Biomass 95% CI	Density (No./ac)	Density 95% CI
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	0.7	+/-0.2	337.0	+/-91.7
	Lower	113.0	44.3	0.5	+/-0.2	313.3	+/-140.1
	Site	297.5	45.6	0.6	+/-0.2	328.6	+/-76.6
2005	Upper	176.0	57.3	0.6	+/-0.1	747.5	+/-90.7
	Lower	108.2	45.6	2.3	+/-0.1	2,665.8	+/-90.8
	Site	284.2	51.9	1.2	+/-0.0	1,385.6	+/-52.9
JUVENILE (80 – 160 mm)							
1993	Upper	201.0	26.4	6.6	+/-1.3	291.4	+/-56.4
	Lower	a	a	b	b	b	b
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	0.6	+/-1.6	57.0	+/-152.6
	Lower	113.0	44.3	1.0	+/-0.2	53.6	+/-
	Site	297.5	45.6	0.7	+/-0.3	44.4	+/-18.3
2005	Upper	176.0	57.3	2.3	+/-0.8	140.8	+/-49.2

Year	Site/ Segment	Site Length (ft)	Site Average Width (ft)	Biomass (lbs/ac)	Biomass 95% CI	Density (No./ac)	Density 95% CI
	Lower	108.2	45.6	5.0	+/-7.7	298.3	+/-
	Site	284.2	51.9	3.0	+/-1.3	179.8	+/-76.4
ADULT (>160 mm)							
1993	Upper	201.0	26.4	2.43c	+/-3.03c	32.84c	+/-41.04c
	Lower	a	a	b	b	b	b
	Site	b	b	b	b	b	b
2004	Upper	184.5	46.7	0.0	+/- -	0.0	+/- -
	Lower	113.0	44.3	0.0	+/- -	0.0	+/- -
	Site	297.5	45.6	0.0	+/- -	0.0	+/- -
2005	Upper	176.0	57.3	0.0	+/- -	0.0	+/- -
	Lower	108.2	45.6	0.0	+/- -	0.0	+/- -
	Site	284.2	51.9	0.0	+/- -	0.0	+/- -

^a No data available.

^b Unable to calculate.

^c Calculated by max-likelihood.

Table 3-19. Trout biomass in the Lost Creek dam reach with comparisons to the Lost Creek reference site. (Source: South Feather, 2007)

Trout Biomass (lbs/acre)											
Site Description	Site Name	1993	1996	1999	2002	2005	2006	No. Years	Site Mean	Ref. Site Mean	P Value
Lost Creek Reference Reach											
Above Sly Creek reservoir	LC 10.2	–	17	21	51	40	–	4	32	–	–
Lost Creek Dam Reach											
Near the stream ford	LC 3.1	15	4	13	17	12	–	5	12	32	0.04
About 1 mile below Lost Creek dam	LC 2.3	64	32	40	35	21	–	5	38	32	0.99

Because the temperature data in figure 3-5 indicate that water temperatures in the Little Grass Valley dam reach are below the optimum range for growth of rainbow trout, increasing water temperatures into the optimal range identified in the literature would likely provide some benefit to trout populations. We note that rainbow trout are known to occur over a very wide range of temperature conditions (Moyle, 2002; Behnke, 1992), and that fish population sampling conducted by South Feather shows that trout populations downstream of Little Grass Valley reservoir are in very good condition. The average biomass of trout at both sampling sites in the Little Grass Valley dam reach, and at the sampling sites in the South Fork diversion dam and Lost Creek reaches (all of which are affected by release temperatures from Little Grass Valley reservoir) exceeded the biomass found at the upstream reference reach and the average biomass of 24 pounds per acre reported by Gerstung (1973) for similar size streams in the region (see table 3-13). These data indicate that the low temperature of water released from Little Grass Valley reservoir is not having a substantial adverse effect on downstream trout populations, suggesting that the potential magnitude of benefit from implementing selective withdrawal may be limited. We also note that releasing warmer water from Little Grass Valley reservoir would contribute to high water temperatures further downstream in the Forbestown reach of the SFFR, and could adversely affect trout populations there.

Fish Entrainment

Entrainment of fish into hydroelectric intakes typically causes injury or mortality to a portion of the fish that are entrained, 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 smaller passageways (Cook et al., 1997; Franke et al., 1997; Winchell et al., 2000). South Feather evaluated the potential for fish entrainment in its license application, and concluded that effects of the project on trout populations were likely to be minor, and did not propose any measures to reduce or mitigate for fish entrainment.

Forest Service filed a preliminary 4(e) condition that would require South Feather to conduct statistically valid empirical studies to determine the amount of fish entrainment losses in the Woodleaf power tunnel intake and the effects of any fish losses on fish populations in the project area including Slate Creek and the SFFR, and to develop and implement a plan to mitigate for any losses. Forest Service subsequently revised its 4(e) condition to eliminate the fish entrainment studies, but included a requirement that South Feather develop and implement a wild fish supplementation program to mitigate for lost fish resources in the SFFR, in Slate Creek, and in Sly Creek and Lost Creek reservoirs. The plan would be developed in consultation with the Forest Service and other state and federal agencies that have regulatory authority, and would include the following elements: (1) the numbers of wild fish to be planted annually; (2) protocols for the capture and rearing of wild fish brood stock; (3) methods for spawning wild fish brood stock and incubation of eggs; (4) timing of planting wild stock that are free of diseases from the hatchery; and (5) placement locations of young-of-the-year wild fish planting. The basis for determining the amount of fish to be planted would be determined by reviewing age class distributions of rainbow trout in the Little Grass Valley reservoir and the upper Slate Creek diversion dam reach, and estimating the numbers of fry needed to enhance rainbow trout production toward density and biomass level observed in streams surrounding the project area. In its reply comments, South Feather stated that it supports each of the revised 4(e) conditions, including the wild fish supplementation program.

Cal Fish & Game recommends that South Feather develop and implement a plan to screen the diversions at South Fork diversion dam, Slate Creek diversion dam, and the Woodleaf powerhouse intake in Lost Creek dam with fish screens acceptable to Cal Fish & Game and in accordance with their screening criteria.

Our Analysis

South Feather developed and implemented a study in consultation with the agencies to assess the potential for entrainment losses to affect fish populations in the project area. The study focused on rainbow and brown trout, and included a literature review, review of the likelihood of entrainment based on physical characteristics of each intake, and assessment of trout populations upstream and downstream of each intake.

The results of South Feather's literature review and analysis indicate that entrainment potential at the Sly Creek reservoir power tunnel intake is probably low due to the depth of the intake, which is submerged by a minimum of 84 feet when the reservoir is drawn down to its minimum surface elevation. South Feather's review of existing studies indicated that juvenile and adult rainbow and brown trout tend to reside the upper levels of reservoirs, and would have relatively little risk of exposure to entrainment at such a deep intake.

The top of the intake to the power tunnel in Lost Creek reservoir (which leads to the Woodleaf powerhouse) is submerged at a minimum depth of 25 feet, but the trashracks extend to an elevation that is 6 feet above the water surface when the reservoir is at minimum pool. The maximum average velocity at the racks (at the maximum flow rate of 625 cfs with the reservoir at minimum pool) is 1.12 feet per second, excluding the top 6 feet of the racks, which are 15 feet wide by 43 feet tall. The relatively low velocity at the trashrack probably limits the potential for fish entrainment at this intake.

The Forbestown power tunnel intake may have a greater potential to entrain fish than the intakes in Sly Creek and Lost Creek reservoirs, because the intake is located closer to the surface of the diversion pool and the average approach velocity at the trashrack is relatively high (5.5 feet/second at the maximum flow of 660 cfs). However, the relatively high average biomass of trout in the SFFR/Lost Creek reach upstream of the Forbestown diversion, which was higher than the upstream reference reach and the average biomass for similar-sized streams in the region reported by Gerstung (1973), indicate that entrainment rates are not having a substantial adverse effect on the trout population upstream of the diversion. South Feather reports that the total trout density, total trout biomass, and total catchable trout upstream of the diversion are comparable to and slightly exceed the corresponding values downstream of the diversion.

Construction of effective fish screening facilities at each diversion as recommended by Cal Fish & Game would reduce entrainment mortality, and would likely provide some benefit to trout populations. However, construction of an effective screening facility at Slate Creek is probably not feasible given the stream's high sediment load, which has filled in most of the diversion pool.

Implementing the wild fish supplementation program specified by the Forest Service would serve to augment fish populations in any reaches where recruitment is inadequate to meet the habitat's carrying capacity. Using population assessment data to guide the stocking program would ensure that stocking effort is directed to reaches where it would provide the most benefit to trout populations.

Fish Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan a plan to monitor fish populations in affected bypassed reaches, in consultation with the Forest Service and other interested governmental agencies. South Feather indicated in its reply comments that it fully

supports all of the Forest Service revised 4(e) conditions, including the fish monitoring plan.

The plan specified by the Forest Service would involve:

- Use of the same sampling methods to sample eight of the locations previously established during the relicensing surveys.
- Collection of data on species size/age distributions and condition factors.
- Physical measurements and observations of stream conditions.
- Fish surveys would be conducted in two successive years and begin in the fifth full year after implementation of new license streamflows. Fish surveys would be conducted in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach or at a frequency jointly agreed to by the agencies. If sampling is scheduled in years with high peak flows, the survey may be postponed by 2 years to avoid confounding effects of high peak flows on fish recruitment and populations. Subsequent years of sampling and timing would be jointly agreed to by the agencies listed above.
- When scheduling sampling site selection or field data collections, South Feather would notify the agencies at least 30 days in advance to provide the opportunity to participate or observe. If field conditions or operational situations preclude a 30-day notification, South Feather would provide notice as far in advance as feasible.
- South Feather would provide the results of fish monitoring to the agencies in a technical report at an annual consultation meeting following completion of each sampling effort. In addition to describing the results, the report would compare the results with those of previous surveys, and discuss implications of the results of benthic macroinvertebrate monitoring regarding trends in fish abundances.

Cal Fish & Game recommends a fish monitoring plan that is identical to the Forest Service plan, except that no provision is made to postpone sampling in years with high peak flows and that fish sampling would occur at all 11 of the sites established in the sampling plan that guided the licensing studies.

Our Analysis

Monitoring fish populations would assist in determining the effects of any changes in operation or measures that are implemented in a new license to enhance trout populations, and in assessing whether or not any further modifications or additional measures are needed.

South Feather's analysis of fish population data indicates that fish populations in the project reaches can be substantially reduced during and following severe flood events. Postponing sampling by up to 2 years after a flood event as specified by the Forest

Service would improve data consistency, which would help to identify population trends associated with the measures or operational changes that are implemented in a new license.

In its reply comments, South Feather indicates that the smaller number of study sites that are specified by the Forest Service is more appropriate than the 11 sites recommended by Cal Fish & Game. South Feather reports that the sites that are not included in the Forest Service-prescribed plan include two sites that are dominated by warmwater fish, which are not an agency management priority, and one Lost Creek site that has been affected by local site disturbance and excessive angling pressure.

Benthic Macroinvertebrate Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan, in consultation with the Forest Service and other interested governmental agencies, to monitor benthic macroinvertebrates in affected bypassed reaches. South Feather indicated in its reply comments that it fully supports all of the Forest Service revised 4(e) conditions, including the benthic macroinvertebrate monitoring plan.

The plan specified by the Forest Service would involve:

- Surveys would be conducted in the same years as fish population monitoring (unless an alternative monitoring schedule is approved in consultation with the Water Board, Forest Service, Cal Fish & Game, and FWS).
- The plan would be designed to assess the effects on the macroinvertebrate community in the project bypassed reaches under new flow regimes and other changes that may be stipulated in the new license.
- The plan would describe the methods that South Feather would use to monitor benthic macroinvertebrate species composition and relative abundance. Data would be used to determine trends in the macroinvertebrate community structure, as represented by metrics (e.g., taxa richness, EPT index, tolerance value), such as the California Stream Bioassessment Procedure, and determine the trends in metrics within reaches, between reaches, and in comparison with previous results.
- When scheduling sampling site selection or field data collections, South Feather would notify the agencies at least 30 days in advance to provide the opportunity to participate or observe. If field conditions or operational situations preclude a 30-day notification, South Feather would provide notice as far in advance as feasible.
- South Feather would provide the results of benthic macroinvertebrate monitoring to the agencies in a technical report at the annual consultation meeting following completion of each sampling effort. In addition to

describing the results, the report would compare the results with those of previous surveys.

Cal Fish & Game recommends a benthic macroinvertebrate monitoring plan that is identical to the Forest Service plan, except that sampling would be conducted in years 1 through 4 and in years 8, 12, 16, and 24, unless an alternative monitoring schedule is approved in consultation with the agencies. In addition, Cal Fish & Game recommends that South Feather follow the most recent Cal Fish & Game for sampling benthic macroinvertebrate species composition and abundance.

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 to 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. Identifying the procedures that would be followed in the sampling plan would ensure that comparable methods are employed in different years, and would not be subject to any biases associated with any changes in sampling protocols.

Annual Consultation

The Forest Service specifies that South Feather consult with the Forest Service each year with regard to measures that are needed to ensure protection and utilization of the National Forest resources affected by the project (Forest Service Standard Condition No. 3). The date of the consultation meeting would be mutually agreed to by South Feather and the Forest Service but in general would be held 60 days prior to the beginning of the recreation season to facilitate implementation of flow management requirements and recreational management activities. Representatives from other interested agencies would be able to request to attend the meeting. 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.
- South Feather 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. South Feather 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 South Feather, 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 South Feather, 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.

Cal Fish & Game recommends that South Feather, in consultation with the agencies, develop and implement an adaptive management plan acceptable to Cal Fish & Game that will allow Cal Fish & Game and other interested governmental agencies to recommend changes to project operation during the license term based on the results of biological monitoring. The plan would include a process for identifying whether changes to project operation including, but not limited to, operation of fish screens, operation of a thermal control device, riparian vegetation management, ramping rates, and the amount and timing of flow releases from project features are required, and a mechanism for implementing those changes.

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 important environmental resources are protected. Opening the meeting to all interested parties would assist with interpretation

of monitoring results and ensure that the full range of effects of any changes in operation or measures are fully considered.

3.3.2.3 Cumulative Effects

The construction and operation of the South Feather Power Project contributes to cumulative effects on water resources and fisheries resources within the South Feather basin. Project effects on water temperatures are likely variable by reach, reducing summer temperatures below major storage reservoirs with deep releases such as Little Grass Valley reservoir and Sly Creek, while increasing the amount of warming that occurs within bypassed or diverted reaches. Increased water temperatures from reduced flows in Slate Creek downstream of the Slate Creek diversion and in the Yuba River downstream of the Slate Creek confluence may act in concert with other factors including logging, wildfires, land clearing, and consumptive water uses, to cause a cumulative reduction in streamflow and increase in water temperatures. South Feather's proposal to cease diversions from Slate Creek when the average water temperature exceeds 20°C would eliminate the project's contribution to cumulative effects on water temperature in Slate Creek during the critical high temperature period of the year.

South Feather's impoundments, tunnels, and canals also support some diversions for non-project consumptive uses, which contribute a minor cumulative reduction in flow volumes downstream of these diversions in addition to any reductions associated with upstream consumptive uses. Diversion of flow from Slate Creek by South Feather also contributes to a cumulative reduction in flow volumes in lower Slate Creek and in the Yuba River downstream of the Slate Creek confluence. As noted above, South Feather's proposal to cease diversions from Slate Creek when the average water temperature exceeds 20°C would eliminate the project's contribution to cumulative effects on water temperature in Slate Creek during the critical high temperature period of the year.

Trapping of gravel in project impoundments also may contribute to a reduction in the supply of spawning gravels caused by other diversions and impoundments in the basin. However, the results of South Feather's fish population surveys did not indicate any lack of recruitment, indicating that enough spawning gravel exists to allow sufficient trout spawning to occur.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Vegetation

South Feather conducted field surveys in 2004 and used existing vegetation GIS data prepared by the California Department of Forestry and Fire Prevention, the Plumas National Forest, and DWR to identify vegetation communities within the project area. Tree-dominated communities cover 84 percent of the study area, and dominant conifer species within these communities include ponderosa pine, Douglas fir, white fir, and

incense cedar. Dominant hardwood species include blue oak, California black oak, Oregon white oak, canyon live oak, tanoak, and Pacific madrone. Riparian vegetation accounts for 0.3 percent of the area covered by tree-dominated communities. Tree species within the riparian areas include black cottonwood, willow, alder, and dogwood. Chaparral shrublands and herbaceous areas cover an additional 2.7 percent (2.1 and 0.6 percent, respectively) of the project area. Aquatic habitats, bare areas, and developed areas account for the remaining 13.3 percent.

Riparian Vegetation

South Feather conducted surveys focused on riparian vegetation in 2005 to more accurately describe vegetation dynamics within 200 feet of the normal high water line along river reaches in the project area. The surveys produced a more detailed map and description of existing riparian vegetation and a characterization of tree age structure within these communities.

Dominant riparian communities in the project area include the white alder type (30 percent of total area), followed by the white alder/Indian rhubarb type (15 percent). The mountain alder type, which only occurred at the upper Little Grass Valley dam reach site, comprised 13 percent of the total mapped area. Table 3-20 (at the end of this resource section) presents a complete summary of the composition of riparian vegetation within each surveyed area.

Species composition and age structure studies indicate that species composition is similar at all sites and consistent with regional patterns. For example, Indian rhubarb was found at all sites and white alder occurred in every site except the highest elevation site, where it was replaced by thinleaf alder. Three genera dominated the riparian tree and shrub layers: alders, dogwoods, and willow. Alder species tended to dominate the riparian overstory at all sites. Dogwood species tended to be more abundant at mid- to high elevation sites, and willow species at low- to mid-elevation sites within the study area. Distribution of vegetation is strongly influenced by the natural channel morphology in the study area. The channels are steep, narrow, confined, and dominated by bedrock and boulder substrates, which naturally results in patchy distribution of riparian vegetation. Age analysis focused on white alder because it is the most prevalent tree species within the selected study sites. The study found recruitment at all sites, and a low presence of old trees at lowest elevation sites.

Following a request from the Forest Service, South Feather mapped woody vegetation encroachment on the stream channel within the Forbestown diversion dam reach. South Feather used video footage taken during a helicopter flight along the project and mapped vegetation within the active channel. The survey identified 16 sites ranging from 25 to 150 feet long where encroachment occurred. Combined, these sites comprised 1,250 feet of the 5.5-mile reach (4 percent).

Noxious Weeds

South Feather identified 10 state-designated noxious species within the project boundary during 2004 vegetation surveys for special status plant species. The surveys also identified 12 species listed by the Forest Service or the California Invasive Plant Council (Cal-IPC), but not state listed. Table 3-21 (at the end of this resource section) presents the state- and federally listed noxious species and species identified by Cal-IPC identified within the study area, the size of the populations, and the general location of the recorded observations.

Special Status Plant Species

South Feather conducted a special-status plant survey in 2004 that covered a 0.5-mile buffer around project facilities (table 3-22). The methods used were in conformance with the Special-status Plants Survey Study Plan, which South Feather filed with the Commission on April 8, 2004. These methods are consistent with *Guidelines for Assessing Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* and *California Native Plant Society Botanical Survey Guidelines*. South Feather conducted special-status plant surveys during times plants would be most visible, from March 24, 2004, to July 30, 2004, depending on elevation and climatic conditions. The study area was stratified into low (< 1,700 feet), middle (1,700 to 4,000 feet), and high (4,000 to 5,000 feet) elevation strata. Project facilities and features at which surveys were conducted were grouped into each stratum. Each project facility/feature was surveyed twice to capture the appropriate blooming times for all potential special-status plant species. South Feather's survey identified 10 special status species distributed across a total of 37 sites in the study area. Several species were represented at some but not all sites. Three of the 10 species, Lake Almanor clarkia (*Clarkia stellata*), round-leaf sundew (*Drosera rotundifolia*), and Northern California walnut (*Juglans hindsii*), were not on the initial target list. No federally or state-listed threatened or endangered plant species were observed during the survey.

Wildlife

The diversity of forested, reservoir, and stream habitats in the project area supports a wide variety of invertebrates, amphibians, reptiles, birds, and mammals. Project reservoirs provide habitat and a prey base for piscivorous birds, such as bald eagles and osprey, and nesting and migratory habitat for a diversity of waterfowl. A variety of bat species including, but not limited to, western mastiff bat, Mexican free-tailed bat, pallid bat, Townsend's big-eared bat, big brown bat, red bat, long-eared myotis, little brown myotis, and long-legged myotis occur in or on tunnels, buildings, bridges, or other project features. Game species in the project vicinity include deer, waterfowl, and wild turkey.

Common birds in the project area include waterfowl, gulls, pelicans, and common nighthawks. Columbian black-tailed deer, a subspecies of mule deer found in the project area, use the areas within the project as migration corridors and are known to migrate along the ridgetops to the south of the Sly Creek reservoir. Survey information from Cal

Fish & Game indicates that California's deer populations are "stable" to "slightly declining" Major factors affecting deer herds include fire suppression, timber management practices, livestock grazing, and weather patterns, although hunter harvest, predation, and road kills are also important factors affecting population fluctuations. The Miners Ranch conduit study area is within Cal Fish & Game's Deer Assessment Unit 4. The deer population within Deer Assessment Unit 4 is estimated at 33,960 and slightly declining due to less-than-optimal deer habitat; this trend is expected to continue. Other mammals in the project area include coyote, gray fox, marten, black bear, and beaver.

Special Status Wildlife Species

South Feather conducted a search of federal and state databases of wildlife with special status and consulted with agency (Forest Service, FWS, and the California Natural Diversity Database [CNDDDB]) biologists familiar with special status species locations and determined that 68 vertebrate species and 2 invertebrate species with special status could potentially occur in the project vicinity. Of these species, South Feather identified one invertebrate, eight birds, three mammals, and three amphibians with recorded occurrences on project lands and/or near project facilities. Table 3-23 lists these species.

South Feather conducted more detailed studies for the valley elderberry longhorn beetle, bald eagle, California spotted-owl, northern goshawk, special status bat species, mountain yellow-legged frog, foothill yellow-legged frog, and California red-legged frog. Two of these special status species, valley elderberry longhorn beetle and California red-legged frog, both federally listed as threatened, are discussed in section 3.3.4, *Threatened and Endangered Species*.

Bald eagle – Bald eagles nest in mature forests near bodies of water that provide a suitable fish population for foraging. Nests are typically constructed in large trees with an open view of the surrounding forest and are often used by the same pair of birds in consecutive years. Within the project boundary, nesting bald eagles only occur near Little Grass Valley reservoir. One pair have been recorded nesting near the reservoir since 1987, and have used two different nest sites over that period. Wintering and transient bald eagles have also been observed at the Sly Creek, Lost Creek, Ponderosa, and Miners Ranch reservoirs.

Management of lands surrounding the known nesting territory is guided by the Little Grass Valley reservoir Bald Eagle Management Plan. The Forest Service developed this plan with the intent of implementing, to the extent reasonably possible, resource management strategies to provide sufficient suitable nesting and foraging habitat for bald eagles at Little Grass Valley reservoir for the next 25 to 50 years. The plan includes several protection zones and measures that include the establishment of limited operating periods, promoting perch trees, and restricting the use of herbicides and pesticides. Also, under the plan, the Plumas National Forest is responsible for monitoring human use trends and considering restrictions in areas where conflicts arise,

monitoring and surveying for bald eagles, and coordinating with other agencies, including Cal Fish & Game, and South Feather, to effectively implement the plan.

California spotted owl – The California spotted owl occupies habitat with dense, multi-layered evergreen forest that includes a diversity of tree species, large trees, some trees with evidence of decadence, and open areas under the canopy. Occupied habitat is most often on lower, north-facing slopes of canyons and usually within 0.2 mile of water. The owls feed nocturnally on small rodents.

The Forest Service has designated several areas within the project PACs based on suitable habitat for the California spotted owl. Little Grass Valley, Sly Creek, Lost Creek, Ponderosa, and Miners Ranch reservoirs, as well as the Forbestown, Slate Creek, and South Fork diversions are all within 1 mile of California spotted owl PACs. During the 2004 survey period, Plumas National Forest contractors detected California spotted owls within 0.5 mile of Sly Creek reservoir along the south shore and within 0.5 mile of Horse Camp campground at the northeastern portion of Little Grass Valley. During the 2005 survey period, Plumas National Forest contractors detected California spotted owls within 0.5 mile of Little Grass Valley reservoir. In addition, the Plumas National Forest contractors reported a single detection along the south shore, north of Strawberry campground. Finally, Plumas National Forest surveys near Slate Creek diversion dam yielded three detections and one active nest discovery on Onion Creek. All three detections and the nest discovery near Slate Creek occurred more than 0.5 mile away from the Slate Creek diversion dam and impoundment. During the 2004 and 2005 survey seasons, South Feather detected spotted owls throughout the study area at Sly Creek reservoir, Lost Creek reservoir, and Slate Creek, including one confirmed nesting pair in Strawberry campground at Sly Creek reservoir.

Northern goshawk – The northern goshawk nests in a variety of forest types but generally prefers large tracts of mature or old growth forest. Nesting habitat in the western United States typically occurs in ponderosa pine, lodgepole pine, or mixed coniferous forests. Northern goshawks forage in both densely wooded and open forests. Prey typically includes small mammals, reptiles, and some insects. Two PACs for northern goshawk exist within 1 mile of Little Grass Valley reservoir.

In 2004 and 2005, South Feather, in coordination with the Plumas National Forest, conducted surveys for northern goshawk near the Little Grass Valley, Sly Creek, Lost Creek, Ponderosa, and Forbestown reservoirs; near the Miners Ranch conduit; and near the Slate Creek diversion dam. Surveyors detected northern goshawks, including one active nest, in the Little Grass Valley reservoir study area. South Feather did not detect goshawks in any of the other study areas in 2004 or 2005. However, previous studies did detect this species near Lost Creek, Sly Creek, and Slate Creek.

Bats – There are 10 special status bat species with the potential to occur in the project area (see table 3-24). South Feather surveyed 30 project facilities with the potential to provide roosting habitat for bats. Of these, surveyors identified 10 structures

that either showed evidence of bat activity or had a high potential for use. In 2004, South Feather used passive and active acoustic monitoring and net or trap capture stations to identify bats roosting near these facilities. These surveys encountered 6 of the 10 species listed in table 3-24. Other recent surveys in the project area (2001 to present) encountered three of the remaining four species. The remaining species, the small-footed myotis, may occur in the area, but based on the distribution of existing records, this seems unlikely. This species is not well studied in California, but is presumed to be crevice-dwelling and associated with cliff habitat.

Foothill yellow-legged frog – The foothill yellow-legged frog (FYLF) inhabits small streams below 5,000 feet elevation. Breeding occurs in low to moderate gradient streams in shallow edgewater areas; often close to confluences with tributary streams. Preferred substrate consists of cobble and small boulder bars in side pools and side channels with open sunny areas and little riparian vegetation. FYLF deposit masses of eggs on the downstream side of cobbles and boulders in gentle stream of water flow. Egg laying occurs in spring once water temperatures reach 12 to 13°C. Tadpoles occupy areas adjacent to riffles, cascades, main channel pools, and plunge-pools that provide escape cover and food. These areas are typically associated with edgewater habitat with substrate interstices, vegetation, and detritus for cover. The tadpoles tend to remain near the site of the egg mass they hatched from. Juvenile and adult FYLF prefer perennial streams and ephemeral creeks with pools and areas that provide exposed basking sites and cool shady areas adjacent to water's edge. Preferred streams contain shallow, flowing water, with some cobble-sized substrate.

Egg laying for FYLF is thought to occur over a 2-week period (Nussbaum et al., 1983; Stebbins, 1985; Jennings, 1988). Eggs hatch in 15 to 30 days depending on water temperature, and tadpoles metamorphose into juvenile frogs in 3 to 4 months. Males reach sexual maturity in 1 to 2 years, and females in 2 years (Nussbaum et al., 1983). Life expectancy for FYLF is an estimated 3 years or longer (Duellman and Trueb, 1986).

South Feather conducted an assessment of potential habitat based on video from helicopter flights over the project reaches in 2003 and pedestrian habitat surveys in 2004. Using this information, South Feather selected 30 sites in areas with potential habitat and conducted between 1 and 4 visual encounter surveys at each site. Project reaches where surveyors encountered adult or juvenile FYLF are Lost Creek reach (2 sites), Forbestown diversion dam reach (7 sites), and Slate Creek diversion dam reach (2 sites). Egg masses and/or tadpoles occurred at three sites along the Lost Creek reach and one site along the Slate Creek reach.

Mountain yellow-legged frog – The mountain yellow-legged frog (MYLF) occurs in montane riparian habitats with slow-moving streams, lakes, and ponds above 4,500 feet. MYLF use habitat very similar to FYLF, but with deeper water (12 to 20 inches) and at higher elevation. MYLF egg masses are typically not attached to substrate. Using similar methods to those discussed above, South Feather identified five sites with

potential MYLF habitat and conducted visual encounter surveys. All five sites are located along the SFFR upstream from Little Grass Valley reservoir. During site visits, surveyors determined that MYLF habitat was of low quality due to a lack of deep, slow-moving water and overwintering habitat. No MYLF were encountered.

3.3.3.2 Environmental Effects

Noxious Weeds

Project operation potentially affects vegetation through the introduction and spreading of noxious weed species. Any O&M actions, including road blading, vegetation control along roadsides and in transmission corridors, and fluctuating water levels, that disturb soil or remove existing vegetation could increase the spread of noxious weeds and would have a direct effect on vegetation. Potential indirect project effects could come from recreational users that spread noxious weed seeds or other regenerative plant materials from colonized to non-colonized areas.

South Feather proposes several measures to prevent and control the spread of A and B-rated noxious weeds on National Forest System lands within the project boundary.²¹ South Feather would also implement control measures where contiguous populations continue on National Forest System lands outside of the FERC project boundary, as long as the majority of the treated area is on project lands. Specific measures proposed by South Feather include training staff to recognize noxious species, monitoring populations, sharing information on new populations with the Forest Service, and several best management practices aimed at reducing the spread of noxious weeds.

Forest Service Condition No. 26 prescribes that, within 2 years of license issuance, South Feather would file with the Commission an invasive weed management plan developed in consultation with the Forest Service, appropriate county agricultural commissioner, and California Department of Food and Agriculture. South Feather would control invasive weeds that are defined in the California Food and Agriculture code, and other species identified by the Forest Service. The majority of the prescribed plan is consistent with South Feather's proposed measure; however, the prescription includes several additional requirements that would have South Feather: (1) address aquatic and terrestrial invasive weeds; (2) include protocols for locating, monitoring, and controlling weed populations; (3) include a public education program and facilities for public use to reduce the spread of aquatic species; and (4) provide information on noxious weed populations in a data format compatible with the Forest Service GIS database.

²¹ As defined by the California Department of Food and Agriculture, A-rated species require eradication, containment, rejection, or other holding action at the state-county level. Quarantine interceptions for A-rated species are to be rejected or treated at any point in the state. B-rated species require eradication, containment, control, or other holding action at the discretion of the Commissioner.

Our Analysis

Twenty-two species of noxious weeds occur within the project boundary, eight that Cal-IPC lists as high priority. Both special status and noxious weed species have been observed along most project reaches. Noxious weeds have the potential to out-compete special status plant species, if they move into special status plant habitat. Project maintenance and operation can aid the proliferation of noxious weeds. Project roads can act as a method of seed dispersal into areas previously not infested and vegetation management within transmission lines can cause disturbance which allows noxious weeds to move in. Finally, project-related recreation acts both as a means of dispersal from one project area to another and as a source of disturbance, which creates conditions favorable to noxious weed establishment.

Implementing the proposed invasive weed and vegetation management plan would control current populations and future infestations of noxious weeds within the project boundary on Forest Service lands. We interpret the proposed invasive weed management plan to be intended for lands within the project boundary that are adjacent to project features directly affecting National Forest System lands. Because not all project-related noxious weed infestations occur on project lands adjacent to National Forest System lands, expanding the invasive weed and vegetation management plan to all lands within the project boundary that are affected by project operation or maintenance would result in more complete control of noxious weeds that are affected by the proposed project.

In addition to A- and B-rated species (defined above), the California Department of Food and Agriculture rating system defines C-rated species as those requiring state holding action and eradication only when found in a nursery. Also, at the discretion of the Commissioner, the state can take action to retard spread outside of nurseries. The rating system defines Q-rated species as those pending evaluation for a permanent rating. These species are treated as A-rated species in the interim, which requires action at the state and county level. If, as specified by the Forest Service, South Feather includes Q-rated species, and any additional C-rated species for which the County Agricultural Commissioner's Office has implemented additional control measures, such as the yellow star thistle, in the list of species managed as noxious weeds, project effects on vegetation would be further minimized.

Successful weed control requires a cooperative effort by all landowners and land managers in the vicinity, because untreated weeds on adjacent lands provide a ready seed source for infestation by new species and re-infestation after treatment of existing problem weeds. Communication between South Feather and the Forest Service would be a necessary component of a successful weed management program. South Feather's proposed measures include informal monitoring of known populations and advising the Forest Service of new populations on National Forest System lands. The coordination process would be more productive if this communication includes maps showing locations of all populations on project lands with the potential of spreading onto National Forest System lands. A database prepared using GIS software, as prescribed by the

Forest Service, would be beneficial to the management of noxious weeds and would facilitate communication between the Forest Service and South Feather. South Feather prepared the South Feather Power Project Relicensing GIS Database as a component of filing its application for license renewal and has demonstrated the ability to use such resources. If, as prescribed by the Forest Service, South Feather compiles and maintains a Forest Service-compatible GIS data layer for noxious weeds, South Feather would minimize effects on vegetation.

Recreational boaters may spread noxious aquatic plants to other locations within the project boundary and to other waters in the region. These species could result in degraded aquatic ecosystems affecting wildlife and recreational resources in locations where they are not controlled. If measures including public education and boat cleaning stations are incorporated into the management of noxious weeds, as prescribed by the Forest Service, South Feather would minimize the spread of noxious aquatic weeds.

Riparian Vegetation Encroachment

Project operation has the potential to affect riparian vegetation by altering the timing, magnitude, and duration of water flows (i.e., hydrograph) along project stream channels. Many species of riparian trees, including Fremont cottonwood and willow, have specific requirements for micro-habitats within which seeds can germinate and survive. Altering the flows could cause either riparian encroachment into the channel or limit the extent of the riparian corridor. South Feather does not propose to change large flood flow control from current practices.

The Forest Service specifies in Condition No. 19, part 3, and Cal Fish & Game recommends that South Feather conduct video surveys to identify areas of vegetation channel encroachment. Surveys would be conducted the fourth year after license issuance and repeated every 10 years. South Feather would conduct the surveys by helicopter along the South Fork diversion dam and Forbestown diversion dam reaches. South Feather and the agencies would review the video and identify up to three 100- to 300-foot long segments within the South Fork diversion dam reach, and up to five 100- to 300-foot long segments in the Forbestown diversion dam reach where vegetation is encroaching into the channel. South Feather would then treat these reaches with vegetation removal measures, and evaluate the effectiveness of the treatments every 5 years to determine if conditions would require another treatment.

South Feather agreed to Forest Service Condition No. 19, part 3, in its reply comments.

Our Analysis

By nature, riparian systems are highly dynamic, with changes in vegetation structure occurring over space and time. The presence of some vegetation within the channel is expected as it is a component of channel formation and vegetation regeneration processes. The spatial pattern of riparian vegetation is controlled by the

timing, duration, and frequency of water flows. High flood flows remove vegetation from the stream channel and deposit sediments suitable for establishing new vegetation. Low flow levels determine whether enough water is present for vegetation to persist.

South Feather maintains that the magnitude and frequency of floods that have occurred during the life of the project have been suitable for maintaining a healthy riparian ecosystem. Past floods have been large enough to control encroachment of vegetation into the channel, and also have promoted the regeneration of riparian trees. South Feather's studies indicate that existing flooding processes active within the Forbestown and South Fork reaches are sufficient to prevent substantial channel encroachment of vegetation. Encroachment was only evident along 4 percent of the Forbestown diversion dam reach and was not observed at the South Fork diversion dam reach. We would expect to see this condition at more than 4 percent of the area if project operation was not sufficiently controlling encroachment. The new license would not alter the low frequency, high magnitude floods that are associated with the formation of germination sites and control of riparian encroachment. The new license also would increase minimum flows, and maintain a wider active channel. We do not expect proposed project operation to result in an increase in riparian encroachment compared to current operations. Furthermore, removing riparian vegetation also would cause a loss in habitat for other species and potential increases in erosion. The Forest Service condition to treat riparian vegetation would have an adverse effect on riparian vegetation and habitat for some wildlife species because habitat would be removed. However, as discussed below, the benefits to FYLF could outweigh these adverse effects if encroachment of riparian vegetation is adversely affecting FYLF habitat.

Special Status Plant and Wildlife Species Management

New species are added to and removed from special status lists maintained by FWS, Forest Service, and Cal Fish & Game on an annual basis. Currently, 10 plant and 15 wildlife species with some form of special status occur within the project area. Disturbance from road maintenance, reservoir water level fluctuations, weed management and debris removal, and recreation activities associated with the project could reduce habitat or cause mortality of special status plant and wildlife.

South Feather proposes to annually review, in consultation with the Forest Service, any new species proposed for listing under the Endangered Species Act, California Endangered Species Act, California Native Plant Protection Act, or by the Forest Service, to assess the potential for those species to occur on NSF lands within the project boundary and to be affected by project O&M. South Feather would develop and implement a study plan, in consultation with resource agencies, to assess the effects of continued project O&M on such species. This study would include a detailed description of the methodology to be used and schedule for conducting the study. In addition, the study plan would (1) describe the goals and objectives of the study; (2) address any known resource management goals related to the species; (3) describe existing information regarding the species, including its abundance and distribution; (4) explain

the nexus between normal project O&M and potential effects on the species; (5) explain how the study methodology is consistent with generally accepted practices in the scientific community; and (6) describe considerations of level of effort and cost. Additionally, South Feather would annually train employees in the proper procedures for minimizing effects on special status plant and wildlife species.

The Forest Service specifies in Condition No. 24 an annual review process similar to that proposed by South Feather. The Forest Service specification does not include any additional measures not already addressed by South Feather's proposal; however, the Forest Service specifies that, before construction of any new project features on National Forest System lands that might affect Forest Service special status species or their critical habitat, South Feather should prepare a Biological Evaluation. The Biological Evaluation would analyze the effects of the new construction on the species and habitat, report findings from any necessary surveys, propose mitigation measures, and describe monitoring efforts that would be implemented to ensure mitigation is effective.

Our Analysis

Project operation and management activities (including roadside vegetation management, hazard tree removal, fire management practices, and reservoir level fluctuations) and recreation activities could affect special status plant and animal species. These activities could alter or eliminate existing habitat, or directly result in mortality of some individuals. Resource agencies maintain lists of rare, threatened, or endangered species to preserve biodiversity and limit the risk of species extinctions. As new information becomes available and environmental conditions change, species are added to and removed from these lists. An adaptive management program for special status species would ensure that project management considers potential impacts on sensitive species, is aware of changes in the status of species, and lists and modifies project O&M as appropriate.

Measures proposed by South Feather and prescribed by the Forest Service for protecting future special status species are consistent and compatible. South Feather and the Forest Service would develop a set of study methodologies and procedures that would adequately monitor and protect these resources. If South Feather prepares a Biological Evaluation, as specified by the Forest Service, prior to the construction of any new development on National Forest System lands, effects on special status plant and wildlife species could be identified and minimized early. Under such circumstances, the production of a Biological Evaluation would reduce effects on special status species.

Terrestrial Habitat Connectivity

The Miners Ranch conduit contains a 5.5-mile long segment of above-ground, open canal that impedes wildlife movement near Lake Oroville. Occasionally animals become trapped in the conduit and drown. Multiple crossing points, including culverts and wildlife bridges, exist along the length of the open segment. The canal also contains escape ramps for wildlife that have fallen into the canal. Over time, large flow events,

changes in vegetation structure, or general deterioration of facilities could reduce the effectiveness of these mitigation measures. Under such conditions, the conduit could cause increased migration impediments and mortality for wildlife.

To ensure that mitigation measures in place to facilitate wildlife movement across the canal continue to be successful, South Feather proposes to consult with Cal Fish & Game regarding specifications and design prior to replacing or retrofitting existing wildlife bridge crossings or deer escape facilities. South Feather would file the design, including evidence of consultation, with the Commission within 60 days after the crossing or facility has been replaced or retrofitted.

Cal Fish & Game recommends that, in addition to consultation prior to the development of new facilities, South Feather conduct surveys to ensure that existing facilities are operational. The agency recommends that these surveys occur twice a year—in the spring and fall prior to deer migration. The recommended surveys would ensure that existing bridges, escape ramps, and fences are operational and maintained.

Our Analysis

South Feather's surveys indicate that the Miners Ranch conduit is a source of wildlife mortality, with an average of 9 mule deer trapped and killed in the canal annually. However, surveys of crossing facilities indicate that they are used by wildlife, thus reducing potential additional mortality. These studies indicated, and Cal Fish & Game agreed, that the existing facilities are sufficient for facilitating wildlife movement between the two areas of habitat bisected by the Miners Ranch conduit. As such, additional facilities are not required for mitigating project effects on terrestrial habitat connectivity. Surveys also show that the greatest use occurs in the spring and fall during seasonal migrations. If South Feather conducts surveys prior to the spring and fall migrations, it would be able to evaluate the operational status of the facilities and therefore, maintain them as appropriate to ensure they are functional prior to heavy use periods. Such monitoring and maintenance would ensure that existing habitat connectivity over the Miners Ranch conduit is maintained for the term of the new license.

Bald Eagle

One pair of bald eagles has been recorded nesting in the project area. The pair has used two nest sites, both located on National Forest System lands in the vicinity of the Little Grass Valley reservoir. In 2002, the Forest Service developed and implemented, and FWS approved, the Little Grass Valley reservoir Bald Eagle Management Plan. This plan established management guidelines, including limited operation periods, timber and hazard tree removal prescriptions, and eagle monitoring programs, aimed at addressing the needs of the Little Grass Valley reservoir bald eagles. Where applicable, South Feather adheres to the measures prescribed in this plan and has not proposed any additional measures relating to the bald eagle. The Forest Service specifies in Condition No. 25 that South Feather consult with the Forest Service to update and revise the existing Bald Eagle Management Plan based on new project O&M.

Our Analysis

Relicensing the project would result in changes in project O&M, which could include increases in minimum flows released from reservoirs. Increasing water releases would affect reservoir levels, which would affect foraging area for the bald eagle. A reduction in water surface area may provide reduced fishing area for eagles and more competition between eagles and recreational anglers; conversely, it may provide better forage opportunity, by concentrating fish in areas with suitable water depth resulting in more fish per acre. As such, it is not possible to ascertain whether the project would adversely affect bald eagles; effects are expected to be both positive and negative and vary across space and time. If South Feather consults with the Forest Service, as specified, to revise and update the existing Little Grass Valley reservoir Bald Eagle Management Plan, as prescribed by the Forest Service, effects on the bald eagle could be reduced.

Bat Management

During pre-licensing surveys, South Feather observed six special status bat species using project facilities for day and night roosting habitat. None of the six species are state or federally listed as endangered or threatened. To reduce potential effects of project O&M on bats, and address potential health concerns associated with South Feather employees working in proximity to bats, South Feather proposes to replace existing bat exclusion devices on project facilities that are regularly visited by employees. South Feather would not place such devices within tunnel areas behind grates to allow bats to have access to these areas where human activity is minimal. South Feather would select the exclusion devices following consultation with Cal Fish & Game or a Bat Conservation International-approved specialist.

Forest Service Condition No. 25 specifies and Cal Fish & Game recommends that South Feather consult with resource agencies and develop a bat management plan to mitigate effects on bats that result from project associated recreation and vegetation management activities.

Our Analysis

Continued operation of the project has the potential to disturb foraging and roosting bats as a result of recreational activities or vegetation management. South Feather could mitigate these effects with the installation of bat boxes or other protection or mitigation measures. South Feather's maintenance of existing bat exclusion devices would reduce the potential for human health concerns were bats to occupy project facilities frequented by project personnel. If South Feather consults with resource agencies to develop a bat management plan, as specified by the Forest Service and recommended by Cal Fish & Game, the agencies and South Feather would identify and implement such protection and mitigation measures and South Feather would reduce effects on special-status bat species.

Foothill Yellow-legged Frog

South Feather identified suitable habitat and observed FYLF within three project reaches: the Lost Creek/SFFR, Forbestown diversion dam, and Slate Creek diversion dam reaches. New minimum flows, ramping rates, and flow pulses associated with continued operation of the project could affect water velocity, temperature, and channel morphology in reaches with FYLF. These changes in habitat could cause increased stress, affect the timing of breeding, and reduce reproduction success for FYLF.

South Feather proposes several measures to minimize effects on FYLF, including considering FYLF habitat preference when developing minimum flow levels (discussed in detail in section 3.3.2, *Aquatic Resources*) and avoiding high pulse flows. South Feather proposes to avoid the release of controlled high flows during periods when FYLF are expected to be active. This measure would be in effect from April 15, or whenever water temperatures reach 13°C (whichever is later) until October 31 of each year.

Cal Fish & Game recommends that South Feather develop a FYLF monitoring plan. The plan would include annual surveys monitoring FYLF adult, tadpole, and egg mass numbers in the SFFR/Lost Creek dam, Forbestown diversion dam, and Slate Creek diversion dam reaches for the first 10 years after relicensing, followed with similar surveys every 5 years for the term of the license. Cal Fish & Game also recommends that following 5 years of FYLF monitoring, South Feather implement ramping rates that would protect FYLF egg masses and tadpoles in all reaches where they occur.

In addition to the population monitoring recommended by Cal Fish & Game, the Forest Service specified in preliminary Condition No. 19, 2.2 through 2.4, the development of a population model, a population viability model, a 2-D habitat model, a temperature monitoring protocol, and a geomorphology and riparian encroachment monitoring protocol.

In response to the Forest Service condition, South Feather commented that the development of population and habitat models and studies relating water temperature to development processes would be overly expensive and are not necessary for evaluating effects of the project. South Feather also states that these prescriptions are not directly related to the project, but are research projects aimed at better understanding FYLF biology in general. South Feather filed an alternative 4(e) condition in which it proposed to eliminate the population model, population viability model, 2-D habitat model, temperature monitoring and associated studies, and geomorphology and riparian encroachment monitoring from Forest Service's 4(e) condition. South Feather's alternative 4(e) condition also proposed a monitoring plan which would include two types of surveys: full reach and representative. South Feather would conduct full reach surveys in first year following relicensing and then repeat them every 10 years. These surveys would consist of surveying all reasonable accessible FYLF habitat in the SFFR/Lost Creek, Forbestown diversion dam, and Slate Creek diversion dam reaches. South Feather would conduct the representative surveys once every 10 years starting the fifth year after relicensing which would include surveys located at one site within each of

the three reaches. South Feather would conduct both the full reach and representative surveys following the methodology used for the pre-license application studies. Based on the results of these surveys, South Feather, in consultation with the Forest Service, would evaluate project effects on FYLF. If it is evident that there are adverse project-related effects, South Feather, in consultation with the Forest Service, would recommend more targeted studies aimed at identifying the mechanisms for such adverse effects and identifying appropriate mitigation measures. South Feather would implement any such recommendations subsequently approved by the Commission.

Following issuance of the draft EIS, the Forest Service issued its final conditions on March 6, 2009. The final conditions differ substantially from the preliminary conditions in terms of monitoring frequency and monitoring intensity. The final 4(e) conditions also provide more detail regarding the type of data South Feather should collect to determine potential effects of temperature on development rates and conducting a population viability analysis. Rather than requiring South Feather to develop a population model, the Forest Service has provided a model and specified data collection protocols for determining tadpole and adult survival rates for use with the existing model. Specifics of these conditions are described in the following section.

In its final 4(e) Condition No. 19, part 2, the Forest Service specifies that, within 1 year of license issuance, and after consultation with the Forest Service, and other interested governmental agencies, South Feather file with the Commission an amphibian monitoring plan approved by the Forest Service. The Plan would outline sampling to be conducted in the following reaches: Little Grass Valley dam, South Fork diversion dam, SF Feather River/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam.

The amphibian monitoring plan for the above reaches would include targeted monitoring of Forest Service-listed sensitive amphibians beginning no later than the first spring following license issuance and continuing at some level through out the project license period. Monitoring would include FYLF population status, distribution, viability, and reproductive success. Because the new minimum streamflow conditions would alter the base flow levels and timing of flows relative to recent project operation, the following would be assessed in detail for typical oviposition (egg-laying) and rearing (tadpole) habitats for both occupied and non-occupied habitat locations: temperature regimes; riparian vegetation establishment, encroachment, and scouring; habitat conditions (water depths, velocities, bank slopes, etc.); and river bar formation/loss. In addition, a ramping rate assessment is specified.

The Forest Service condition specifies that South Feather conduct full reach visual encounter sampling for FYLF in the Little Grass Valley dam, South Fork diversion dam, SF Feather River/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam reaches during the first year following issuance of the new license. If such surveys are not possible during the first year due to weather, timing of surveys, or

project operations, the surveys are to be completed during the second year. Full reach surveys in each of these six reaches are then to be repeated every once every 10 years for the duration of the license.

Based on the results of the initial surveys under a new license, South Feather, in consultation with the Forest Service, would select representative sample sites in each of the six reaches mentioned above. The Forest Service condition specifies that South Feather conduct visual encounter surveys at these representative sampling sites in years 2-6 of the new license, and once every 4 years for the duration of the license. Annual surveys of the representative sites would resume for the last 3 years of the license period.

In addition to visual encounter surveys, the Forest Service final 4(e) conditions specify temperature and habitat monitoring, and data collection to determine FYLF incubation period (time from egg laying to hatching), metamorphosis period, and size of metamorphs, to determine the influence of water temperature on development rates. South Feather would collect temperature and growth rate data annually until data for all three water year types has been collected. The Forest Service specified habitat monitoring would include measuring the size (length and width during breeding and rearing season) of depositional bars, bank slope, substrate composition, and vegetation cover at all FYLF breeding sites. These surveys would occur once every 10 years in conjunction with the full reach visual encounter surveys.

Finally, the Forest Service final 4(e) conditions specify a method for determining appropriate ramping rates to protect FYLF. To make this evaluation, South Feather would provide to the Forest Service its expectation of the water year type through July of that year and: (1) a brief description of the protocols that it proposes to use for the sampling described below and (2) the locations it proposes for monitoring. Monitoring locations would coincide with known FYLF breeding sites in the following stream reaches: (1) SFFR from the confluence with Lost Creek to Forbestown diversion dam (SFFR/Lost Creek reach); (2) SFFR from Forbestown diversion dam to Ponderosa reservoir (Forbestown diversion dam reach); and (3) Slate Creek from Slate Creek diversion dam to New Bullards Bar reservoir (Slate Creek diversion dam reach). The monitoring locations are to be representative of FYLF breeding sites in each reach. Sampling would include the following two components:

1. Velocity and Stage Measurements. At each of the above listed project dams, South Feather would implement each step reduction from May through July in two approximately equal steps over 2 hours (e.g., a step reduction from 126 to 53 cfs would occur over 2 hours with a reduction at the beginning of the first hour from 126 to 89 cfs, and the reduction at the beginning of the second hour from 89 to 53 cfs). During each reduction, immediately prior to the reduction in flow at the dam and approximately every 30 minutes after the reduction in flow at the dam, South Feather would measure stage (total depth in tenths of a foot) and water velocity (mean column velocity in tenths of a foot per second) at the monitoring locations. Monitoring would continue until stage

change related to the step reduction is no greater than 0.1 foot between sampling events at the monitoring location.

2. Habitat Monitoring. At the highest and lowest step reduction flow, South Feather would map FYLF habitat availability at each monitoring location, including showing location of the edge of water. Mapping protocols would be similar to those for FYLF habitat mapping in Silver Creek performed by the Sacramento Municipal Utility District for its Upper American River Project relicensing (FERC Project 2100) or other protocols approved by the Forest Service.

Within 3 months of completing the sampling for a given water year type, South Feather would prepare a draft report that describes the results of the sampling, including curves that relate stage and velocity to discharge at each monitoring location sampled, and the results of the habitat mapping in appropriate plots. The report would discuss the findings in relation to the Forest Service's water velocity and stage targets described above and recommend a ramping rate (in cfs per unit time) at each of the South Fork, Forbestown, Lost Creek, and Slate Creek dams for the periods from May through July for the water year type in which the sampling was performed. The report is to also include an estimate of accretion from the project dams to the monitoring locations during the sampling, and the actual water year types for each month during which the sampling occurred. The report would be provided to the Forest Service for 60-day review. Within 60 days of the close of the comment period, South Feather would file with the Commission a final report including evidence of consultation and any written comments made by the Forest Service. Following Commission approval, South Feather would subsequently implement the specific ramping rate for that water year type.

South Feather would conduct the above measurements for each water year type. If the expected water year type in a subsequent year is the same as a water year type for which monitoring has previously been performed or if data from previous years is deemed adequate by the Forest Service to address the expected water year type, South Feather would not repeat the exercise in that year. The sampling would occur for a maximum of 4 years.

Our Analysis

Proposed project operation would alter the existing hydrograph in stream channels known to support FYLF, including the SFFR/Lost Creek reach, Forbestown diversion dam reach, and Slate Creek diversion dam reach. Quickly reducing high flows to minimum low flow levels could increase mortality of egg masses and tadpoles by stranding them in dry areas as flows recede. Conversely, high flows could wash egg masses, tadpoles and adults downstream to unsuitable habitat, which could increase mortality. The degree to which these changes would affect FYLF populations is unknown. Monitoring the effect of high flow releases on FYLF populations is needed to determine whether proposed changes in project operation adversely affect FYLF, and to develop measures that may be warranted to reduce adverse effects.

The release of high flows for recreational purposes is discussed in section 3.3.4.2, *Recreational Resources*. The FYLF breeding period is triggered by water temperatures warming to 12°C following springtime high water flows associated with snowmelt. The date this occurs will vary from year to year depending on climatic conditions. Avoiding the release of pulse flows between the date water temperatures reach 12°C and October 31 would avoid affecting FYLF during their spring and summer periods of activity.

The implementation of an appropriately structured monitoring plan that identifies changes in FYLF habitat, breeding periods, and population levels would be a necessary tool for evaluating project effects on FYLF, and developing and implementing mitigation measures. South Feather's alternative 4(e) condition includes surveys in the SFFR/Lost Creek, Forbestown diversion dam and Slate Creek diversion dam reaches in the first year of the license and every 5 years thereafter. However, to detect the effects of new license conditions on amphibian populations, it is important to incorporate lag times into the design and interpretation of monitoring because the response of breeding populations may not be detected for years after the new discharge regimes have altered conditions for spawning and tadpole rearing (Kupferberg, 1996). It would take 1 to 2 years for new eggs to hatch, mature, and reproduce. Therefore, the full effects of initial project-related changes in breeding success on population levels would not be evident for several years. As such, annual monitoring for the first 10 years, as specified by the Forest Service and recommended by Cal Fish & Game, would be needed to identify any unanticipated short term effects early in the license term, while monitoring every 5 years thereafter would be sufficient to detect any long-term changes.

South Feather's alternative 4(e) condition would include full-reach surveys of all reasonably accessible FYLF habitat in the first year of the license, and every 10 years thereafter, while all other surveys would be conducted in representative areas within each reach. The survey protocols recommended by Cal Fish & Game did not specify the extent of the surveys to be conducted in each reach. The Forest Service specified sampling would include full reach surveys in all six project reaches in year 1 and every 10 years thereafter, supplemented with representative surveys in years 2-6 and once every 4 years thereafter.

Representative sampling is an accepted scientific method for collecting biological data, and if used appropriately, could detect most changes in FYLF populations and habitat conditions. However, as channel morphology adjusts to the new hydrologic conditions, suitable FYLF habitat could be removed in some areas and created in others. As a result, periodic full reach surveys would be needed to detect such long-term shifts in habitat. A monitoring methodology that includes both full reach and representative surveys would be appropriate for detecting changes in habitat and population levels. We recommend that visual encounter surveys be consistent with the Forest Service 4(e) specifications. Such survey frequencies and intensities are necessary to determine both short- and long-term effects of project operations on FYLF population levels.

In its alternative to the Forest Service preliminary 4(e) conditions, South Feather states that, in the event South Feather's monitoring surveys suggest adverse effects related to the project, South Feather would consult with the Forest Service to initiate more focused studies aimed at identifying the mechanisms for such adverse effects and for mitigating those effects. However, the results of the Forest Service-specified data collection to support population modeling and temperature studies would be informative and could enhance conservation efforts for FYLF. These components of the final 4(e) conditions were scaled back from the preliminary conditions and are presented in an explicit manner that describes the specified procedures. Changes in project operations, including increases in minimum flows, are expected to influence water temperature and sediment erosion and deposition processes. To complete its lifecycle, FYLF requires suitable water temperatures and stream channel substrates. As such, monitoring these components of FYLF habitat is an important step in ensuring the project does not have adverse effects on this species. The specified monitoring and data collection measures would provide quantitative information to determine project effects on population size, distribution, development rates, and habitat characteristics.

The encroachment of vegetation into the stream channel could affect FYLF by slowing water velocities and altering patterns of sediment scour and deposition. Channel substrates in areas with slow water velocity are dominated by fine silts, which could replace gravel bars preferred by FYLF. The Forest Service specifies habitat and geomorphological surveys in Condition No. 19, parts 2 and 3. South Feather's encroachment study indicated that the intensity and timing of flood flows and associated channel scour processes that have occurred under current operations have been effective in controlling encroachment. However, there are some locations where riparian vegetation is present in the active channel. These results suggest that the current effect of encroachment on the FYLF population is probably minimal, and that treatment would be premature at this time. However, if future monitoring indicates that encroachment of riparian vegetation is affecting FYLF, implementation of the Forest Service specified treatment protocol may be warranted.

Controlling the rate at which managed flow increases or decreases occur would be a necessary component of a successful FYLF management strategy. Increasing flows too quickly would increase the potential for FYLF eggs, tadpoles, or adults to be washed downstream into unsuitable habitat. Similarly, decreasing flows at too great a rate would increase the potential for all lifestages to become stranded in pools where conditions could become unsuitable as flows continue to decrease and pools dry up. Minimum flow requirements, as discussed above, would depend upon current climatic conditions. Implementing a methodology, as recommended by Cal Fish & Game, that identifies suitable rates of flow fluctuation based the needs of FYLF would reduce effects on this species. A methodology for determining appropriate ramping rates for each water year type, as specified by the Forest Service, would further reduce effects on FYLF.

Table 3-20. Field-mapped riparian vegetation types at eight intensive study sites and at the Slate Creek diversion dam impoundment, based on the Potter (2003) classification. (Source: South Feather, 2007)

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Potter Vegetation Type	Acres and Percent of Total Site											
	Little Grass Valley Dam Reach		South Fork Diversion Dam Reach	Forbestown Diversion Dam Reach		Lost Creek Dam Reach	Slate Creek Diversion			Study Area Totals		
	SFFR 27.4 (4,641 ft)	SFFR 22.7 (3,920 ft)	SFFR 13.7 (3,100 ft)	SFFR 7.2 (1,607 ft)	SFFR 3.5 (1,050 ft)	LC 3.3 ^b (3,116 ft)	SC 7.8 (3,378 ft)	SC 1.1 (2,066 ft)	Impoundment ^c (3,552 ft) ³	Total Acres	% Total Area	No. of polygons
White Alder		0.31 (19%)	0.98 (39%)	1.16 (59%)	0.79 (41%)		1.12 (50%)	0.73 (32%)	2.87 (47%)	7.97	30.80	80
White Alder / Indian Rhubarb	0.14 (2%)	0.93 (57%)	0.67 (27%)		0.10 (5%)	0.97 (86%)	0.44 (20%)	0.65 (29%)		3.91	15.12	42
Bedrock and Boulder	2.23 (37%)	0.39 (24%)	0.03 (1%)	0.02 (1%)	0.94 (49%)		0.32 (14%)	0.59 (26%)	0.08 (1%)	4.61	17.82	54
Mountain Alder	3.47 (57%)									3.47	13.40	35
Unclassified Riparian Scrub	0.08 (1%)		0.22 (9%)	0.21 (11%)	0.06 (3%)	0.16 (14%)	0.05 (2%)	0.06 (3%)	0.87 (14%)	1.71	6.62	15
Unconsolidate d Material			0.52 (20%)	0.09 (5%)			0.24 (11%)	0.17 (7%)	2.34 (38%)	3.36	12.99	32
Mid- elevation Unclassified Riparian Forb	0.04 (1%)			0.11 (6%)			0.05 (2%)			0.21	0.80	2

Acres and Percent of Total Site												
Oregon Ash				0.37 (19%)						0.37	1.44	8
Unclassified Riparian Forest and Woodland		0.09 (4%)						0.01 (1%)		0.11	0.42	2
Douglas fir / Incense Cedar / White Alder	0.08 (1%)									0.08	0.31	1
Fremont Cottonwood / Red Willow				0.02 (1%)						0.02	.06	1
Low Elevation Unclassified Riparian Forb								0.06 (3%)		0.06	0.23	1
Totals	6.04 (100%)	1.64 (100%)	2.52 (100%)	1.97 (100%)	1.92 (100%)	1.13 (100%)	2.23 (100%)	2.26 (100%)	6.16 (100%)	25.86	100.00	273

Notes: Table includes extent (acres), percent of total acres, and frequency (number of polygons) of field-mapped riparian vegetation and cover types in the study area.

- ^a The following intensive study sites were not mapped due to poor image quality of orthophoto basemaps and/or shading by upland vegetation: South Fork Diversion Dam Reach upper site (SFFR 16.5) and South Fork Feather/Lost Creek Reach site (SFFR 8.7)
- ^b Riparian vegetation at the Lost Creek dam reach site (LC 3.3) was mapped further upstream than where greenline surveys occurred, due to poor image quality of orthophoto basemaps and shading by upland vegetation. These areas exhibited similar vegetation types as those found at the greenline transects.
- ^c Consists of additional mapping conducted in and around the Slate Creek diversion dam impoundment.

Table 3-21. Summary of incidental observations of non-native species designated as noxious weeds. (Source: South Feather, 2007)

Scientific Name	Common Name	CDFR Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Aegilops triuncialis</i>	Barbed goatgrass	B	High	-Miners Ranch reservoir		
<i>Carduus pycnocephalus</i>	Italian thistle	C	Moderate	-Miners Ranch reservoir -Little Grass Valley reservoir		
<i>Centaurea solstitialis</i>	Yellow star-thistle	C	High	-Kelly Ridge powerhouse -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -Sly Creek reservoir		Common in disturbed, dry areas (e.g., in and around powerhouse yards). Especially abundant on dam faces and along roadsides. Dense infestation along southern berm slope of Miners Ranch reservoir. Scattered, diffuse occurrences along Miners Ranch conduit.
<i>Cirsium vulgare</i>	Bull thistle	UR	Moderate	-Miners Ranch reservoir -Ponderosa reservoir -South Fork diversion -Little Grass Valley reservoir -Sly Creek reservoir		
<i>Convolvulus arvensis</i>	Bindweed	C	Eval No List	-Kelly Ridge powerhouse -South Fork diversion -Little Grass Valley reservoir -Sly Creek reservoir		
<i>Cynodon dactylon</i>	Bermuda grass	C	Moderate	-Ponderosa reservoir -Sly Creek reservoir		

Scientific Name	Common Name	CDFR Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Elytrigia repens</i>	Quackgrass	B		-South Fork diversion -Lost Creek reservoir -Sly Creek reservoir		
<i>Genista Monspessulana</i>	French broom	C	Moderate	-Kelly Ridge powerhouse	2	(1) One mature shrub (2) Dense patch
<i>Hypericum perforatum</i>	Klamath weed	C	Moderate	-Kelly Ranch powerhouse -Miners Ranch conduit -Miners Ranch reservoir -Forbestown diversion -Lost Creek reservoir -Sly Creek reservoir -Slate Creek reservoir		
<i>Taeniatherum caput-medusae</i>	Medusa-head	C	High	-Miners Ranch reservoir		Scattered occurrences in dry, disturbed areas (e.g., along roads/trails surrounding reservoir) with other Mediterranean grasses.
<i>Ailanthus altissima</i>	Tree-of-heaven	N/A	Moderate	-Miners Ranch conduit -Forbestown diversion	1 1	One mature tree Four large plants with abundant root suckers
<i>Arundo donax</i>	Giant-reed	N/A	High	-Ponderosa reservoir		Each population consists of a large mature patch
<i>Brassica nigra</i>	Black mustard	N/A	Moderate	-Kelly Ridge powerhouse -Miners Ranch reservoir -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -Lost Creek reservoir -Sly Creek reservoir	2	Widespread in disturbed areas (e.g., roadsides)
<i>Bromus madritenis ssp. rubens</i>	Foxtail chess	N/A	High	-Kelly Ridge powerhouse -Miners Ranch reservoir -Miners Ranch conduit		Common in disturbed dry areas. Especially abundant on dam faces and along

Scientific Name	Common Name	C DFA Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Ficus carica</i>	Edible fig	N/A	Moderate	-Ponderosa reservoir -Forbestown diversion -Kelly Ridge powerhouse -Ponderosa reservoir -Forbestown diversion		roadsides. Limited to one or two mature trees at each facility, with the exception of a large well-established population above Kelly Ridge powerhouse
<i>Hedra helix</i>	English ivy	N/A	High	-Ponderosa reservoir	1	Near abandoned shack along edge of reservoir.
<i>Leucanthemum vulgare</i>	Oxeye-daisy	N/A	Moderate	-Slate Creek diversion		
<i>Robinia pseudoacacia</i>	Black locust	N/A	Limited	-Miners Ranch Reservoir -Ponderosa reservoir		One tree was found at a riparian study site within the FDD reach.
<i>Rubus discolor</i>	Himalayan blackberry	N/A	High	-FDD reach (SFFR 3.9) -Kelly Ridge powerhouse -Miners Ranch Reservoir -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -Lost Creek reservoir -Sly Creek reservoir -Sly Creek powerhouse -Little Grass Valley reservoir -FDD reach (SFFR 3.9 and SFFR 6.9) -LCD reach (LCD 3.0) -SFF/LC reach (SFFR 8.4)	3	Species is wide-spread and well established at all Project facilities. Typically found at or above high water line in dense, patchy to continuous stands surrounding reservoirs. Also commonly found in mid- to low-elevation Project reaches as understory component in riparian zone, often in dense thickets.
<i>Saponaria officinalis</i>	Bouncing-bet	N/A	Limited	-Slate Creek diversion and reach		Widespread on large cobble bars in middle of Slate Creek Diversion. Also found downstream of the

Scientific Name	Common Name	CDFA Pest Listing ^a	Cal-IPC Listing ^b	General Location in Study Area	No. of Populations Mapped	Abundance/Density Notes
<i>Spartium junceum</i>	Spanish broom	N/A	High	-Miners Ranch conduit	4	diversion as patchy understory component along riparian zone. (1) One main dense patch (2-4) Individuals
				-Miners Ranch reservoir	10	(1-5) individuals (6) large patch ~ 75ft X15ft (7) Patch of 5-10 large plants (8) Large patch ~ 60ft X 30ft (9) Approx. 7 medium plants (10) Two plants
<i>Verbascum thapsus</i>	Woolly mullen	N/A	Limited	-Kelly Ridge powerhouse -Miners Ranch reservoir -Miners Ranch conduit -Ponderosa reservoir -Forbestown diversion -South Fork diversion -Lost Creek reservoir -Sly Creek reservoir -Slate Creek diversion -Little Grass Valley reservoir		

^a CDFA 2004. These are considered Noxious Weeds by the state of California and have received the following ratings:

B: Weeds subject to action by CDFA only when found in a nursery, and otherwise subject to eradication, containment, control, or other holding action at the discretion of the local county agricultural commissioner.

C: Not subject to state action except to provide for general pest cleanliness in nurseries; reject by CDFA only when found in a crop seed for planting or at the discretion of the commissioner, action to retard spread outside of nurseries at the discretion of the county agricultural commissioner.

UR: Unrated.

^b Cal-IPC 2006.

High: These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate: These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited: These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Eval No List: Evaluated but not listed due to either lack of sufficient information to assign a rating or the available information indicates that the species does not have significant impacts at the present time.

Table 3-22. Summary of special-status plant occurrences located in 2004. (Source: South Feather, 2007)

<i>Scientific Name</i>	Common Name	Status^a	Total No. of Populations	Location	Approx. No. Plants w/in Population
<i>Cardimine pachystigma</i> var. <i>dissectifolia</i>	Dissected-leaved toothwort	Fed: None PNF: FSI Cat 1 CA: None CNPS: 3	1	Forbestown diversion	2
<i>Clarkia biloba</i> ssp. <i>brandegeae</i>	Brandegee's clarkia	Fed: FSC PNF: FSS CA: None CNPS: 1B	4	Miners Ranch conduit	50; 50; 25; 100
<i>Clarkia mildrediae</i> ssp. <i>lutescens</i>	Golden-anthered clarkia	Fed: None PNF: FSI Cat 1 CA: None CNPS: 4	10	Little Grass Valley reservoir	1,000; 500; 10; 5; 150; 1
<i>Clarkia mosquinii</i>	Mosquin's clarkia	Fed: FSC PNF: FSS CA: None CNPS: 1B	4	Sly Creek powerhouse	400; 300; 300
				Slate Creek diversion	1,000
				Miners Ranch conduit	30
<i>Clarkia stellata</i>	Starry clarkia	Fed: None PNF: FSS CA: None CNPS: None	1	Ponderosa reservoir	1; 20
				Lost Creek reservoir	3
				Little Grass Valley reservoir	30
<i>Drosera rotundifolia</i>	Round-leaved sundew	Fed: None PNF: FSI Cat 2 CA: None CNPS: None	1	Little Grass Valley reservoir	1,000
<i>Fritillaria eastwoodiae</i>	Butte County fritillary	Fed: FSC PNF: FSS CA: None CNPS: 3	2	Forbestown diversion	5

<i>Scientific Name</i>	Common Name	Status^a	Total No. of Populations	Location	Approx. No. Plants w/in Population
				Ponderosa reservoir	No data ^b
<i>Juglans hindsii</i>	Northern California black walnut	Fed: None PNF: None CA: None CNPS: 1B	1	Miners Ranch reservoir	1
<i>Vaccinium coccineum</i>	Siskiyou Mountains huckleberry	Fed: None PNF: FSS CA: None CNPS: 3	2	South Fork diversion	1
<i>Viola tomentosa</i>	Woolly viola	Fed: FSC PNF: FSI Cat 1 CA: None CNPS: 4	5	Sly Creek reservoir Little Grass Valley reservoir	150; 5; 50; 100; 20

^a Status listing definitions are as follows:

Federal Status (Fed):

FE Listed as endangered under the federal Endangered Species Act.
 FT Listed as threatened under the federal Endangered Species Act.
 FC Federal candidate species.
 FSC Federal species of concern (SFWP 2003)

Plumas National Forest (PNF) Status:

MIS Considered a Management Indicator Species by the USDA Forest Service under the National Forestry Management Act (USDA 1988).
 FSS Considered a sensitive species by the USDA Forest Service under the National Forestry Management Act.
 FSI Cat1 Special Interest Category 1-survey and recommend conservation measures.
 FSI Cat2 Special Interest Category 2-report occurrences and Forest Service recommend conservation measures.

California (CA) Status:

CT Listed as threatened under the state Endangered Species Act.
 CE Listed as endangered under the state Endangered Species Act.
 CR Listed as rare under the California Native Plant Protection Act.

California Native Plant Society (CNPS) Status:

1A Plants presumed extinct in California
 1B Plants rare, threatened, or endangered in California and elsewhere
 2 Plants rare, threatened, or endangered in California, but more common elsewhere
 3 Plants for which more information is needed to determine its status.
 4 Limited distributions (watch list).

^b This cell should contain an estimate for the number of plants in a population of an RTE species; however, the cell was blank in South Feather's application.

Table 3-23. Special-status wildlife species with documented occurrences in the project area. (Source: South Feather, 2007)

Common and Scientific	Status	Habitat Notes	Occurrences in Project Area
Name	Status	Habitat Notes	Occurrences in Project Area
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	FT	Entire life cycle dependent on elderberry plants (<i>Sambucus</i> spp.), which occur within riparian forests or occasionally in separate patches or as individuals in non-forested habitat types in the Central Valley. Elderberry typically grows in association with various species of woody plants, often on the top and slope of banks, and rarely on sandbars. VELB appears to typically prefer larger, mature plants. Conservation guidelines consider potential host plants with one or more stems measuring 1 in (2.5 cm) in diameter or greater at ground level. Emergence holes have been observed at heights of 4 ft (1.2 m) or less. Specific conservation guidelines for VELB include survey protocols and measures for avoiding, protecting, restoring and monitoring impacted VELB habitat.	<ul style="list-style-type: none"> • Only known location in PNF with potential VELB habitat found near Pulga Road south of Poe Dam on Hwy 70 at the western boundary near Lassen National Forest (T23N R5E S32). No VELB was recorded at this site although exit holes have been observed in the elderberry plants here. • Elderberry occurs in scattered locations throughout PNF, but no other areas have shown evidence of VELB activity.
Canada goose <i>Branta canadensis</i>	MIS	Use a variety of habitats including lacustrine, fresh emergent wetlands, moist grasslands, croplands, pastures, and meadows.	<ul style="list-style-type: none"> • Occur at Little Grass Valley and Ponderosa reservoirs; also observed at Sly Creek and Lost Creek reservoirs.
Osprey <i>Pandion haliaetus</i>	CSC	Nest in large trees near open, fish-bearing water.	<ul style="list-style-type: none"> • Project reservoirs have increased the distribution and amount of potential foraging and nesting habitat in the vicinity of the Project; Osprey are known to occur at Little Grass Valley, Sly Creek, and Lost Creek reservoirs, and near Miners Ranch conduit (along Lake Oroville).
Bald eagle <i>Haliaeetus leucocephalus</i>	CE, CFP, MIS	Tend to nest in areas of primarily mature/late-successional, or old-growth forest in fairly close proximity to water. Nests usually constructed in very large trees within fairly open stands of approximately 40% canopy closure. The nest tree is often the dominant or co-dominant tree in the surrounding stand and must be sturdy enough to support a large, heavy stick nest (e.g., 5 feet wide and 3 feet deep) and often re-used and/or reconstructed each year. Breeding territories may include one or more alternate nests. Fish	<ul style="list-style-type: none"> • Project reservoirs have increased the distribution and amount of potential foraging and nesting habitat in the vicinity of the Project; occur at Little Grass Valley, Sly Creek, Lost Creek, and Ponderosa reservoirs, and near Miners Ranch conduit (along Lake Oroville). • Nesting has been documented at Little Grass Valley reservoir which supports the only known bald eagle nest territory in the vicinity of the Project; located on south side of reservoir, 3 miles north of La Porte. • Spring hollow territory; south of the Middle Fork

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
Northern goshawk <i>Accipiter gentiles</i>	FSC, CSC, MIS, FSS	are primary diet although waterfowl, gulls and other birds, mammals, and carrion may also be taken. Large bodies of water required for hunting, including estuaries and coastal waters, rivers, large lakes, and reservoirs. Open, easily approached perches and feeding areas are preferred. Winter habitat requirements include adequate food supplies and the presence of roosting sites generally located close to open water but can be up to over 20 mi (32 km) from foraging areas. Important perch and roost sites include snags and dead-topped, live trees located in areas with minimal human disturbance. Prefers dense, late successional stage forest interspersed with meadows and other openings, and low-elevation riparian habitats (middle and higher elevations).	Feather River arm of Lake Oroville, 5.5 mi WSW of Feather Falls. <ul style="list-style-type: none"> • One CNDDDB occurrence at UTM 672731 4399488. • One CNDDDB occurrence at UTM 661899 4367010. • One CNDDDB occurrence at UTM 640937 4381717. <ul style="list-style-type: none"> • Forbestown. • Mooreville Ridge, 1.5 miles west of Lost Creek Reservoir. • Four nests northeast of Little Grass Valley reservoir in the Bald Onion Management Unit • 13 goshawk detections and three active nests in the vicinity of the confluence of Lost Creek and the SFFR. • One CNDDDB occurrence at UTM 10 647669 437760. • One CNDDDB occurrence at UTM 10 657833 438207. • The nearest known or suspected peregrine falcon sites are on bridges at Lake Oroville, and north of the Middle Fork Feather River near Lake Oroville.
American peregrine falcon <i>Falco peregrinus anatum</i>	CE, CFP, MIS	Use a variety of habitats, including wetlands, woodlands, cities, agricultural lands, and coastal areas. Often nest in open areas near rivers, lakes, and coasts, and increasingly, in urban settings. Nests usually located near water, typically constructed on ledges of large cliff faces; birds in urban environments nest on city buildings and bridges. Nests consist of a well-rounded hollow scrape with accumulated debris in tree cavities, caves or on cliff ledges, occasionally lined with grass. Peregrine falcons may hunt prey in a variety of open habitat types such as wetlands, estuaries, mudflats, marshes, meadows, lakes, and rivers. Individuals have been known to forage up to 15 km (9 miles) from their nest sites.	<ul style="list-style-type: none"> • Although 7 pairs were found nesting in Plumas County in 1988, there are no sandhill crane records documented in the CNDDDB for the Project area.
Greater sandhill crane <i>Grus canadensis tabida</i>	CT, CFP, FSS	Winters in the Central Valley, where it feeds on grasses, forbs, waste grains, small mammals, amphibians, snakes, and invertebrates in relatively	

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
California spotted owl <i>Strix occidentalis occidentalis</i>	FSC, CSC, MIS, FSS	treeless plains, pastures, flooded grain fields, wet meadow, shallow lacustrine, and fresh emergent and seasonal wetlands habitats. Found in late- and mid-successional stage forest; dense multi-layered mixed conifer, redwood, and Douglas-fir habitats (0–7,500 ft [2,300 m]).	<ul style="list-style-type: none"> California spotted owl observations have been recorded throughout PNF since 1975 with nests documented (outside Project areas) in the vicinity of: Little Grass Valley reservoir, Pinkard Creek near Sly Creek reservoir, and Devil’s Gap near South Fork diversion dam.
Great grey owl <i>Strix nebulosa</i>	CE, FSS	Found in old-growth forests interspersed with openings for foraging, particularly mixed conifer and red fir forests of the Sierra Nevada during the breeding season. Distributed mainly in the scattered meadow-mature forest zone on the west slope of the central Sierra Nevada.	<ul style="list-style-type: none"> No owls observed during 2002 surveys of Watdog and Bald Onion Management Areas (Klamath Wildlife Resources 2002) or during surveys of Blakeless-Grizzly Creek (PNF) in 1984. One 1937 record of an owl shot 3 miles south of Mt. Ingalls along Blakeless Creek in September 1937.
Western Mastif bat <i>Eumops perotis</i>	FSC, CSC, WBWGH	Found in open areas with abundant roost locations provided by crevices in rock outcrops and buildings (lower elevations, but as high as 8,700 ft [2,660 m]) ^c	<ul style="list-style-type: none"> Multiple observations noted from Plumas County. Confirmed population associated with the basaltic table mountains near Oroville; additional population noted near Chico thought to be year-long resident.
Pacific fisher <i>Martes pennanti</i>	FSC, CSC, FSS, FC	Occur in late successional forest near streams and meadows (0–11,000 ft [3,350 m])	<ul style="list-style-type: none"> Vicinity of Bullards Bar Reservoir, the south side of Bullards Bar Dam. Plumas National Forest.
California wolverine <i>Gulo gulo luteus</i>	FSC, CT, FSS	Most historical records in the Sierra Nevada associated with coniferous forests. Home range size extremely variable and appears to depend on the abundance and distribution of food. Localized areas of high food availability tend to result in smaller home ranges. Home range size varies from less than 39 mi ² (100 km ²) to over 347 mi ² (900 km ²). Natal den sites located in cavities in trees and snags and in holes dug under standing trees or downed logs in forested areas. Dens also found in abandoned beaver lodges, within the roots of recently downed trees, among boulders, on rock ledges, old bear dens, and in caves. Dense cover used for resting and reproduction, open areas used for hunting (4,300–7,545 ft [1,300–2,300 m]). Topographic features such as rivers, lakes, and	<ul style="list-style-type: none"> White Springs.

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
Mountain yellow-legged frog <i>Rana muscoca</i>	FSC, FC, CSC, CP	mountain ranges do not appear to block the movement of wolverines. Riparian areas are used as travel corridors. In the Sierra Nevada, wolverine populations may have become isolated due to human activities, and their current distribution in the Sierra Nevada is unknown. Montane riparian habitats with slow moving streams, lakes, and ponds (above 1,372 m [4,500 feet])	<ul style="list-style-type: none"> • Pine Grove Creek, 0.7 miles NW of Howland Flat, Plumas National Forest. • Pinkard Creek; 1.1 miles directly north of Lost Creek Reservoir and 2 miles directly east of Sugar Pine Point. • Vicinity of Bottle Springs, 6.4 miles north of Fowler Peak and 5.7 miles west of Little Volcano.
Foothill yellow-legged frog <i>Rana boylei</i>	FSC, CSC, CP	Moderate-sized, open streams with coarse substrate and low gradients (0–1,524 m [0–5,000 feet])	<ul style="list-style-type: none"> • Observed on Slate Creek upstream and downstream of Slate Creek Diversion Dam. • Slate Creek, north of forest road 512, 3 miles SE of Little Grass Valley Reservoir • SFFR, at forest road 22N24, Plumas National Forest. • Oroleve Creek, just east of forest road 20N29 (Forbestown Dam Road), Plumas National Forest. • Woodruff Creek, approximately 2.0 miles south of Goodyear’s Bar, North Yuba River Basin. • North Yuba River, from the mouth of Humbert Creek to Devils Canyon Creek, Tahoe National Forest. • Unnamed tributary to Woodruff Creek, along Mountain House Road, 1 mile SSW of Goodyears Bar, North Yuba River Basin, Tahoe National Forest. • Unnamed tributary to Woodruff Creek, along Mountain House Road, 2 miles SSW of Goodyears Bar, North Yuba River Basin, Tahoe National Forest. • Fiddle Creek, at Fiddle Creek Ridge Trailhead, North Yuba River Basin, Tahoe National Forest. • Woodruff Creek, 0.6 mile south of Goodyears Bar (0.8 mile south of HWY 49), North Yuba River Basin, Tahoe National Forest • Along forest road 22N62, east of Milsap Bar, Middle Feather River Basin, Plumas National Forest.

Common and Scientific Name	Status	Habitat Notes	Occurrences in Project Area
California red-legged frog <i>Rana aurora draytonii</i>	FT, CSC, CP	Wetlands; wet meadows; ponds and lakes; and pools in low-gradient, slow moving stream reaches, with permanent sources of deep water and riparian vegetation (0– 1,524 m [0–5,000 feet])	<ul style="list-style-type: none"> • North side of Little Oregon Creek, just east of Oregon Hill Road (CNDDDB 2004, Challenge Quad). • Closest occurrence (from 1994) is approximately one mile north of Lost Creek Reservoir along Pinkard Creek.

Notes:

FE = Listed as endangered under the federal ESA.

FT = Listed as threatened under the federal ESA.

FTPD = Listed as threatened under the federal ESA but currently proposed for delisting.

FP = Proposed for listing under the federal ESA.

FC = Federal candidate species.

FSC = Federal species of concern (former Category 2 candidate for listing under the ESA).

CE = Listed as endangered under the California Endangered Species Act.

CT = Listed as threatened under the California Endangered Species Act.

SC = Candidate for listing under the California Endangered Species Act.

CFP = Fully protected by the state of California.

CSC = Considered a species of special concern by the state of California.

MIS = Considered a Management Indicator Species by the Forest Service under the National Forestry Management Act.

FSS = Considered a Sensitive Species by the Forest Service under the National Forestry Management Act.

WBWG-H = Considered imperiled or are at high risk of imperilment by the WBWG.

Table 3-24. Roosting and foraging behavior summary of special-status bat species potentially occurring in the study area. (Source: South Feather, 2007)

Common and Scientific Names	Regulatory Status^a	Roosting Behavior	Foraging Behavior
Western mastiff bat <i>Eumops perotis</i>	CSC, FSC, WBWG-H	Colonial (30–300); predominantly cliff-dwelling; associated with major river canyons, and basaltic tablelands.	Aerial forager; feeds in both aquatic and terrestrial habitats; strong, long distance flier (1- way distance up to 25 km/night).
Pallid bat <i>Antrozous pallidus</i>	FSS, CSC, WBWG-H	Colonial (30–300); roosts in caves, abandoned mines, tree hollows, buildings, and bridges; often associated with oak habitat; somewhat sensitive to human disturbance.	Forages primarily on large, ground dwelling arthropods (scorpions, Jerusalem crickets, long-horned beetles); comes to water to drink.
Townsend's big-eared bat <i>Corynorhinus townsendii</i>	FSS, CSC, FSC, WBWG-H	Colonial (30–300); roosts in caves, abandoned mines, and cavity-like manmade structures (e.g., enclosed attics); restrictive roost requirements; sensitive to human disturbance; roosts in large, basal redwood hollows.	Moth specialist; forages close to vegetation, often following secondary stream drainages, often away from water sources.
Spotted bat <i>Euderma maculatum</i>	FSS, CSC, FSC, WBWG-H	Little known about roosting behavior; typically only one is caught per night at a given site; individuals well dispersed, separated by distances of 750–1,000 m.	Forages on moths; less than 10 km from diurnal roost; seems to forage constantly; roost faithful—returns to same diurnal roost every night during summer.
Red bat <i>Lasiurus blossevillii</i>	FSS, CSC*, WBWG-H	Non-colonial; foliage-roosting; summer breeding populations found predominantly in	Feeds predominantly on moths; often forages above canopy height, in association

Common and Scientific Names	Regulatory Status^a	Roosting Behavior	Foraging Behavior
		mature riparian forests in Central Valley; migrates through Central Valley in spring and fall.	with both aquatic and terrestrial habitats.
Small-footed myotis <i>Myotis ciliolabrum</i>	FSC	Non-colonial or small colonies; often associated with rock features; roosting behavior poorly known; may tree roost.	Generalist; aerial hunter of small flying insects; diet poorly known in California.
Long-eared myotis <i>Myotis evotis</i>	FSC	Small colonies (10-30); crevice-roosting in trees, caves, mines, rock jumbles (riprap) and sometimes in buildings.	Forages in close association with vegetation; in clutter and along edges in both aquatic and terrestrial habitats.
Fringed myotis <i>Myotis thysanodes</i>	FSC, CSC*, WBWG-H	Generally small colonies (10-100); roosts in trees (primarily bark crevices in snags) caves, mines, and sometimes in buildings.	Aquatic and terrestrial habitats, often along secondary streams; feed mainly on beetles.
Long-legged myotis <i>Myotis volans</i>	FSC, CSC*, WBWG-H	Colonies (30-100); day roosts in trees, sometimes in buildings or caves; very few roosts known in California; night roosts on bridges.	Feeds predominantly on moths; forages in aquatic, riparian, and terrestrial habitats, often along secondary streams.
Yuma myotis <i>Myotis yumanensis</i>	FSC	Colonial; versatile roosting habits—caves, mines, trees, buildings, bridges.	Species dependent on aquatic habitats; often skims open water surface.

Notes: CSC = Considered a species of special concern by the state of California

FSC = Federal species of concern (former Category 2 candidate for listing under ESA).

FSS = Considered a Sensitive Species by the Forest Service under the National Forestry Management Act.

WBWG-H = Considered imperiled or are at high risk of imperilment by the WBWG.

* Status proposed.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Central Valley Spring-run Chinook Salmon

On September 19, 1999, NMFS listed the Central Valley spring-run Chinook salmon ESU as threatened under the ESA, and the listing was reaffirmed on June 28, 2005. The Central Valley spring-run Chinook salmon ESU is also listed as endangered under the California Endangered Species Act. The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River, as well as fish from the Feather River Hatchery spring-run Chinook program. NMFS' Central Valley Technical Recovery Team believes that the existing spring-run population in the Feather River, including the hatchery fish, may be the only remaining representative of this important ESU component and that the Feather River Hatchery spring-run Chinook salmon stock may play an important role in the recovery of spring-run Chinook salmon in the Feather River Basin as efforts progress to restore natural spring-run populations in the Feather and Yuba rivers (70 FR 37,160).

A designation was published on September 2, 2005, with an effective date of January 2, 2006. NMFS identified occupied habitat in the Feather River downstream of the fish barrier dam at the Feather River Hatchery as critical habitat for Central Valley spring-run Chinook salmon. NMFS further ruled that it is premature to include areas upstream of Oroville dam until ongoing recovery planning efforts in the central valley identify above-dam unoccupied areas that are essential for conservation of these ESUs (70 FR 52,630).

Historically, spring-run Chinook salmon were reported to have ascended to the very highest streams and headwaters in the Feather River watershed while they completed gonadal maturation (Cal Fish & Game, 1998a). The fish barrier dam, located 5 miles downstream of Oroville dam, is now the upstream limit to anadromous fish migrations. The Oroville facilities block the upstream migration of anadromous salmonids into historical spawning habitat in upstream tributaries, including the SFFR. Blocked access to historical spawning grounds in the upper watershed causes spring-run Chinook salmon to spawn in the same lowland reaches of the Feather River that fall-run Chinook salmon use as spawning habitat. The overlap in spawning sites and in spawning timing (Moyle, 2002) may be responsible for inter-breeding between spring-run and fall-run Chinook salmon in the Feather River (Hedgecock et al., 2001).

In the Feather River, it has been reported that adult spring-run Chinook salmon enter the river from March through June (Sommer et al., 2001), and are found holding at the Thermalito afterbay outlet and the fish barrier dam as early as April (FERC, 1997). When daily average water temperatures decrease to about 60°F, female Chinook salmon begin to construct nests (redds) into which their eggs (simultaneously fertilized by the male) are eventually released. Fertilized eggs are subsequently buried with streambed

gravel. Spawning activity in the Feather River occurs from late August through December and generally peaks in mid to late November (Myers et al., 1998), and incubation may extend through March.

Water temperatures reported to be optimal for rearing of Chinook salmon fry and juveniles are between 45 and 65°F (NMFS, 2002; Rich, 1987; Seymour, 1956). Juvenile fall-run Chinook salmon normally rear for 1 to 7 months in freshwater before migrating to the ocean (Yoshiyama et al., 1998), and normally spend 4 to 5 years in the ocean (Moyle, 2002). Juvenile Chinook salmon in the Feather River have been reported to emigrate from about mid-November through June, with peak emigration occurring from January through March (DWR, 2002c; Painter et al., 1977).

California Central Valley Steelhead

Steelhead are native to California rivers. On March 19, 1998, NMFS listed the naturally spawned California Central Valley steelhead as threatened under the ESA (63 FR 13,347). In June 2005, NMFS determined that hatchery stocks are to be included in a steelhead Distinct Population Segment if they are no more than moderately diverged from local, native populations in the watershed(s) in which they are released.

In its final listing determination published January 6, 2006 (71 CFR 834), NMFS concluded that the threatened California Central Valley Steelhead Distinct Population Segment includes all naturally spawned populations of steelhead (and their progeny) below natural and manmade barriers in the Sacramento and San Joaquin rivers and their tributaries. The listing excludes steelhead from San Francisco and San Pablo bays and their tributaries, and includes steelhead from Feather River Fish Hatchery.

Critical habitat for California Central Valley steelhead was designated by NMFS in September 2005 (70 FR 52,488), and includes all occupied habitat in the Feather River downstream of the fish barrier dam at the Feather River Hatchery.

Most of the natural steelhead spawning in the Feather River occurs in the low flow channel, particularly in its upper reaches near Hatchery Ditch, a side-channel located between RM 66 and 67. Limited steelhead spawning also occurs below the Thermalito afterbay outlet. Soon after emerging from gravel, a moderate percentage of the fry appear to emigrate. The remainder of the population rears in the river for at least 6 months to 1 year. Studies have confirmed that juvenile rearing and probably adult spawning are associated with secondary channels within the low flow channel (DWR, 2005a). The lower velocities, smaller substrate size, and greater amount of cover (compared to the main river channel) likely make these side-channels more suitable for juvenile steelhead rearing.

Currently, this type of habitat comprises less than 1 percent of available habitat in the low flow channel (DWR, 2001b). Juvenile steelhead in the Feather River emigrate from about February through September, with peak emigration occurring from March through mid-April. However, empirical and observational data suggest juvenile steelhead potentially emigrate during all months of the year in the Feather River.

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desomcerus californicus dimorphus*) is listed as threatened under the ESA. All lifestages of the beetle are associated with elderberry plant (*Sambucus* spp.). Adult females lay eggs in crevices in the bark of the host plant. After the eggs hatch, the larvae spend 1 to 2 years eating elderberry wood, which is the insect's only food source. The larvae pupate in the tree, exit to breed, and then the life-cycle is complete. The host plants are found in riparian areas in California, but the beetle has only been observed on plants below 3,000 feet. During pre-licensing surveys, South Feather conducted surveys for valley elderberry longhorn beetles following FWS survey protocols. Surveyors did observe some elderberry plants within the project area; however, all observations were recorded near 5,000 feet. No elderberry plants were recorded at elevations suitable for the valley elderberry longhorn beetle.

California Red-legged Frog

The California red-legged frog (*Rana aurora draytonii*) is listed as threatened under the ESA. This species occurs in wetlands; wet meadows; ponds and lakes; and pools in low-gradient, slow moving stream reaches, with permanent sources of deep water and riparian vegetation, at elevations ranging from 0 to 5,000 feet). Eggs are laid in ponds or backwater pools and attached by females to an emergent vegetation brace. Tadpoles inhabit the same area as eggs, often occurring in slow-moving, shallow riffle zones, and along the margins of pools. The larvae spend most time in submergent vegetation or organic debris. Following metamorphosis, adults and juveniles occur in emergent and/or riparian vegetation, undercut banks, semi-submerged root masses, open grasslands with seeps, or springs with dense growths of woody riparian vegetation. Cattails, bulrushes, and willows are good indicator species for frog presence. Adults are typically associated with deep (>0.7 meter), still or slow-moving water. Juveniles prefer open, shallow aquatic habitats with dense submergents. In the project area, the closest recorded observation of California red-legged frog is about 1 mile north of Lost Creek reservoir along Pinkard Creek. As part of the re-licensing process, South Feather conducted habitat and visual encounter surveys following FWS protocols for the California red-legged frog. Based on review of helicopter flight video, potential habitat for California red-legged frog was identified in the Forbestown diversion dam reach, Lost Creek dam reach, and at Miners Ranch reservoir; however, only one of these reaches was accessible for on-the-ground surveys. Two additional areas of potential habitat were identified during ground reconnaissance along the Lost Creek dam reach. Areas of potential habitat were limited and generally of poor quality due to high silt content, lack of appropriate vegetation, and presence of predators. Visual encounter surveys were conducted at three sites. No California red-legged frog observations were made during these surveys.

3.3.4.2 Environmental Effects

As discussed in section 3.3.2, *Aquatic Resources*, during summer months, discharge of warm water from the Kelly Ridge powerhouse has the potential to increase water temperatures in the upper portion of the Thermalito diversion pool. However, we have seen no data showing, and consider it unlikely that the addition of this water at the head of the diversion pool would cause any appreciable increase in temperature at the downstream compliance points (i.e., the Feather River Fish Hatchery and Robinson Riffle) where these listed anadromous fish are found. As noted previously, listed salmonids do not occur in the vicinity of the Kelly Ridge tailrace or in the Thermalito diversion pool. Consequently, we conclude that the proposed project may affect, but is not likely to adversely affect, Central Valley spring-run Chinook salmon and California Central Valley steelhead, and critical habitat for these species.

There is no known potential valley elderberry longhorn beetle habitat in the project area. No comments filed with the Commission address this species. Although it is unlikely that this species occurs in the project area, it cannot be ruled out. We conclude the proposed project may affect, but is not likely to adversely affect, this species.

Potential habitat for the California red-legged frog in the project area is generally limited and of poor quality. However, several areas of potential habitat were not accessible for ground surveys and the presence of California red-legged frog in these areas is unknown. Ground reconnaissance and visual encounter surveys conducted in the accessible reaches indicated a presence of predatory species and did not record any occurrences. No comments filed with the Commission address this species. However, if California red-legged frog were to occur in the project area, the species could be affected by project effects on flow regimes, water levels, and riparian habitats. As a result, we conclude that the proposed project may affect, but is not likely to adversely affect, this species.

3.3.5 Recreation Resources

3.3.5.1 Affected Environment

Regional Recreation Resources

More than half of the South Feather Power Project is located on lands within the Plumas National Forest. The Plumas National Forest, totaling 1,146,000 acres, provides a variety of recreational opportunities such as camping, fishing, hunting, picnicking, off-highway vehicle (OHV) areas, mountain biking, water skiing, whitewater boating; snow skiing, snowmobiling, and more than 300 miles of hiking trails including the Pacific Crest National Scenic Trail, and the Feather Falls and Hartman Bar National Recreation Trails. The Pacific Crest National Scenic Trail stretches across the Plumas National Forest for 75 miles, while the Feather Falls and the Hartman Bar trails extend 3.5 miles each. The Plumas National Forest hosts nearly one million visitors a year.

The Lake Oroville State Recreation Area adjoins the South Feather Power Project, making up 0.5 percent of the lands within the project boundary. The park offers camping, picnicking, horseback riding, hiking, boating, water-skiing, fishing, and swimming. Lake Oroville State Recreation Area has a visitor center, museum, store, 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. There are more than 200 campsites for tents and recreational vehicles with restrooms and showers, boat-in campsites, floating campsites, and one group campground. More than 100 primitive camping sites are available by boat access only.

Other recreation areas outside of the project area, but within the project region, include: Bucks Lake Recreation Area, New Bullards Bar reservoir, Feather Falls National Scenic Area, and Plumas-Eureka State Park. Additional recreation areas within the region include Silver Lake, which is adjacent to the Bucks Lake Wilderness Area, the North Fork Feather River recreation complex that includes numerous family campgrounds and day-use areas; the Lakes Basin and Sierra Buttes recreation areas that offer hiking trails, snowmobile trails, developed campgrounds, day-use areas, boat launch facilities, scenic trails and overlooks, cabins, private resorts and dispersed recreation opportunities; and the Middle Fork Feather River Wild and Scenic River with opportunities for hiking trails into the river corridor, including Bald Rock Dome trail, Big Bald Rock trail, fishing, whitewater rafting and kayaking; and various dispersed recreation and OHV camps.

Bucks Lake Recreation Area offers activities such as swimming, boating, hunting, fishing, hiking, and snowmobiling in winter. There are seven public campgrounds for tents and recreational vehicles, three boat launches, and two day-use areas. Private recreation facilities around Bucks Lake include campgrounds, cabins, a country store, a marina, slip rentals, a grocery store, a gas station, a restaurant, boat rentals, boat launch areas, a swimming area, and a water ski beach. The Bucks Lake Wilderness Area provides opportunities for non-motorized, dispersed recreation.

Recreation facilities at New Bullards Bar reservoir includes six private campgrounds including group camping, shoreline camping, boat-in camping, and land-based camping and two boat launches. Feather Falls National Scenic Area, located northeast of Lake Oroville, provides hiking opportunities along the Feather Falls National Recreation Trail and scenic views of a 640-foot waterfall. Plumas-Eureka State Park is 20 miles east of Little Grass Valley reservoir and offers 67 campsites, a visitor center and museum, fishing opportunities, hiking, bike trails, natural trails, guided tours, a nature study, and picnic areas.

Project Area Recreation Resources

There are two developed recreation areas within the project boundary: Little Grass Valley reservoir recreation area and Sly Creek reservoir recreation area; both are located within the Sly Creek development. South Feather constructed and currently

operates and maintains the Sly Creek reservoir recreation area facilities. South Feather constructed the Little Grass Valley reservoir recreation area facilities, with the exception of the Horse Camp campground and the fishing trail, which were constructed by the Forest Service. At the Forest Service's request, South Feather turned over ownership of the Little Grass Valley reservoir recreation area facilities to the Forest Service, which currently administers, maintains, and operates these facilities. The Plumas National Forest and South Feather contract with Northwest Parks Management to operate and maintain the facilities at these two areas, which offer recreational opportunities such as camping, picnicking, hiking, waterskiing, swimming, boating, fishing, sightseeing, snowmobiling, and cross-country skiing. Hunting is allowed only in the general forest area outside and beyond the developed recreation area boundaries.

Little Grass Valley Reservoir Recreation Area

The Little Grass Valley reservoir recreation area has eight campgrounds, three boat ramps, two day-use areas, and four trails (figure 3-13 and table 3-25). The campgrounds include Little Beaver, Red Feather, Running Deer, Horse Camp, Wyandotte, Peninsula, Black Rock, and Tooms.

Paved access to the reservoir occurs on FS Road 27 and FS Road No. 120 (La Porte Road). On the eastern shoreline, Running Deer, Little Beaver, and Red Feather campgrounds can be accessed by FS Road No. 22N57. Wyandotte, Tooms RV, and Peninsula Tent campgrounds are located on a protruding peninsula on the south shore, and can be accessed by FS Road No. 22N57Y. The Black Rock campground and Horse Camp campground facilities are accessed via FS Road No. 22N57 that extends around the eastern and northern shore of Little Grass Valley reservoir. The campgrounds at Little Grass Valley reservoir recreation area combined offer 295 campsites with tables, fire rings, grills, water, and restrooms. Some units provide space for trailers up to 40 feet. No hookups are provided but dump stations are available near Little Beaver, Peninsula, and Wyandotte campgrounds.

The three boat ramps on Little Grass Valley reservoir (Black Rock, Tooms, and Maidu) are paved, have loading docks, and nearby parking areas. Black Rock boat ramp is located at the Black Rock RV campground while Tooms is located near Tooms RV campground, and Maidu is located adjacent to Bluewater Beach day-use area and Little Beaver campground. South Feather states that elevation 5,022 feet msl is 2 feet above the edge of the paved portion of the boat ramps, and is considered by South Feather to be the minimum elevation at which the boat ramps are available for use by anglers and recreationists.

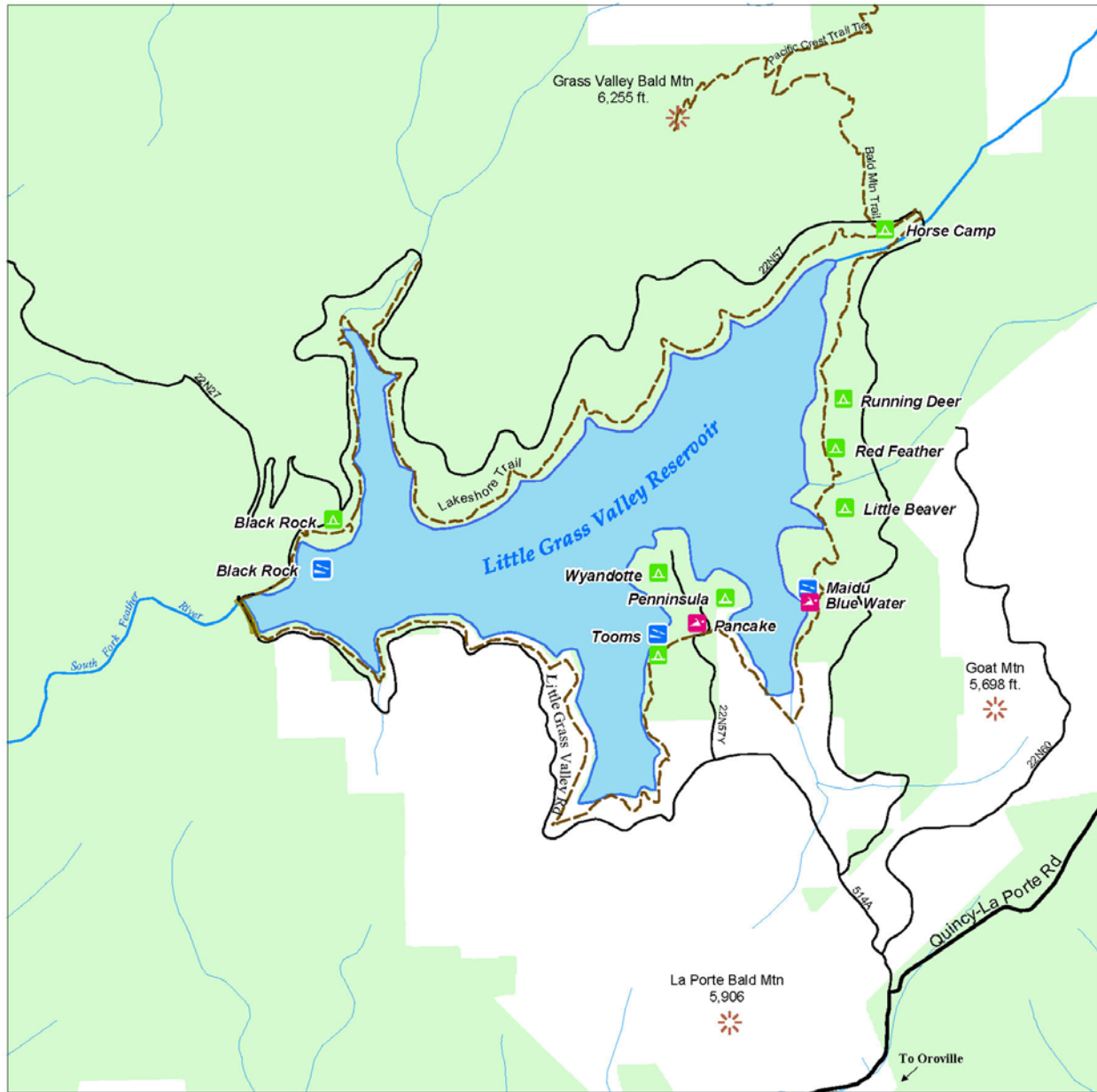


Figure 3-13. Recreation sites at Little Grass Valley reservoir recreation area. (Source: South Feather, 2007)

Table 3-25. Recreation facilities at the Little Grass Valley reservoir recreation area. (Source: South Feather, 2007, staff)

Site Name	Facilities
Little Beaver Complex	120 campsites including six lakeside sites, trailer space, flush toilets, drinking water

Site Name	Facilities
Red Feather campground	60 campsites including 12 lakeside sites with trailer spaces, flush toilets, drinking water
Running Deer campground	40 campsites including five lakeside sites with trailer space, flush toilets, drinking water
Horse Camp campground	10 campsites with trailer space, vault toilets, no piped drinking water, a warming hut, restricted to use by campers with horses only, Pacific Crest Trail trailhead and parking area
Wyandotte campground	30 campsites, trailer space, flush toilets, drinking water, pump station, four picnic units
Peninsula Tent campground	25 tent-only campsites, drinking water, flush toilets
Black Rock Tent campground	10 walk-in campsites, two picnic units, vault toilets, drinking water
Black Rock RV campground	20 parking spaces for RV's, vault toilets, drinking water, boat ramp
Black Rock boat ramp	Paved ramp, loading dock, parking area, accessible restroom, fish cleaning station
Tooms RV camp	12 parking spaces for RV's, vault toilets, drinking water, dump station, nearby boat ramp
Tooms Boat Ramp	Paved ramp, loading dock, parking area, accessible restroom, fish cleaning station, lighting
LGV RV dump station	RV wastewater septic tank and running water for rinsing
Bluewater Beach day-use area	12 picnic units, flush toilets, drinking water, changing rooms, amphitheater nearby, swimming area
Maidu boat ramp	Paved ramp, loading dock, parking area, accessible restroom, fish cleaning station, amphitheater
Pancake Beach day-use area	12 picnic units, vault toilets, drinking water, changing rooms, swimming area
Little Grass Valley lakeshore trail	13.5 mile trail around most of reservoir
Little Grass Valley accessible fishing trail	Accessible 800 foot cement trail, accessible parking area, and accessible restroom

Site Name	Facilities
Bald Mountain trailhead	15 mile Forest Service trail
Black Rock Creek trail	0.58 mile trail

Since 2000, improvements at all three boat ramps were implemented through funding from the California Department of Boating and Waterways, which provides grants to public agencies for the construction of boat launching ramps and ancillary facilities. At Tooms boat launch, these improvements included: widening of the existing launch ramp; repair of damaged parking areas and roadways; construction of an accessible restroom, and removal of the old restroom; and the installation of a fish cleaning station and area lighting. At the Black Rock and Maidu boat ramps, improvements included: widening the existing boat ramps, applying seal to the parking areas, installing accessible restrooms, and adding a fish cleaning station at each ramp.

The two day-use areas, Pancake Beach and Bluewater Beach, both consist of 12 picnic units, drinking water, restrooms, and changing rooms. Pancake Beach is located on the peninsula, while Bluewater Beach is near Maidu boat ramp. Hiking, boating, swimming, and picnicking are available on the reservoir at or near all day-use areas.

Four trails exist along Little Grass Valley reservoir. The Lakeshore trail is 13.5 miles long and is open only for foot traffic. The cement accessible fishing trail is located near the Little Grass Valley dam and extends 800 feet to the water level and is accessible at different elevations to accommodate fishing access as the reservoir elevation fluctuates. The Bald Mountain trailhead is located in the Horse Camp campground. This trail is a Forest Service trail that extends 15 miles. The Black Rock Creek Trail extends 0.58 mile in length and begins at the road edge, adjacent to Black Rock Creek, and extends down to the large rock outcropping.

The Davis-Grunsky Act (Chapter 5, commencing with Section 12880, of Part 6 of Division 6 of the California Water Code) provides financial assistance for local water supply and sanitation projects and is administered by DWR. The 1967 contract between South Feather and DWR provided about \$2.5 million for construction of on-shore recreation facilities at Little Grass Valley reservoir (the Forest Service now operates these facilities.). In accordance with the South Feather's Davis-Grunsky Contract, South Feather has maintained the Little Grass Valley reservoir at or above 58,500 acre-feet (elevation 5,022 feet msl) through September 30 to keep boat ramps operational. South Feather's contract with DWR expires when the current FERC license for the project expires.

South Feather currently assists the local county sheriff departments to install public safety buoys in Little Grass Valley and Sly Creek reservoirs. The buoys provide the public with information regarding boat speed in restricted areas, danger areas, and

other safety information. The buoys are typically installed each year around Memorial Day at the start of the recreation season and removed after Labor Day.

Sly Creek Reservoir Recreation Area

At Sly Creek reservoir, there are two campgrounds, two boat ramps/launches, and a day-use area (figure 3-14 and table 3-26). This reservoir offers many recreational opportunities, although steep terrain makes access more difficult than at Little Grass Valley reservoir. The boat ramp facilities provide access to the water for fishing, water-skiing, and boating. Sly Creek reservoir can be accessed by FS Road No. 21N16 (Barton Hill Road). Sly Creek campground is located on the southwest side of Sly Creek reservoir. Adjacent to Sly Creek campground is the Mooreville boat ramp and day-use area. Sly Creek campground and Mooreville boat ramp and day-use area are accessible from Barton Hill Road. The Strawberry campground is located on FS Road No. 21N20, on the northeast side of the reservoir. Nearby is a car-top boat launch facility for canoes, rafts, or kayaks.

In 1999-2001, South Feather with its own funding and funding from the California Department of Boating and Waterways, made improvements to the recreation facilities at Sly Creek reservoir recreation area. Sly Creek campground improvements included: road and site development, the purchase and installation of picnic tables, fire rings, vault toilets, and paving the campground road and parking areas. Improvements at Mooreville boat ramp included: relocation of the ramp off the end of the trailer parking area, extension of the ramp to accommodate launching at lower water levels, courtesy floats, and a fish cleaning station. Upgrades at the car-top boat launch include paving the parking area, paving a 250-foot footpath, and adding a restroom.

Lost Creek Reservoir

There are no developed recreation sites at Lost Creek reservoir. Access to this reservoir is difficult and limited to the areas near Lost Creek and Sly Creek dams. Upstream from Lost Creek dam is an informal boat ramp, accessible only by high clearance vehicles.

Ponderosa Reservoir

There are no developed recreation facilities at Ponderosa reservoir. Access to the reservoir is limited to unimproved Forest Service roads or private roads. FS Road No. 20N24 turns into a primitive trail that leads to the shoreline of Ponderosa reservoir. Three private residences are located on private lands along the reservoir shoreline.

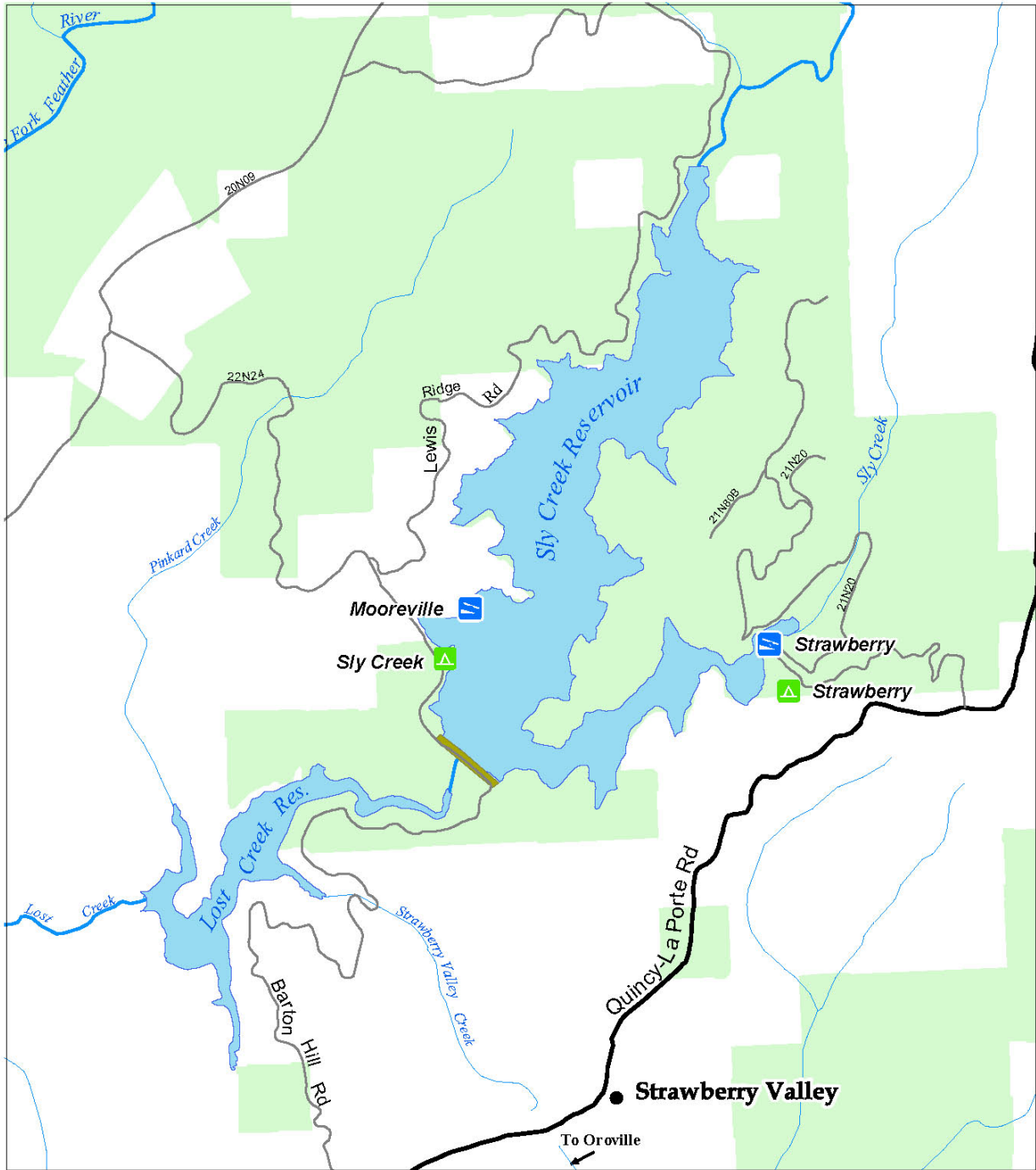


Figure 3-14. Recreation sites at Sly Creek reservoir recreation area. (Source: South Feather, 2007)

Table 3-26. Recreation facilities at the Sly Creek reservoir recreation area. (Source: South Feather, 2007, staff)

Site Name	Facilities
Sly Creek campground	30 campsites, drinking water, picnic tables, fire rings, vault toilets, trailer space, two campsites with picnic tables, accessible restrooms
Mooreville boat ramp and day-use area	Concrete boat launch, courtesy floats, fish cleaning station, picnic tables, fire ring/grill, vault toilets, water hydrant, parking area
Strawberry campground and car-top boat launch	Campground - 17 campsites with trailer spaces, vault toilets, drinking water; boat launch – paved foot path, water access for car-top boats, paved parking area, restroom

Miners Ranch Reservoir

Public access at Miners Ranch reservoir is prohibited. The reservoir is locked and gated to prevent use because it is part of the domestic water supply. The lands surrounding the reservoir are zoned for public use, residential use light commercial use, and state use as the Lake Oroville State recreation area.

South Fork, Slate Creek, and Forbestown diversions

At South Fork, Slate Creek, and Forbestown diversions, there is no developed recreation. Access to the South Fork and Slate Creek diversions is difficult and limited due to the steep terrain and location in the canyons. Roads used for access are 21N11Y from 21N16 (Mooreville Ridge), and Upper Scales Road, a Yuba County road. Forbestown diversion can be accessed by FS Road No. 20N27 that ends at the Woodleaf powerhouse. Shoreline fishing is permitted at the Forbestown diversion, however, boating and swimming are not permitted because of the overflow spillway and use for domestic water supply. The South Fork diversion dam impoundment is used as a take-out by whitewater boaters.

Recreation Use and Facility Capacity

Recreation use within the project boundaries occurs at the two developed recreation areas, Little Grass Valley and Sly Creek recreation areas, and dispersed recreation use at the undeveloped recreation areas. According to the Plumas National Forest, dispersed recreation makes up 60 percent of all recreation in the Plumas National Forest. Based on visitor surveys conducted by South Feather in 2004, the primary recreation uses within the project include relaxing/camping (33 percent), picnicking (16 percent), swimming (13 percent), boating (12 percent), fishing (8

percent), and hiking/walking (7 percent). At Little Grass Valley recreation area, the top five activities by percentage, accounting for greater than 80 percent of the total recreational activity, included: relaxing/camping, boating (motorized), swimming, picnicking, and fishing (lake or lakeshore). At Sly Creek reservoir recreation area, the top five activities, accounting for 90 percent of the total activity, included picnicking, relaxing/camping, swimming, OHV use, and boating (motorized). About 10 percent of visitors surveyed at Sly Creek reservoir recreation area spent their time riding OHVs, compared to less than one percent of Little Grass Valley recreation area visitors that were surveyed. The Forest Service states that Sly Creek dam borrow pit is an unofficial OHV play area.

In 2005, South Feather estimated use based on the extrapolation of visitor counts (number of people at one time at the facilities) at the day-use areas and boat launches at Little Grass Valley and Sly Creek reservoirs during the peak recreation season (table 3-27). South Feather defines the peak recreation season for Little Grass Valley reservoir as May 21 through October 15, and April 28 through October 15 for Sly Creek reservoir. The Forest Service states that peak use typically occurs during Memorial Day weekend; before and after July 4 and Labor Day weekend are the highest occupancy weekends of the season; and that fishing and boating access continues into the fall, up until the first snowfall. South Feather estimates use in recreation days was highest at Bluewater Beach and Pancake Beach at Little Grass Valley reservoir recreation area and at the Mooreville day-use area at Sly Creek reservoir recreation area. South Feather estimates percent capacity at day-use areas and boat launches is highest on holiday weekends and some weekend days in July and August.

South Feather estimates the site occupancy at the campgrounds at Little Grass Valley recreation area was at 13.3 percent capacity in 2003, 15 percent in 2004, and 22.7 percent capacity in 2005 (table 3-28). South Feather suggests the number of visitors per year and percent capacity varies due to open and close dates for each facility. In addition, Forest Service states that other factors also influence recreational visitation in the vicinity of the project, including road conditions and road construction, logging operations within the recreation area, fire incidents and closures on the forest, costs of travel and gasoline, and presence or lack of snow in the late fall. In terms of estimated future use and capacity, South Feather estimates that, by the year 2050, the campgrounds would only be at about 41 percent of overall capacity at Sly Creek recreation area and at about 26.9 percent of overall capacity at Little Grass Valley recreation area. At the day-use facilities, South Feather estimated that none of the facilities would reach full capacity by the year 2050; however, it is likely Bluewater Beach and Mooreville day-use area would be at full capacity on most holiday days.

Table 3-27. 2005 Peak season day-use estimates in recreation days for the day-use facilities at Little Grass Valley and Sly Creek reservoir recreation areas. (Source: South Feather, 2007)

Facility	Use Estimate (recreation days) ^a
Little Grass Valley Reservoir Recreation Area	
Maidu boat launch	526
Tooms boat launch	527
Black Rock boat launch	601
Pancake beach	1,614
Bluewater beach	2,324
ADA Fishing trail	582
<i>Subtotal</i>	6,174
Sly Creek Reservoir Recreation Area	
Mooreville boat launch	986
Strawberry car-top boat launch	455
Mooreville day-use area	1,126
<i>Subtotal</i>	2,567
<i>Project Total</i>	8,741

^a Recreation day is each visit by a person to a development for recreation purposes during any portion of a 24-hour period (as defined in the glossary of FERC Form 80 terms).

Table 3-28. Annual use and capacities at campgrounds. (Source: South Feather, 2007, staff)

Campground (Sites per Facility)	2003			2004			2005		
	No. Sites Occupied	No. Visitors	Percent Capacity	No. Sites Occupied	No. Visitors	Percent Capacity	No. Sites Occupied	No. Visitors	Percent Capacity
Little Grass Valley Reservoir Recreation Area									
Black Rock (22)	355	1,199	11.1	436	1,413	13.8	331	1,211	11.0
Horse Camp (10)	50	154	3.4	115	465	8.0	133	418	10.4
Little Beaver (120)	3284	11,210	18.9	3,253	11,686	18.8	3,627	13,258	23.3
Peninsula Tent (25)	134	567	3.7	177	823	4.9	CLOSED		
Red Feather (60)	1391	5,909	16.0	1,435	6,530	16.6	1,491	6,713	26.2
Running Deer (41)	980	4,172	16.5	837	3,808	14.2	1,123	5,107	28.8
Tooms RV (20)	11	27	.1	45	110	1.6	CLOSED		
Wyandotte (30)	893	3,355	20.6	803	3,056	18.6	CLOSED		
Annual Totals (328)	7,098	26,593	13.3	7,101	27,891	15.0	6,705	26,707	22.7
Sly Creek Reservoir Recreation Area									
Sly Creek (30)	1,377	5,873	29.8	1,398	6,143	30.3	1,571	6,633	34
Strawberry (17)	269	982	12.1	130	404	5.8	50	169	4.2
Annual Totals (328)	1,649	6,855	24	1,528	6,547	22.3	1,621	6,802	27.9

South Feather also evaluated the vehicle data in vehicles-at-one-time at the parking lots of each recreation facility. On average, Little Grass Valley day-use parking capacities were lower than Sly Creek day-use parking areas. In 2005, Maidu boat launch was the only facility at Little Grass Valley to exceed capacity. At Sly Creek, South Feather estimated use at Mooreville day-use area was on average 41 percent capacity, while the parking lot, on five different occasions, met or exceeded 100 percent capacity. Tables 3-29 and 3-30 show average and maximum vehicle data.

Table 3-29. Average, minimum, and maximum vehicles at one time observed by day type for day-use facilities at Little Grass Valley reservoir recreation area, summer 2005. (Source: South Feather, 2007)

Day Type	Total Spaces			Percent Capacity ^a		
	Ave	Min	Max	Ave	Min	Max
Maidu Boat Launch (50 spaces)						
Overall	11.8	0	51	23.6	0	102
Weekday	5.4	0	11	10.8	0	22
Weekend	15.2	6	37	30.3	12	74
Holiday	14.8	0	51	29.6	0	102
Tooms Boat Launch (30 spaces)						
Overall	0.9	0	7	3.1	0	23.3
Weekday	0.5	0	2	1.7	0	6.7
Weekend	0.7	0	6	2.4	0	20
Holiday	1.6	0	7	5.2	0	23.3
Black Rock Boat Launch (25 spaces)						
Overall	3.4	0	10	13.6	0	40
Weekday	2.2	0	5	8.9	0	20
Weekend	3.4	0	7	13.6	0	28
Holiday	4.6	0	10	18.2	0	40
Pancake Beach (20 spaces)						
Overall	1.8	0	14	8.8	0	70
Weekday	0.7	0	3	3.3	0	15

Day Type		Total Spaces			Percent Capacity ^a		
		Ave	Min	Max	Ave	Min	Max
	Weekend	1.4	0	7	7.2	0	35
	Holiday	3.2	0	14	15.8	0	70
Bluewater Beach (30 spaces)							
	Overall	5.2	0	22	17.2	0	73.3
	Weekday	1.6	0	4	5.2	0	13.3
	Weekend	5.8	0	19	19.4	0	63.3
	Holiday	8.1	0	22	27.0	0	73.3
ADA Fishing Trail (10 spaces)							
	Overall	0.6	0	3	5.9	0	30
	Weekday	0.3	0	2	3.3	0	20
	Weekend	0.7	0	3	7.2	0	30
	Holiday	0.7	0	2	7.2	0	20
Bald Mountain Trailhead (4 spaces)							
	Overall	0.3	0	2	7.9	0	50
	Weekday	0.1	0	1	2.8	0	25
	Weekend	0.2	0	2	5.6	0	50
	Holiday	0.6	0	2	15.3	0	50

^a Percent capacity is the total number of spaces occupied during the season divided by the total spaces available for the days observed.

Table 3-30. Average, minimum, and maximum vehicles at one time observed by day type for day-use facilities at Sly Creek reservoir recreation area, summer 2005. (Source: South Feather, 2007)

Day Type		Total Spaces			Percent Capacity ^a		
		Ave	Min	Max	Ave	Min	Max
Mooreville Boat Launch (24 spaces)							
	Overall	8	0	24	32	0	100

Day Type		Total Spaces			Percent Capacity ^a		
		Ave	Min	Max	Ave	Min	Max
	Weekday	2	0	4	8	0	17
	Weekend	9	4	18	36	17	75
	Holiday	12	3	24	51	13	100
Strawberry Car-top Boat Launch (8 spaces)							
	Overall	0	0	2	6	0	25
	Weekday	0	0	1	1	0	13
	Weekend	0	0	2	5	0	25
	Holiday	1	0	2	10	0	25
Mooreville Day Use (3 spaces)							
	Overall	1	0	5	41	0	167
	Weekday	0	0	2	15	0	67
	Weekend	1	0	2	33	0	67
	Holiday	2	0	5	76	0	167

^a Percent capacity is the total number of spaces occupied during the season divided by the total spaces available for the days observed.

Angling

The project reservoirs and streams provide angling opportunities. Survey data collected by South Feather indicated a high level of participation in angling. The percentage of visitors who fished at a developed recreation site was highest at Little Grass Valley reservoir (36 percent) and lowest at Sly Creek reservoir (18 percent). The percentage of visitors who fished at an undeveloped recreation site was highest at Forbestown diversion (80 percent) and lowest at South Fork diversion (29 percent). None of the visitor's surveyed fished from a boat at the undeveloped recreation sites.

Overall, survey data showed that the majority of respondents, 97 percent at Little Grass Valley reservoir and 85 percent at Sly Creek reservoir, did not have problems accessing the reservoirs for fishing. Those who stated they had problems (four respondents at Little Grass Valley reservoir and two respondents at Sly Creek reservoir)

indicated that angling opportunities were inhibited by access issues, including lack of trails, roads, or signage; presence of large boulders; steep terrain; and large crowds.

Whitewater Boating

In 2004, South Feather assessed whitewater boating opportunities within the project region through a literature review and surveys of individuals knowledgeable about whitewater boating opportunities within the region. In the Plumas National Forest, to the north and west of the project, the river systems of the Main Fork and the North Fork Feather River provide numerous, well established whitewater boating opportunities of varying classes²² (table 3-31). To the south and east of the project, whitewater boating opportunities are available on the North Yuba River and its tributaries primarily during spring run-off (table 3-32). None of the river reaches within the project reaches were listed in published literature or guidebooks; however, those who were surveyed indicated they had boated the Little Grass Valley dam reach.

Following completion of the 2004 Whitewater Boating Study, the Forest Service, FWS, the Water Board, and Cal Fish & Game requested that South Feather perform controlled whitewater boating flow studies on all project reaches except the Slate Creek diversion dam reach. Accordingly, in 2005, South Feather conducted controlled flow studies for whitewater boating opportunities for the Little Grass Valley dam reach, the South Fork and Forbestown diversion dam reaches, and the Lost Creek dam reach. A controlled flow study of the Slate Creek diversion dam reach was not conducted because the project has limited ability to control flow from Slate Creek diversion dam. Instead, assessment of this reach included a survey (same survey instrument as the controlled flow studies) of three boaters who ran the reach in April 2005. The following sections summarize the characteristics and boatable and optimum flow ranges²³ for each

²² Classification of rapids is based on the International Whitewater Classification System (American Whitewater, 2008): Class II, Novice: Straightforward rapids with wide, clear channels which are evident without scouting; Class III, Intermediate: Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe; Class IV, Advanced: Intense, powerful, but predictable rapids requiring precise boat handling in turbulent water; Class V, Expert: Extremely long, obstructed, or very violent rapids that expose a paddler to above average endangerment; Class VI, Extreme and exploratory: These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

²³ The optimum flow range represents a narrower, ideal range flows for boating; the boatable flow range is a broader representation of flows that brackets the optimum range but has a slightly higher and lower end whereby some but not all boaters would run the reach at the flows outside the optimum range.

reach identified in the studies. Table 3-33 summarizes the identified boatable and optimum flow ranges for all of the reaches.

Table 3-31. Whitewater boating runs on the North and Middle forks of the Feather River, as identified by Holbeck and Stanley, 1998. (Source: South Feather, 2007)

River	Name of Whitewater Run	Put-In Take-Out	Length (miles)	Gradient (feet/mile)	Class	Season of Boating Use
East Branch of North Fork Feather	Virgilia - Belden	Virgilia - Belden	10	40	IV-V	Spring
West Branch of North Fork Feather	Upper	Whiskey Flat Bridge - Dean Rd.	3.3	64	IV-V	Winter/ Spring
	Ben & Jerry's Gorge	Dean Road – Lake Oroville	4	118	V+	Winter/ Spring
North Fork Feather	Rock Creek Run	Rock Creek Dam – Rock Creek Powerhouse	8	50	III-V	Spring
	Cresta Run	Cresta Dam- Cresta Powerhouse	6.5	48	III-V	Spring
	Poe Run	Poe Dam- Poe Powerhouse	7.5	70	IV-V	Spring
Middle Fork Feather	Devils Canyon	Nelson Point– Milsap Bar	32.5	70	V	Spring
	Devils Canyon	Nelson Point– Milsap Bar	6.5	108	V+	Spring
Little North Fork Middle Feather	n/a	Glazer Creek – Milsap Bar	9.8	196	V-VI	Winter/ Spring

Table 3-32. Whitewater boating runs on the North Fork of the Yuba River, as identified by Holbeck and Stanley, 1998. (Source: South Feather, 2007)

Name of Whitewater Run	Put-In Take-Out	Length (miles)	Gradient (feet/mile)	Class	Season of Boating Use
Loves Falls	Salmon Creek – Wild Plum Road	2.8	300	V+	Winter/Spring
Sierra City to Downieville	Wild Plum Campground – Downieville	13	109	IV-V	Spring
Rosasco Canyon	Downieville - Goodyear’s Bar	4	60	IV-V	Spring
Goodyear’s Bar	Goodyear’s Bar - Hwy. 49 Bridge	8.5	49	IV+	Spring
Bullards Bar Dam to Middle Fork Yuba	Bullards Bar Dam - Englebright Lake	2.3	80	V	Spring

Table 3-33. Boatable and optimum flow ranges for project reaches. (Source: South Feather, 2007)

Reach	Flow Ranges Based on Flow Studies (cfs)	
	Boatable Flow Range	Optimum Flow Range
Little Grass Valley dam	180 - 464	230 - 400
South Fork diversion dam	188 - 700	250 - 438
Forbestown diversion dam	216 - 400	250 - 350
Lost Creek dam	96 - 193	100 - 185
Slate Creek diversion dam ^a	167 - 517	300 - 450

^a A controlled flow study was not conducted; flow range based on knowledgeable kayakers’ survey responses.

Little Grass Valley Dam Reach

The Little Grass Valley dam reach is 9.1 miles long with an average gradient of 141 feet per mile and a number of significant drops. The reach is accessed by County Road 514 to the put-in at Little Grass Valley dam and the take-out is accessible by La

Porte Road near the South Fork diversion dam. Black Rock RV and Tent campground is located 0.25 mile from the put-in, making overnight boating on the Little Grass Valley reach possible.

Whitewater boating study participants indicated that the Little Grass Valley dam reach is best suited for hard shell and inflatable kayaks and could provide Class IV and V whitewater opportunities. Study participants indicated that boatable flows ranged between 180 and 464 cfs, with an optimum flow range of between 230 to 400 cfs. South Feather estimates that, based on the period 1972 to 2001, existing project operation provides, on average for all water years, 104 days when flows are in the optimal boating flow range on the Little Grass Valley dam reach.

South Fork Diversion Dam Reach

The South Fork diversion dam reach is about 9.4 miles long, consisting of the upper reach which extends about 4.3 miles from the South Fork diversion dam to the Golden Trout Crossing and the lower section extending about 5.1 miles from Golden Trout Crossing to the Forbestown diversion dam. The gradient of the upper reach is about 85 feet per mile, and the gradient of lower 5.1-mile reach averages 266 feet per mile with 1 mile that drops over 400 feet. (With the concurrence of the agencies and American Whitewater, the lower 5.1-mile reach was not further assessed due to the steep gradient and limited whitewater boating opportunities.) Access to the put-in, near South Fork diversion dam, and to the take-out, near Golden Trout Crossing, occurs only by a vehicle with high clearance or 4-wheel drive.

Whitewater boating study participants indicated that the upper portion of the South Fork diversion dam reach is best suited for hard shell kayaks, open canoes, and inflatable kayaks and that the reach could provide Class II through Class IV whitewater opportunities. The study participants indicated that boatable flows for the upper portion of the South Fork reach ranged from between 188 to 700 cfs, with an optimal flow range of 250 to 438 cfs. South Feather estimates that, based on the period 1972 to 2001, existing project operation provides, on average for all water years, two days when flows are in the optimal boating flow range on the South Fork diversion dam reach and the Lost Creek dam reach.

Lost Creek Dam Reach

The Lost Creek dam reach is 4 miles long with an average gradient of about 305 feet per mile. Access to the put-in, near Lost Creek dam, is via La Porte Road, Barton Hill Road, and FS Road No. 20N09 and access to the take-out, near the Forbestown diversion dam, is via Forbestown Road and FS Road No. 20N29. Whitewater boating study participants indicated that the Lost Creek dam reach is best suited for hard shell kayaks and that the reach could provide Class V through VI whitewater opportunities. The study participants indicated that boatable flows at Lost Creek dam reach range from 96 to 193 cfs; while optimal flows range of 100 to 185 cfs.

Forbestown Diversion Dam Reach

The Forbestown diversion dam reach is 5.4 miles long and has an average gradient of 135 feet per mile. The put-in can be accessed by a steep bank near the diversion dam via Forbestown Road and FS Road No. 20N29, and the take-out can be accessed on the Ponderosa reservoir near the Forbestown powerhouse via Lower Forbestown Road and FS Road No. 20N24. Based on gradient and number of portages, whitewater boating study participants found that the Forbestown diversion dam reach is best suited for hard shell kayaks. The study participants indicated that the reach could provide Class V whitewater opportunities, and that the boatable flows at Forbestown diversion dam reach were between 216 and 400 cfs, with an optimal flow range of between 250 to 350 cfs. South Feather estimates that, based on the period 1972 to 2001, existing project operation provides, on average for all water years, 33 days when flows are in the optimal boating flow range on the Forbestown diversion dam reach.

Slate Creek Diversion Dam Reach

The Slate Creek diversion dam reach is 8.8 miles long with a gradient of 172 feet per mile and extends from the base of Slate Creek diversion dam to the confluence with the North Yuba River. The put-in is located at the base of Slate Creek diversion dam and accessed from County Road 2 and the take-out is at FS Road No. 20N16 at the confluence of North Yuba River. Survey respondents indicated that the Slate Creek diversion dam reach is best suited for hard shell kayaks and could provide Class IV or V whitewater opportunities. Based on survey responses, boatable flows at Slate Creek diversion dam reach range from 167 to 517 cfs; and optimal flows range of between 300 to 450 cfs.

The results of the study showed that boaters preferred other runs available in the area and elsewhere in California as opposed to the project reaches. Generally, boaters noted the primary draw to boat on the identified project reaches was their potential to be boated in the fall when boating opportunities are limited elsewhere.

3.3.5.2 Environmental Effects

Replace and Rehabilitate Existing Recreation Facilities

Recreation facilities at the project may need to be replaced or rehabilitated in part or in total due to decline of such facilities through age, repeated use, or increased demand by the public.

Facility Master Plans

South Feather, under Measure 45,²⁴ proposes to develop and implement facility master plans for Little Grass Valley and Sly Creek reservoir recreation areas that illustrate the layouts, locations, sizes, shapes and relationships between existing and proposed improvements. The master plan for Little Grass Valley reservoir recreation area would be filed within 1 year of license issuance and the master plan for Sly Creek reservoir recreation area would be filed within 3 years of license issuance. South Feather would obtain Forest Service approval of all plans before filing these plans with the Commission. In addition, South Feather, under Measure 34, proposes to consult annually with the Forest Service regarding planned project O&M activities on Forest Service lands for that calendar year.

The Forest Service (Condition No. 20, part 1) specifies measures for the development of facility master plans consistent with South Feather's proposal and also specifies that South Feather conduct an annual coordination meeting to help ensure the goals and objectives of the master plans are being met.

Our Analysis

South Feather's proposed master plans would provide the means to develop and implement the proposed recreation measures in a consistent and coordinated manner. Consultation, including an annual consultation meeting, with the Forest Service would help to ensure that the measures being developed and implemented would be consistent with the management goals and objectives of the Plumas National Forest. Submittal of these master plans to the Commission for review and approval would help to ensure that project facilities are maintained and adequate public recreation access is provided at the project over the term of a new license.

Individual Site Rehabilitation Measures

South Feather proposes to develop and implement individual site development plans for each existing recreation facility within the existing project boundary. The site development plans would include the following components: (1) management objectives for the site; (2) an existing conditions survey; (3) description of conceptual and specific proposed rehabilitation measures; (4) a schedule for completion of the proposed rehabilitation measures; (5) measures for South Feather to provide for all construction related to maintenance, including preparation of all necessary engineering specifications and detailed construction drawings, and to select and manage a contractor to perform the construction; (6) measures for South Feather to obtain all necessary

²⁴ As revised by South Feather in letter from M. Glaze, General Manager, South Feather, Oroville, CA, to K. Bose, Secretary, FERC, Washington, DC, October 12, 2007.

regulatory approvals and permits for the proposed construction; (7) measures for South Feather to obtain Forest Service approval of all proposed construction prior to performing any ground-disturbing activities; and (8) measures for South Feather to operate and maintain all rehabilitations, replacements, improvements and new facilities, and to include such facilities within the FERC project boundary.

Site rehabilitation measures to be incorporated into the site plans would include the following, as appropriate: (1) rehabilitation of all existing roads, parking areas, and campground vehicle spurs within the facility; (2) replacement of all existing fire rings, grills, and picnic tables within the facility; (3) ensure tent camping areas are at least 12 feet by 16 feet, and RV camping areas are 225 square feet; (4) replacement of all existing entrance signs, directional signs, and information/bulletin signs; (5) upgrade of the existing water systems at each facility unless South Feather and Forest Service agree that the upgrade is not necessary at any or all of the facilities; (6) replacement of a number of current campsites and the replacement or retro-fitting of restrooms with new campsites and restrooms that meet accessibility requirements; and (7) replacement of the existing floating boat docks and concrete launch ramps with similar structures. South Feather proposes to file site development plans for Little Grass Valley reservoir recreation area facilities within 3 years of license issuance; and for Sly Creek reservoir recreation area facilities within 5 years of license issuance. The site development plan for Peninsula Tent campground would be filed within 5 years of license issuance.

South Feather proposed specific rehabilitation and enhancement measures for the following individual recreation sites:

Little Grass Valley Recreation Area

- *Little Beaver Campground Loop C* – South Feather proposes to remove about 10 existing campsites and re-configure the existing campground layout to provide improved RV opportunities with larger vehicle spurs and campsite space, while incorporating accessibility design standards.
- *Peninsula Tent Campground* – All work described in this measure for Peninsula Tent Campground would be dependent upon the Forest Service’s and South Feather’s collaborative assessment of the facility’s usefulness, which would occur in the fifth year after license issuance. Peninsula Tent Campground may be considered for re-configuration depending upon future facility needs. If changes are proposed, South Feather would include the changes in the Peninsula Tent Campground site development plan. If South Feather and the Forest Service determine that Peninsula Tent Campground should not be re-configured, the site development plan would include rehabilitation of the existing restroom structure to meet accessible restroom standards.
- *Black Rock Tent Campground* – South Feather proposes to remove the existing restroom structure and install a two-unit vault restroom that meets accessibility

standards. South Feather would also re-size, re-pave (asphalt) and stripe the existing tent site unloading zone to accommodate two vehicles (pull-in) including installing vehicle barriers and directional signs. If it is determined that an accessible campsite is feasible at the tent campground, then one of the two vehicle unloading spaces would be modified to meet accessibility standards.

- *Black Rock RV Campground* – South Feather proposes to paint and add signage at one existing RV campsite for accessibility, including making a single (adjacent) water hydrant accessible.
- *Bluewater Beach Day Use Area* – South Feather proposes to upgrade the existing picnic sites to be fully accessible, install new trash and recycle bins, and rehabilitate existing paths. During site plan development, South Feather would consult with the Forest Service regarding the need to re-design the path or include stepped access.
- *Pancake Beach Day Use Area* – South Feather proposes to rehabilitate the existing parking area, replace the existing picnic area, and install a new beach access path. South Feather would re-design and construct a new parking area. South Feather would remove the existing restroom and install one new two-unit vault, accessible restroom facility. South Feather would remove the existing changing room structures adjacent to the restroom.
- *Black Rock and Tooms Boat Launches* – At both boat launch facilities, South Feather proposes to remove the existing two-unit accessible vault restroom and replace the facility with a similar structure.
- *Maidu Boat Launch* – South Feather proposes to remove the existing two-unit vault restroom and replace the facility with a similar structure and to install an accessible boat loading platform in the facility parking area.
- *Maidu Amphitheater* – South Feather proposes to replace the existing path to the amphitheater from the adjacent existing accessible flush restroom at Maidu Boat Launch. South Feather would re-surface, widen, and harden the existing gravel path in its current location, while incorporating accessibility design standards.
- *Horse Camp Campground* – South Feather proposes to install a water system, as long as the cost does not exceed \$217,000 (in 2004 dollars). South Feather also proposes to remove the two existing single-unit accessible vault restrooms and replace the facility with similar structures that meets Forest Service standards.
- *Little Grass Valley Reservoir Accessible Fishing Trail* – South Feather proposes to replace the existing concrete trail surface, curb and pull-outs.

Sly Creek Reservoir Recreation Area

- *Mooreville Boat Launch* – South Feather proposes to remove the existing two-unit vault restroom and replace the facility with a similar structure.
- *Mooreville Day Use Area* – South Feather proposes to provide one accessible picnic table and one accessible combination fire ring/grill at the day-use area, and provide an accessible path from the existing parking area to the accessible picnic site. South Feather would replace the one existing water hydrant with a new accessible water hydrant.
- *Strawberry Car-top Boat Launch* – South Feather proposes to re-pave the existing asphalt car-top launch ramp to the same design and remove the existing single-unit accessible vault restrooms and replace the facility with a similar structure.

Also under Measure 45, South Feather proposes to, within 1 year of license issuance in consultation with the Forest Service, conduct the following minor maintenance measures: (1) at Little Grass Valley and Sly Creek reservoir recreation areas, replace about 25 percent of all existing fire rings and grills and replace 25 percent of picnic tables; (2) at Tooms, Black Rock, Mooreville, and Strawberry car-top boat launches, paint and sign one accessible parking space adjacent to the existing accessible restroom; and (3) at Maidu boat launch, provide two accessible parking spaces adjacent to the accessible restroom including signs and striping.

The Forest Service specifies (Condition No. 20, part 1) measures for the development of individual site plans that are consistent with South Feather's proposed site plans. The Forest Service specifies that South Feather complete the individual site plans within five years of the license issuance unless otherwise agreed to by the licensee and the Forest Service. The Forest Service specifies several additional components to be incorporated into the site plans including measures for public interpretive facilities, such as kiosks and trail signs, as well as measures to develop and implement a re-vegetation plan that would be submitted within 5 years of license issuance for all developed recreation facilities within the project boundary.

The Forest Service also specifies (Condition No. 20, part 2) that South Feather consult with the Forest Service and other appropriate agencies to ensure that the recreation rehabilitation and enhancements are consistent with the overall goals of other resource conditions and management plans required under the license and initiate consultation with Native Americans to determine appropriate protection and mitigation measures if potential recreational facility construction or rehabilitation impacts to cultural resources are identified.

O'Rourke's Outdoor Adventure recommends that the license require the following recreation enhancements at the Peninsula (Tooms), Black Rock, and Little

Beaver (Maidu) boat ramps: enlarge boat ramps and vehicle turn around areas; install signs prohibiting parking in turn around or pre-launch areas and 80 yards leading to the ramp area; and extend existing boat ramps to accommodate for lower water levels. For the Peninsula, Little Beaver, Red Feather and Running Deer campgrounds, O'Rourke's Outdoor Adventure recommends that the license require the following enhancement measures: update the campgrounds to accommodate for larger trailer sizes; remove low hanging trees and branches; and remove or replace existing wood blocks along the campground roads. In addition, O'Rourke's Outdoor Adventure states that both the Forest Service and South Feather should be responsible for paving the remaining 1.9 miles of the Little Grass Valley Road and for brushing 4 miles of access road into Sly Creek for safety concerns.

Our Analysis

South Feather's proposed site rehabilitation measures include provisions for the upgrade of site facility features that would be implemented at various times over the term of a new license. These measures include provisions for rehabilitation and enhanced accessibility of project-related facilities, including trails, boat ramps, restrooms, campsites and amenities, picnic areas and amenities, trash facilities, parking, and boat loading platforms. Improving access for the disabled at the project would be consistent with the Commission's policy on recreation facilities²⁵ at licensed projects under which licensees are expected to consider the needs of the disabled in the design and construction of such facilities. These measures, along with South Feather's proposed minor maintenance measures, would provide enhanced accessibility to recreation opportunities at the project over the term of a new license.

South Feather's proposed enhancement and rehabilitation measures are consistent with the Forest Service's Condition No. 20, although that condition contains a few additional measures that South Feather did not propose. Providing interpretive facilities, such as enhanced signage and interpretive kiosks, would help enhance public use of the recreation facilities at the project. The Forest Service's proposed re-vegetation plans would help to ensure that any disturbed areas resulting from implementation of the recreation enhancements are adequately mitigated through reestablishment of vegetation, as necessary. In addition, consultation with the Forest Service and other relevant resource agencies to coordinate recreation plans with other management plans at the project would help to limit any potential adverse effects of the proposed recreation measures on other project resources.

South Feather's proposed site rehabilitation measures and maintenance measures, with the addition of the specified interpretive measures and re-vegetation plans, would help to ensure that project recreation facilities meet future recreational demand. In addition, South Feather's consultation with the Forest Service and other relevant

²⁵ See 18 CFR Part 2.7.

resource agencies would help to ensure that the proposed rehabilitation and maintenance measures would be consistent with the goals and objectives of the Plumas National Forest and other resource plans at the project.

O'Rourke Outdoor Adventures' recommended measures to enhance boat ramps and campgrounds at the project are included in South Feather's proposed rehabilitation measures and would be implemented over the term of a new license, with the exception of extending the boat ramps. In addition, South Feather has already implemented measures to improve access at Tooms Boat Launch and Black Rock and Maidu boat ramps, including widening the launch ramps, repairing damaged parking areas and roadways, constructing an accessible restroom, and installing a fish cleaning station.

O'Rourke Outdoor Adventures also recommended road maintenance measures for Little Grass Valley Dam Road and the access road to Sly Creek, such as paving and brush clearing. Both these roads are county roads and although South Feather states it currently conducts brush trimming on a regular basis along Sly Creek Road as determined during annual meetings held pursuant to the road use special-use permit between South Feather and the Forest Service, because both these roads are county roads outside of the FERC project boundary, they would not be South Feather's maintenance responsibility under a new license.

Capital Improvement Measures

South Feather proposes to construct, within 3 years of license issuance and in consultation with the Forest Service, a multi-use trail below Little Grass Valley dam to provide better access to the SFFR, primarily for recreational boating and angling. The trail would be constructed to a primitive and non-accessible standard on river left extending from the gravel parking area below the accessible restroom about 0.5 mile to the river's edge.

The Forest Service specifies (Condition No. 20, part 1) that South Feather implement the following capital improvement projects: construct a groundwater potable water well, in conjunction with the proposed upgrade of water systems, for the east shore facilities on Little Grass Valley reservoir within 5 years of license issuance; implement a horse watering supply and distribution system at Horse Camp campground within 10 years of license issuance; explore opportunities to extend paved or native trails to increase pedestrian connectivity of sites in the development of the master plans;

and construct amenities such as parking and off-loading ramps at the Sly Creek OHV use area, dependent on pending designation of the borrow site.²⁶

Our Analysis

South Feather's proposed recreation access trail below Little Grass Valley dam would improve recreational angler and boating access in this area. Currently, there is drinking water at all of the east-shore facilities on Little Grass Valley reservoir, except Horse Camp campground, and South Feather has proposed to upgrade each of these water systems as necessary. The Forest Service's specification to construct a groundwater potable water well and implement a horse watering supply and distribution system at Horse Camp campground would further improve existing facilities since there is no water for drinking or for horses at the camp.

The Forest Service's specified OHV site amenities would be associated with a currently informally designated, unconstructed facility located near the Sly Creek campground, which may or may not ever be built. Further, OHV use at the project is moderately low (15 percent) and future demand for this type of activity is estimated to increase only slightly over the next 40 years (about 3.3 percent increase). Therefore, the proposed facilities would not be necessary for current or future recreation demand at the project. If the OHV site amenities were constructed, this could stimulate increased OHV use in the project area, with associated increases in noise levels, exhaust emissions, and soil erosion.

Maintenance and Operation of Recreation Facilities

The Little Grass Valley and Sly Creek reservoir recreation areas require short-term maintenance and operation of all facilities. This would include routine maintenance such as minor repairs and/or replacement of parts, prevention measures, and cyclic maintenance to keep the facilities in acceptable condition.

Under Measure 46, South Feather proposes to file, in coordination with the Forest Service, a routine maintenance and operation plan within 6 months of license issuance for the Little Grass Valley and Sly Creek reservoir recreation areas. In Condition No. 20, part 2, the Forest Service specifies that South Feather perform routine annual maintenance at all the recreation facilities at Little Grass Valley and Sly Creek reservoir recreation facilities to keep facilities in working, acceptable condition. The

²⁶ There is a proposal to designate the borrow site for dam construction near Sly Creek campground as an open OHV use area. Undetermined amenities such as parking and off-loading ramps may be desired upon successful designation. The Forest Service specifies that specific proposals, if applicable, would be evaluated during the annual consultation process.

Forest Service specifies that South Feather develop and file a plan, in consultation with the Forest Service, within 1 year of license issuance.

Both the Forest Service and South Feather submitted a draft “Operation Plan for Little Grass Valley and Sly Creek Reservoir Recreation Facilities” to meet the proposed specified provisions related to maintenance and operation of the recreation facilities described under South Feather Measure 46 and the O&M measures specified by the Forest Service under Condition No. 20, part 2. The Forest Service states that this draft plan has been tentatively agreed to by both the Forest Service and South Feather and would be reviewed and finalized to meet license conditions within the first year following issuance of a new license for the project. The proposed operation plan specifies: (1) their respective roles and management responsibilities in the routine O&M of the project recreation facilities; (2) specific operational measures such as the operating season, length of stay at the campgrounds, and user fees; (3) specific maintenance measures, such as daily and weekly maintenance measures, and annual maintenance measures and target dates for implementation; and (4) description of measures associated with other programs such as signs, and the interpretive programs.

Our Analysis

Maintenance and operation measures associated with the project’s recreation facilities helps to ensure that these facilities and associated public recreational access are provided over the term of a license. South Feather’s proposed draft operation plan for Little Grass Valley and Sly Creek reservoir recreation facilities was developed in consultation with the Forest Service and would be consistent with Condition No. 20. The proposed plan provides specific guidelines for the O&M of the facilities associated with the project. Therefore, implementation of the proposed plan would help ensure proper maintenance and operation of the Little Grass Valley and Sly Creek reservoirs recreation facilities and would help to ensure that these facilities are maintained over the term of a new license. In addition, submittal of the final plan to the Commission for review and approval would help to ensure that the proposed O&M measures are consistent with the terms and conditions of a new license.

Monitoring Recreation Use

Recreation use, demand, and user preferences can change over time. Most project licenses extend over a 30 to 50 year timeframe and existing recreation facilities may not be adequate over time to meet future recreation demand at the project.

Under Measure 47, South Feather proposes to, concurrent with the filing of the Form 80 Recreation Report, file with the Commission a report on recreational use to determine if the capacity of existing recreation facilities is adequate to meet demand over the term of the license at the developed recreational facilities. If South Feather’s calculations show that the maximum capacity for campgrounds, day-use areas, or boat launches at either the Little Grass Valley or Sly Creek reservoir recreation areas are

exceeded, South Feather would, within 1 year of filing the report with the Commission and in consultation with the Forest Service, develop a site concept plan for that recreation area. South Feather would be fully responsible for the planning, design, construction and O&M of the new facilities. South Feather would provide a draft of the report to the Forest Service for 60-day review, would file the report with the Commission, including documentation of consultation, and would implement those measures approved by the Commission.

Under Measure 48, South Feather proposes to, concurrent with every third filing of the Form 80 Recreation Report, file with the Commission a report on recreational user surveys at developed recreational facilities at Little Grass Valley and Sly Creek reservoir recreation areas. The purpose of the report would be to determine if existing recreation facilities are adequate to meet user preferences. South Feather proposes to file this report with every third filing of the FERC Form 80 Recreation Report, therefore, every 18 years.

South Feather would prepare the report based on the survey information, including objectives, methods, results, recommended resource management measures, including assessment of the need for recreation facility modification or new facilities, and a schedule for implementation of recommended measures. South Feather would provide a draft of the final report to the Forest Service for a 60-day review and would file the report, including evidence of consultation, with the Commission concurrent with the next Form 80 filing. South Feather would implement those measures following approval by the Commission.

The Forest Service specifies (Condition No. 20, part 1) that South Feather file a Recreation Use and Facilities Condition Survey once every 6 years. The survey would determine trends of use, condition of facilities, the number of days parking capacity is met or exceeded and whether resource damage is occurring.

Our Analysis

The level and type of recreation use and recreation user preferences could change over the term of a new license. Periodic monitoring of recreation use, surveying of user preferences, and assessment of facility capacity and recreation demand can help to determine if the project's recreation facilities meet demand and provide adequate public recreational access to the project over the term of a new license.

South Feather's proposed recreation report to be filed concurrently with the FERC Form 80 filings every 6 years would provide additional periodic review of trends of recreation use, condition of facilities, and parking capacity. This is consistent with the Forest Service's Condition No. 20, part 1. South Feather's proposed recreation user survey would provide the means for further assessment of recreation demand at the project based on recreation user preferences. However, South Feather proposes to

conduct the recreation user survey every 18 years (every third filing of the Form 80), and recreation user preferences could change significantly over an 18-year timeframe. Conducting the recreation user survey every 12 years (every other filing of the Form 80), instead, would allow for enhanced assessment of the adequacy of public recreation facilities and access at the project over the course of a new license. South Feather's proposed recreation monitoring measures and associated recreation reports would be consistent with the Forest Service's specification that South Feather file a recreation use and facilities condition report. Both the recreational use report and the recreation user preference report would be submitted to the Commission for review and approval, which would provide the mechanism to help ensure that recreation facilities meet project needs and purposes over the term of a new license. Therefore, South Feather's proposed measures for monitoring and reporting recreation use, with the modification of conducting the recreation user survey every 12 years, would provide the means to assess the need to provide additional or modified recreation facilities to meet demand for public recreational access at the project over the term of a new license.

Reservoir Levels

Project operation results in drawdown and fluctuation of reservoir elevations, which can affect recreation use and access at the project reservoirs. Drawdown and fluctuation of the project reservoirs have the greatest effects on reservoirs where higher levels of recreation use and access occur such as Little Grass Valley and Sly Creek reservoirs and can substantially affect boat access and use at these reservoirs. South Feather proposes to maintain the water level at Little Grass Valley reservoir no lower than elevation 5,022 feet msl through September 15 in all water years, except Dry water years, to facilitate the use of Little Grass Valley boat launch facilities. In Dry water years, South Feather proposes to maintain Little Grass Valley reservoir as high as possible through Labor Day weekend.

The Forest Service, as part of Condition No. 20, part 2, specifies that South Feather support reservoir-based recreation consistent with lake levels required by the license conditions, and provide seasonal lake level data and monitor boat usage and fishing activities. Cal Fish & Game states that the project reservoirs provide valuable angling and other recreational opportunities, and that reservoir elevations that are too low may exclude public access to boat ramps and other recreational facilities. The public submitted various letters expressing concerns related to potential lower water surface levels at Little Grass Valley reservoir during the recreation season. Concerns included: boat ramps could become less accessible; bank fishing would be further from the tree line and more treacherous to access; reservoir surface area would be reduced; swimming and boating would become hazardous; beaches would be further from camping and picnic areas, and the potential dewatering of the Pancake Bay area.

Our Analysis

Under existing conditions, water surface elevations at Little Grass Valley reservoir can vary significantly from year to year with reservoir fluctuations ranging from about 18 to 31 feet depending on the water year type. During the primary recreation season (Memorial Day through Labor Day) elevations can typically range from about elevation 5,044 feet to elevation 5,025 feet (see figure 3-3 in section 3.3.2, *Aquatic Resources*). South Feather has historically maintained Little Grass Valley reservoir at or above elevation 5,022 feet msl through September 30 to keep boat ramps operational. South Feather's proposed measures would change the management of the Little Grass Valley water surface elevations by maintaining the water levels above elevation 5,022 feet msl through September 15. This would potentially result in lower surface water elevations during the period between September 15 and September 30, compared to existing conditions.

Most recreation use at Little Grass Valley reservoir occurs during the primary recreation season, from Memorial Day to Labor Day; however, recreation use at the project can continue into the fall period. As a result, holding the reservoir elevation at 5,022 feet msl through September 15 would preserve reservoir access and boating opportunities during the primary recreation season. The lower water surface elevations between September 16 and September 30 have some potential to adversely affect reservoir boating access compared to existing conditions.

Various individuals stated concerns regarding the potentially lower water surface elevations at Pancake Bay. Pancake Bay is a protected cove with a gently sloping bottom located in the southeastern portion of Little Grass Valley reservoir near the Peninsula area (see figure 3-13). Pancake Bay offers wind- and wave-sheltered canoeing and kayaking experiences, compared to the open reservoir. Pancake Bay begins to form when Little Grass Valley reservoir reaches an elevation of about 5,020 feet msl. The cove is rapidly inundated between elevations 5,020 and 5,040 feet msl and continues to grow in size up to the normal full pool elevation of 5,045.5 feet msl.

South Feather assessed the incidence and period of the inundation of Pancake Bay when it is at or near full inundation (between elevations 5,040 and 5,045.5 feet msl) under (1) existing (no-action) conditions; (2) South Feather's alternative 4(e) condition (adopted into the staff alternative); and (3) Forest Service's preliminary 4(e) condition and Cal Fish & Game's recommended flow regime (which are the same below Little Grass Valley dam); see further discussion of proposed flow regimes in section 3.3.2, *Aquatic Resources*). Based on this assessment (table 3-34) under the Below Normal water years the percent of years where inundation would occur at Pancake Bay area would be reduced by about 50 percent under the Forest Service's preliminary 4(e) condition and Cal Fish & Game's recommended flow regime and about 25 percent under the staff alternative (i.e., South Feather's alternative 4(e) condition) as compared to existing conditions. In Dry water years, the Pancake Bay area would not be

inundated under the Forest Service’s preliminary 4(e) condition and Cal Fish & Game’s flow regime. Under the staff alternative, the percentage of Dry water years where inundation would occur would be reduced about 38 percent, compared to existing conditions. These reductions in the inundation of the Pancake Bay area would result in potential adverse effects on recreational use of project waters in this area. The Forest Service modified the flows that it specified for the Little Grass Valley dam reach in its final 4(e) conditions, filed on March 6, 2009. The flows specified in the final 4(e) condition for below normal and dry years are reduced from the flows specified in their preliminary 4(e) condition, and average annual minimum flows in these water year types fall about mid-way between the flows included in South Feather’s alternative 4(e) condition and the flows recommended by Cal Fish & Game, so effects on water levels would be fall about mid-way between the effects of the other two flow regimes.

Table 3-34. Incidence and period of Upper Pancake Bay inundation (5,040 through 5,045.5 feet msl) under alternative flow regimes, below normal and dry water years. (Source: South Feather, 2008)

Period	No-Action Alternative	Staff Alternative (South Feather’s Alternative 4(e) Condition)	Forest Service preliminary 4(e) and Cal Fish & Game, Rec. 1
Below Normal Water Years			
Percent of Years Where Inundation Occurs	100%	75%	50%
Average Inundation Period	May 7 – June 29	May 9 – June 29	May 13 – June 29
Duration (days)	54	52	48
Dry Water Years			
Percent of Years Where Inundation Occurs	50%	12%	None
Average Inundation Period	May 19 – June 29	June 2 – June 28	None
Duration (days)	42	27	None

Implementation any of the alternative flow regimes and the corresponding potential reduced reservoir elevations, compared to existing conditions, would result in potential adverse effects on recreational use and access at Little Grass Valley reservoir. Monitoring the effects of reservoir elevations resulting from the implementation of a

modified flow regime would provide the means to assess the potential adverse effects on recreational use and access to project waters. South Feather proposes to provide a concise reservoir elevation monitoring report to the Commission annually following license issuance until the next Form 80 filing and then provide a reservoir elevation monitoring report as a component of the subsequent Form 80 report filings. The reservoir elevation monitoring report would include a summary of water surface elevations at Little Grass Valley reservoir during the May 1 through October 15 period (primary recreation period), an assessment of the duration and period of inundation of the Pancake Bay area; and an assessment of the potential effects on recreation use and access at the project. This monitoring would provide the means to evaluate these potential effects on recreational use and access at the project. The reservoir elevation monitoring report would help provide the means for the Commission to ensure that adequate public recreational use and access to project waters is provided over the term of a new license.

Whitewater Boating Flows

Project operation can change quantity and timing of flows in project-affected reaches and thereby affect potential whitewater boating opportunities. South Feather proposes various measures to provide supplemental streamflows for recreation opportunities.

Little Grass Valley Dam Reach - Under Measure 50, South Feather proposes to provide a supplemental streamflow for recreational purposes in the Little Grass Valley dam reach in all water years from September 16 of each year until the date that Little Grass Valley reservoir elevation is 5,017 feet msl. This recreational streamflow would have a target magnitude of between 180 and 460 cfs over a continuous 24-hour period.

South Fork Diversion Dam Reach - Under Measure 51, South Feather proposes to provide a supplemental streamflow for recreational purposes downstream of the South Fork diversion dam in the spring of Above Normal and Wet water years. This recreational streamflow would have a target magnitude of no less than 190 cfs and no more than 700 cfs, measured continuously over two weekend days, starting around April 1 and lasting through June 15, or no later than when the average water temperature reaches 13°C. In this measure, South Feather also proposes to install, in consultation with the Forest Service and state agencies, a continuous water temperature monitor near the Woodleaf powerhouse.

Forbestown Diversion Dam Reach - Under Measure 52, South Feather proposes a supplemental streamflow in the spring during Above Normal and Wet water years at Forbestown diversion dam reach to improve opportunities for Class IV and V whitewater boating in the spring. This recreational streamflow would have a target magnitude of no less than 215 cfs and no more than 400 cfs, measured continuously over two weekend days, from April 1 through June 15, but no later than when the

average water temperature reaches 13°C. In this measure, South Feather also proposes to install, in consultation with the Forest Service and state agencies, a continuous water temperature monitor near the Forbestown powerhouse.

Our Analysis

South Feather's proposed supplemental streamflows would provide for enhanced whitewater boating opportunities in the project reaches, compared to existing conditions. The provision of supplemental flows during the fall period at Little Grass Valley dam reach would provide opportunities for increased whitewater boating at a time when whitewater boating opportunities within the region are not as abundant, compared to the spring season. The proposed spring recreational releases at the South Fork and Forbestown diversion dams during above normal and wet years would provide additional whitewater boating opportunities during those years. The proposed installation of water temperature monitors and cessation of releases when water temperature reaches 13°C would help ensure that the spring releases at the South Fork and Forbestown diversion dams would not adversely affect FYLF. However, because FYLF breeding may commence when temperatures rise to 12°C, discontinuing whitewater releases at this temperature would be more protective.

Provision of Streamflow Information

Accurate and timely stream flow information can provide information for recreationists planning water-related visits to the project. Under Measure 53, South Feather proposes to provide streamflow information to the public within the first year after license issuance. During Above Normal and Wet water years starting March 15, South Feather would notify the public of anticipated date and magnitude of recreational streamflow release for the South Fork and Forbestown diversion dam reaches. By April 10, South Feather proposes to provide a preliminary forecast of water year type, initiation date, and duration of anticipated releases in addition to the minimum required streamflow at Little Grass Valley and Lost Creek dams. South Feather proposes to update this information on a monthly basis. South Feather also proposes to make available to the public the daily mean streamflows for the SFFR downstream of Little Grass Valley, South Fork, and Forbestown diversion dams; Lost Creek downstream of Lost Creek dam; and Slate Creek downstream of Slate Creek diversion, from May 1 through November 30. The daily average streamflow readings would be updated weekly and rounded up to the nearest 50 cfs.

Our Analysis

South Feather's proposed provision of streamflow information to the public would provide the means for the public to gain information regarding streamflow for specified stream reaches. This information could then be used by the public to determine if recreational opportunities and desired flow ranges for angling, whitewater

boating, and other recreational activities would be available. This would allow the public to take better advantage of opportunities for public recreational use at the project.

Public Safety

Public information at key locations on Little Grass Valley and Sly Creek reservoirs provides the public with information on acceptable and prohibited activities, as well as dangerous or restricted areas. Under Measure 54, South Feather proposes to install and maintain public safety buoys in Little Grass Valley and Sly Creek reservoirs. The buoys would be installed after the roads are cleared of snow and would be maintained throughout the summer recreation season. Buoys would be removed from the reservoirs after September 15 each year. South Feather would coordinate with the local county sheriff departments to ensure the proper buoys are installed at the appropriate locations. South Feather also would be responsible for the purchase and replacement of buoys, as necessary. South Feather states that inclusion of this measure does not imply that South Feather is responsible for monitoring adherence to applicable state of California regulations and county ordinances regarding speeding and public safety at Little Grass Valley and Sly Creek reservoirs.

Our Analysis

Until 2002, South Feather assisted the local county sheriff departments with the installation of public safety buoys in Little Grass Valley and Sly Creek reservoirs. South Feather took over responsibility for installing safety buoys from the local county sheriff departments in 2002. South Feather's proposed continued assistance with the installation of public safety buoys in those reservoirs would continue to provide recreation visitors information regarding boat speed limits, dangerous areas, and other safety information. The proposed installation of these buoys would continue to help ensure public safety at both Little Grass Valley and Sly Creek reservoirs. The state of California and Plumas and Butte counties would continue to be responsible for monitoring compliance with state regulations and county ordinances regarding speeding and other public safety measures at Little Grass Valley and Sly Creek reservoirs.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Definition of Historic Properties

Section 106 of the National Historic Preservation Act requires the Commission to take into account the effects of licensing a hydropower project on any historic properties, and allow the Advisory Council on Historic Preservation (Advisory Council) a reasonable opportunity to comment on the proposed action. Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources also

need enough internal contextual integrity to be considered historic properties. For example, dilapidated structures or heavily disturbed archaeological sites may not have enough contextual integrity to be considered eligible. An undertaking means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including, among other things, processes requiring a federal permit, license, or approval. In this case, the undertaking is the proposed issuance of a new license for the project.

If there would be an adverse effect on historic properties, the applicant must develop an HPMP to seek to avoid, reduce, or mitigate the effects. Potential effects that may be associated with a hydroelectric project include any project-related effects associated with the day-to-day O&M of the project after issuance of a new license. During development of the HPMP, the applicant should consult with the Commission, the Advisory Council, the State Historic Preservation Officer (SHPO), Indian tribes, appropriate land-management agencies, and any other consulting party that may be involved with the licensing process. In most cases, the HPMP would be implemented by execution of a Programmatic Agreement that would be signed by the Commission, Advisory Council, SHPO, and other consulting parties.

Section 106 also requires that the Commission seek concurrence with the SHPO on any finding involving effects or no effects on historic properties, and allow the Advisory Council an opportunity to comment on any finding of effects on historic properties. If Native American properties have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

Other federal laws, such as the American Indian Religious Freedom Act or the Native American Graves Protection and Repatriation Act, also may apply when sacred areas or burial sites of Indian tribes have been identified. These and other cultural resources that possess religious or cultural significance to an Indian tribe, if eligible, can be considered as historic properties and treated through the section 106 process. Such historic properties are called Traditional Cultural Properties (TCPs).

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 a project's APE. The APE is delineated in consultation with the SHPO and 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 and/or TCPs, if any such properties exist. For the relicensing of the South Feather Power Project, we define the APE as:

- all lands within the FERC project boundary surrounding the Sly Creek, Woodleaf, Forbestown, and Kelly Ridge developments; and
- the six project reaches as described in section 1.8, *Description of General Locale*, of the final license application (South Feather, 2007).

Excluded from the APE are project tunnels, private lands not owned by the applicant unless access by the property owner has been granted, and steep terrain where access would be unsafe.

Cultural Context

Three primary cultural complexes have been proposed for the region encompassing the South Feather Power Project area. Classification of cultural materials was first undertaken by Heizer and Elsasser (1953, as cited by South Feather, 2007). They proposed two prehistoric periods based on investigations at 26 prehistoric sites: the Martis Complex and the Kings Beach Complex.

The Martis Complex (4000 – 2000 before present [BP]) is characterized by the favored use of basalt over other lithic sources. The mano and metate, large, crudely shaped projectile points, atlatl weights, the bowl mortar and cylindrical pestle, and abundant basalt tools were identified as typical material attributes of the Martis Complex. The Martis Complex peoples were believed to be primarily interested in the exploitation of floral and faunal resources. Elsasser (1960, as cited by South Feather, 2007) felt that the widespread distribution of Martis Complex was the result of a relatively homogeneous local culture and probably represented a seasonal adaptation to an economy based on the hunting of large mammals.

Kowta (1988, as cited by South Feather, 2007) undertook an overview of the archaeology and prehistory of Plumas and Butte counties. He recognized the limitations in applying the concept of the Martis Complex to an archaeological manifestation that is presently “poorly defined” and often is loosely applied to “...archaeological assemblages, sometimes solely on the basis that basalt is the dominant lithic material in evidence” (Kowta 1988, as cited by South Feather, 2007). Kowta proposes the use of the more generic term “Martis Tradition” which can be taken to refer to the cultural remains present in the central and northern Sierra from 2,500 B.C. to A.D. 500

Elston (1971, as cited by South Feather, 2007) later proposed that the Martis Complex could be separated into two distinct phases. The Early Martis phase (1,000 B.C. to A.D. 1) is characterized by Elko, Martis Series, and Sierra Stemmed Triangular projectile points, and the Kings Beach Complex (1000 A.D. to historic contact) is defined by the dominant use of non-basalt lithic sources such as chert and obsidian, small projectile points with the inferred use of the bow and arrow, and the use of bedrock mortars. The Kings Beach Complex peoples were believed to be primarily interested in the exploitation of fish resources with a secondary emphasis on hunting. Heizer and Elsasser (1953, as cited by South Feather, 2007) suggest that the Kings Beach Complex dated from between 1,000 A.D. to the time of historic contact and was the ethnographic culture of the Washoe Indians.

Following the work of Elsasser, Elston (1971, as cited by South Feather, 2007) also defined a pre-Martis phase: the Spooner Complex. This Complex was first identified at site 26Do38 (Spooner Lake Site). Elston places the Spooner Complex

between 5,000 and 3,000 B.C. (possibly as late as 1,000 B.C.) and notes the similarities between these dates and the hypothesized Altithermal period (Antevs, 1948, as cited by South Feather, 2007) in the Great Basin. Given the similarities in dates and the presence of two projectile points typically found in the western Great Basin (Pinto and Humboldt Concave Base), Elston concludes that the Spooner Complex peoples may have been refugees from the Great Basin who began to colonize the Sierra Nevada.

Ethnographically, the project area was inhabited by the Konkow or Northwestern Maidu. The Konkow lived in village communities, comprising several adjacent villages with a head man or chief. Villages ranged in size from a single lodge to upwards of twenty lodges situated on ridgelines above major drainages or on flats situated on the sides of river canyons. Structures were either circular or semi-subterranean, or were smaller cone-shaped huts built at ground level. In the summertime, simple lean-tos were built.

Hunting and fishing grounds were owned by each Konkow community. In the mountain areas, deer, elk, and mountain-sheep were taken, while antelope and smaller animals were hunted in the Sacramento Valley. Grizzly bears, wolves, coyotes, and dogs were not hunted. Salmon was caught using large nets or gigs fashioned from antler or bone. Weirs across tributaries also assisted in salmon spearing. Salmon could be dried, pounded into a powder, stored, and eaten dry. Seasonal hunting and fishing was augmented by a strong reliance on gathering plants. Hundreds of species of plants were used for subsistence, material, and medicinal purposes. Greens, bulbs, and roots were collected during springtime; seeds were gathered in the summer; and acorns harvested in the fall. Acorns were a staple food for the Konkow and were shelled and then dried. Ground acorn was leached with warm water to remove tannins. Afterward, it could be cooked into bread.

Impacts on the Konkow way of life from American settlers began in the early 1800s. The onset of malaria in the Sacramento Valley in 1833 as a result of contact with early explorers led to significant reductions in Konkow population. Further changes occurred following the discovery of gold in 1848. An increase in the number of settlers to the area resulted in conflicts, and the practice of traditional lifeways by the Konkow was increasingly difficult. These conflicts led to attempts to negotiate treaties designed to remove the Indians to protect gold claims. The treaties established reservations and educational and economic aid in return for government title to traditional territory. The Konkow signed such a treaty. However, the treaties were not ratified by the U.S. Senate, which resulted in many Indians becoming homeless.

The first account of European exploration into the Feather River area was in 1808 when Lieutenant Gabriel Moraga searched the Central Valley for potential mission sites. He followed the Sacramento River into the lower reaches of the Feather River. In 1820, Captain Luís Argüello's party traveled into its upper reaches. He named the river

“Río de Las Plumas,” or the “River of Feathers” for the large numbers of waterfowl feathers he observed floating on the river’s surface.

Following the discovery of gold in January 1848, thousands of miners traveled to California. Miners began prospecting many rivers and creeks throughout northern California. As a result, many mining camps and small towns arose. Some of these small towns are located in the vicinity of the project, including Clipper Mills, Forbestown, American House, Mooretown, and La Porte.

In 1850, John Bodly established a trading post at Little Grass Valley that provided goods to mining camps in the area. Additionally, an ice house and a boarding house were also located in the valley.

Logging was also important in the region. Mills were established to provide lumber for mining flumes, including mills in Oroville. Railroads carried the logs to the mills until the establishment of the trucking industry in the 1920s and 1930s. This brought an end to railroad logging, and roads were pioneered to many remote sites in the region to cut the first growth timber. Major mills were located at Oroville.

In the early 20th century, a rancheria system was developed where small parcels of isolated land were purchased for various tribal groups. Many Konkow joined rancherias at Mooretown, Enterprise, Berry Creek, Strawberry Valley, and Chico. In 1953 many of these rancherias were “terminated” by the Bureau of Indian Affairs due to changing national policy. It was not until 1983 with the Tillie Hardwick et al., case that 16 rancherias in California were “unterminated.” However, nine tribes remain terminated including Strawberry Valley Rancheria, which is located on a tributary to the upper Yuba River in proximity to the project area.

Prehistoric and Historic Archaeological Resources

The project Historic and Archaeological Sites Inventory and Impact study was conducted by South Feather to determine if continued project O&M would directly affect archaeological and historic-era sites within the project APE that are listed or eligible for listing on the National Register.

South Feather conducted a record search at the Northeast Center of the California Historical Resources Information Center at California State University, Chico, and Plumas National Forest records to determine if any lands within the APE had been previously surveyed and if any cultural resource sites had been documented. The record searches resulted in the identification of 11 sites located within the APE. Three of these sites are located within the Sly Creek development (FS-04-11-53-177, FS-05-11-53-179, FS-05-11-53-180) and eight are located within the Kelly Ridge development (CA-BUT-2105H, CA-BUT-2273H, CA-BUT-2382H, CA-BUT-2515H, CA-BUT-2517, P-04-001936, P-04-002100, P-04-002516H). Three of these sites are strictly prehistoric in nature consisting of extensive lithic and tool scatters and midden development. Seven sites are strictly historic and are characterized by historic-period refuse, roads, ditches,

and/or mining-related features. A single site contains both prehistoric and historic components.

Archaeological field investigations of the project APE were conducted between September and November 2004 and in October 2005. This work was undertaken according to the methods provided in the Historical and Archaeological Sites Inventory and Impact Study filed with the Commission on April 8, 2004. Surveys were undertaken in those portions of the APE that had not been previously surveyed. Areas within the APE that were adjacent to project reservoirs were surveyed when the reservoirs were at their lowest elevation. The intensity of survey coverage was dependent upon the likelihood of encountering cultural material and the potential of project-related effects on particular areas. Survey transects varied between 30 and 50 feet in width, with particular attention paid to drainages, seeps, springs, level areas, and exposed bedrock locations. Steep sided shorelines, such as those found at Forbestown reservoir, and portions of Ponderosa reservoir, were not inspected due to safety concerns. In some areas, the researchers depended on prior surveys that they deemed adequate for the current project. These areas included the Miners Ranch conduit which DWR surveyed in 2002 (Selverston et al., 2005, as cited by South Feather, 2007).

In addition to the 11 previously recorded sites within the project APE, 8 new sites were documented. Additionally, three isolated artifacts were also identified. Table 3-35 identifies these 22 resources.

Table 3-35. Archaeological and historical resources within the South Feather Power Project APE. (Source: South Feather, 2007)

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
FS-05-11-53-177	Sly Creek (Little Grass Valley reservoir)	Previously recorded	Lithic and tool scatter and possible midden development. Unevaluated, assumed eligible.	Good
FS-05-11-53-179	Sly Creek (Little Grass Valley reservoir)	Previously recorded	Lithic and tool scatter and possible midden development. Unevaluated, assumed eligible.	Good

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
FS-05-11-53-180	Sly Creek (Little Grass Valley reservoir)	Previously recorded	Lithic and tool scatter and possible midden development, bedrock milling feature. Unevaluated, assumed eligible.	Good
CA-BUT-2105H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic-era earthen ditch. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BUT-2273H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BUT-2382H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic-era and modern refuse scatter. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BUT-2515H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
CA-BIT-2517/H	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Prehistoric bedrock mortar outcrop, midden development, and lithic and tool scatter. Historic dirt road segments and two cans. Unevaluated, assumed eligible.	Unknown, Inundated

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
P-04-001936	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
P-04-002100	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Historic period dirt road segment. Unevaluated, assumed eligible.	Unknown, Inundated
P-04-002156	Kelly Ridge (Miner's Ranch conduit)	Previously recorded	Mining-related feature with roads, ditches, and prospect pits. Unevaluated, assumed eligible.	Unknown, Inundated
PA-04-100	Sly Creek (Little Grass Valley reservoir)	New site	Prehistoric lithic scatter and a single historic bottle fragment. Unevaluated, assumed eligible.	Good
PA-04-101	Sly Creek (Little Grass Valley reservoir)	New site	Prehistoric lithic scatter; unknown historic component. Unevaluated, assumed eligible.	Good
PA-04-102	Sly Creek (Little Grass Valley reservoir)	New site	Prehistoric lithic scatter and possible shelter feature; unknown historic component. Unevaluated, assumed eligible.	Good

Site	Development	Recordation	Site Type/National Register Eligibility	Recommended Integrity
PA-04-103	Sly Creek (Little Grass Valley reservoir)	New site	Boulder containing possible prehistoric inscriptions. Unevaluated, assumed eligible.	Good
PA-04-104	Sly Creek (Little Grass Valley reservoir)	New site	Lithic and tool scatter. Unevaluated, assumed eligible.	Good
PA-04-105	Sly Creek (Little Grass Valley reservoir)	New site	Bedrock mortar outcrops. Unevaluated, assumed eligible.	Good
PA-04-106	Sly Creek (Little Grass Valley reservoir)	New site	Bedrock mortar outcrop. Unevaluated, assumed eligible.	Good
PA-04-107	Woodleaf (Lost Creek reservoir)	New site	Lost Creek dam (circa 1924). Recommended ineligible.	Compromised
IF-04-20	Sly Creek (Little Grass Valley reservoir)	New isolated find	Single basalt core. Recommended ineligible.	N/A
IF-04-21	Sly Creek (Sly Creek reservoir)	New isolated find	Single stone scraper. Recommended ineligible.	N/A
IF-04-22	Woodleaf (Lost Creek reservoir)	New isolated find	Single granite handstone. Recommended ineligible.	N/A

Each new site was recorded to current state of California Department of Parks and Recreation standards and to the standards of the Plumas National Forest, as appropriate. The condition of all sites was documented in the field.

Following fieldwork, the applicant considered the various effects on all sites to determine if it was likely that observed effects were project-related and/or ongoing. The applicant states that it intends to consult further with the SHPO and Plumas National Forest regarding these effects.

While South Feather has provided National Register eligibility recommendations for the three isolated finds identified in the APE, no formal National Register evaluations of the 18 identified archaeological sites were undertaken. However, Lost Creek dam (PA-04-107) has been recommended as ineligible on the basis of a recent evaluation of the dam by South Feather.

Traditional Cultural and Religious Sites Inventory and Impact Study

TCPs are historic properties eligible for inclusion in the National Register because of their association with cultural practices or beliefs of a living community that are (1) rooted in that community's history; or (2) important in maintaining the continuing cultural identity of the community (National Register Bulletin 38, Parker and King, 1998). Assessment of historic properties and potential TCPs is conducted in continuous consultation with the Commission, the SHPO, Native American tribes, and all appropriate agencies (e.g., Plumas National Forest, the National Park Service).

For the current project, South Feather implemented the Project Traditional Cultural and Religious Sites Inventory and Impact Study (TCP study) to identify and assess project effects on TCPs that may be eligible for National Register listing.

South Feather undertook archival research to understand the ethnographic background and past use of the project area by Native American tribes. The results of this research were presented in section 6.3.2 of the license application (South Feather, 2007) and are summarized earlier in this section.

South Feather consulted with the California Native American Heritage Commission to obtain a list of Native American groups and individuals with whom it should consult regarding relicensing the project and potential TCPs that may be located within the project APE. The California Native American Heritage Commission provided the following list:

- Berry Creek Rancheria of Maidu Indians
- Butte Tribal Council
- Enterprise Rancheria of Maidu Indians
- Mr. Joe Marine
- Konkow Valley Band of Maidu

- Maidu Cultural and Development Group
- Mechoopda Indian Tribe of the Chico Rancheria
- Mooretown Rancheria of Maidu Indians
- United Maidu Nation

Other groups and individuals were identified during the course of study implementation including the Strawberry Valley Band of Maidu, Mr. Ennis Peck, and the Greenville Rancheria. South Feather prepared presentations, held meetings, and provided site tours for tribal representatives of cultural resources located within the project APE.

South Feather met with representatives of federally recognized tribes, other tribes, and individuals regarding the project. Consultation with the Native American groups and individuals with interests in the project area did not result in the identification of any specific areas within the project APE that are potentially eligible for listing on the National Register as TCPs.

Historic Buildings and Structures

In general, resources must be more than 50 years old to be considered eligible for listing on the National Register. Lost Creek dam (historic resource PA-04-107 discussed above), was constructed in 1924; South Feather recommends that it is not eligible for listing on the National Register. The remaining structures associated with the project were constructed in the late 1950s and are not currently more than 50 years old.

Historic Properties Management Plan

South Feather prepared an HPMP for the project and filed it with the license application. This HPMP was designed to address current and future project-related effects to historic properties within the APE. In July 2006, South Feather provided a draft of the HPMP to the Plumas National Forest archaeologist for review and comment. No comments were received. On July 27, 2006, South Feather distributed a draft license application to participating agencies, tribes, and NGOs. On September 29, 2007, an addendum to the draft license application, including the HPMP was distributed. A single comment pertaining to cultural resources was provided by the Plumas National Forest on October 23, 2006, stating that the HPMP was being reviewed.

In the HPMP, South Feather proposes to appoint an HPMP coordinator and implement employee training. Additionally, the HPMP includes procedures for (1) monitoring cultural resource sites; (2) addressing unanticipated discoveries; (3) discovery of human remains; (4) emergency undertakings; (5) periodic reporting and meetings; (6) periodic review and revision to the HPMP; and (7) Native American

consultation. The HPMP also discusses potential project effects that identified resources may experience or are experiencing.

3.3.6.2 Environmental Effects

Continued operation of the South Feather Power Project without adequate protection measures could adversely affect properties that may be eligible for listing on the National Register. In particular, sites contained within reservoir fluctuation zones may be subject to lake-induced erosion. Archaeological sites within or near formal or dispersed recreational areas could be affected by both vehicle and pedestrian traffic; sites at Little Grass Valley reservoir are particularly susceptible to disturbance as a result of OHV traffic within the drawdown zone. Sites near recreational areas also could be subject to illicit artifact collection and/or other types of vandalism. Project O&M, including road grading and other activities, also could affect archaeological resources or the qualities of unevaluated hydroelectric system features that may become eligible for listing on the National Register in the near future. Finally, the use of or modifications to recreational facilities and hydroelectric system features could affect areas or plants of significance to Native Americans or could restrict their ability to access these traditional resources.

On March 6, 2009, the Forest Service submitted final terms and conditions for the project pursuant to section 4(e) of the FPA. Condition No. 23 specifies that South Feather file with the Commission a Heritage (Historic) Properties Management Plan for the purpose of protecting and interpreting historic properties within 1 year of license issuance. The HPMP would take into account project effects on National Register-eligible properties located on Forest Service lands, provide measures to mitigate effects, and provide for a monitoring program and management protocols. The Forest Service specified that any ground-disturbing project-related activities must cease in the immediate area should materials of cultural, historical, archaeological, or paleontological value be identified on Forest Service lands. South Feather would be required to notify the Forest Service and not resume work on ground-disturbing activity until appropriate evaluation of the find has been completed and South Feather has received written approval from the Forest Service. The Forest Service reserved the right to require South Feather to perform data recovery excavations and site preservation through the provisions found in the Archaeological Resources Protection Act, if deemed necessary.

Our Analysis

We concur with the APE developed by South Feather, in consultation with the SHPO. Project-related effects to archaeological resources around project reservoirs include erosion from fluctuating water levels and wave action, and accidental or deliberate disturbance of archaeological sites by recreationists or visitors. Archaeological sites along the six stream reaches included in the APE could be affected

by increased minimum flows, as well as supplemental stream flows for recreation or sediment pass-through, as well as project-induced recreation.

While we find the archaeological surveys conducted around project facilities to be adequate, there is no evidence in the record indicating that South Feather conducted surveys of the six project reaches. Archaeological surveys of these reaches would determine whether archaeological sites are present and whether project operation or project-related recreation activities pose a risk to these sites, indicating that management measures may be warranted.²⁷

South Feather provided the Forest Service with an HPMP for review. The HPMP was provided to the Commission as part of the final license application. The HPMP adequately identifies the APE, describes the cultural resource inventories that were conducted within the APE, identifies existing project-related effects that could occur on potentially significant cultural resources, and provides general management measures to resolve such effects. The HPMP also provides procedures for handling unanticipated discoveries and the proper treatment of human remains and sacred objects, if they are encountered. The HPMP provides protocols for emergency undertakings, periodic reporting and meetings, and appropriate review and revision of the HPMP based upon changing conditions over the period of a new license. However, our review of the HPMP reveals that it does not provide enough site-specific measures to ensure that project-related adverse effects on historic properties resulting from operation, maintenance, recreational, or other activities would be adequately addressed over the term of the new license. Missing elements include:

- a report on archaeological surveys in the six project stream reaches within the APE;
- National Register evaluation of archaeological sites that have been or are being adversely affected by project-related erosion, especially the 10 archeological sites located at Little Grass Valley reservoir, and including any discovered during survey of the stream reaches;
- a provision for evaluation of project features that may become eligible for listing on the Natural Register during the term of any new license issued for the project; and
- a more detailed discussion of Lost Creek dam regarding the structure's National Register status and measures to address potential adverse effects

²⁷ In some areas within the reaches, unsafe conditions may warrant using a stratified sample survey. Such sampling techniques are standard practice. Should a stratified survey be necessary, the California SHPO and the other involved parties should be consulted on the survey design prior to implementation of fieldwork to ensure that the APE will be adequately inventoried.

on this potentially eligible structure as a result of project operations and maintenance activities.

Implementation of the HPMP, with staff's additional measures, in consultation with the SHPO, Forest Service, participating Tribes, and the Commission would ensure that adverse effects on historic properties as a result of South Feather Power Project operation, maintenance, recreational or other activities would be addressed over the term of the new license. We anticipate that any new license issued for the project would include a condition to implement a Programmatic Agreement executed among the Commission, SHPO, and the Advisory Council. South Feather, the Forest Service and others would be invited to sign the Programmatic Agreement as concurring parties. The agreement would include a measure to implement the HPMP, including staff's additional measures.

3.3.7 Land Use and Aesthetic Resources

3.3.7.1 Affected Environment

Land Use Resources

The South Feather Power Project is located within the boundaries of the Plumas National Forest in Butte, Plumas, and Yuba counties. The total area within the project boundary is 3,838 acres. About 52 percent of the project land is located on United States-owned lands that are administered by the Forest Service (as part of the Plumas National Forest) and the BLM as public lands. State- and county-owned lands make up about 2 percent of the project lands, including the California Department of Parks and Recreation-managed Lake Oroville State Recreation Area. Approximately 46 percent of the project lands are privately owned. South Feather owns nearly 1,500 acres of land within the project boundary. Table 3-36 summarizes the acreage held by each major landowner.

Federal lands within the project boundary include BLM lands (about 10 acres within the Kelly Ridge Development) and Plumas National Forest lands managed by the Forest Service. More than 50 percent of the project lands are located within the Plumas National Forest. The Plumas National Forest Land and Resource Management Plan (LRMP), amended by the Sierra Nevada Forest Plan, provides management direction for the Plumas National Forest lands. The Sierra Nevada Forest Plan addresses the following five management areas: (1) old forest ecosystems and associated species, (2) aquatic, riparian, and meadow ecosystems and associated species, (3) fire and fuels management, (4) noxious weeds, and (5) lower Westside hardwood forest ecosystems. Table 3-37 summarizes management goals described in the LRMP for the Plumas National Forest.

Table 3-36. Land ownership within the project boundary. (Source: South Feather, 2007, as modified by staff)

Development	Land Ownership (acres)							% of Total
	Plumas National Forest	BLM	State	County	South Feather	Private	Total	
Sly Creek	1,823.1	0	0	0	1,202.6	140.1	3,165.8	82.2
Forbestown	39.3	0	0	0	2.5	22.9	64.7	1.7
Woodleaf	8.0	0	0	0	151.5	52.2	211.7	5.5
Kelly Ridge	104.4	10.6	85.1	2.7	145.1	80.5	411.2	10.7
Total	1,977.1	10.6	85.1	2.7	1,494.8	268.6	3,838.8	100
% Total	51.2	0.3	2	0.1	38.8	7.5	100	--

Table 3-37. Plumas National Forest management goals as described in the Plumas National Forest LRMP. (Source: South Feather, 2007, as modified by staff)

Area/Resource	Management Goal
Recreation Resources	Provide a wide range of developed and dispersed recreation opportunities that meet projected demand at the end of the planning period. Public uses take priority over uses of a semipublic nature, and these in turn take priority over private uses. Stress simpler, more natural recreation experiences over dense, sophisticated developments.
Visual Resources	Protect the most visually sensitive areas of the forest by placing the major roads, trails, streams, and areas of concentrated visitor use in scenic corridors and manage viewsheds.
Wilderness Areas	Maintain a lasting system of quality wilderness for public use and appreciation of the unique characteristics of wilderness, consistent with preserving its values.

Area/Resource	Management Goal
Wild and Scenic Areas	Manage the wild, scenic, and recreation rivers to preserve their free flowing characteristics and protect their outstandingly remarkable values.
Special Interest Areas	Preserve the integrity of the botanical, archaeological, geological, and recreational features for which the areas were established.
Range Resources	Maintain current levels of livestock grazing and take advantage of additional forage induced by even-aged timber management.
Timber Resources	Sustain a long-term yield of logs and other wood products by practicing the most intensive forms of timber management on the most productive sites. Increase this yield by application of high utilization standards and scientific silvicultural growth techniques. Harvest Christmas trees only where timber productivity is enhanced or maintained.
Riparian Areas	Favor riparian dependent resources and limit disturbance in all riparian areas including riparian and aquatic ecosystems, wetlands, stream banks, and floodplains.
Soil, Water, and Air Resources	Protect streams, lakes, wetlands and riparian vegetation that surround them. Establish a permanent streamside management zone to furnish shade, ground cover, and natural environmental elements, which maintain high water quality and enhance fish and wildlife habitat. Limit cumulative disturbing impacts on watersheds within the forest. Induce moderate increases in water yield by direct watershed improvement projects, meadow rehabilitation and expansion projects, and snowpack manipulation associated with timber harvest practices.
Wildlife, Fish, and Sensitive Plants	Provide a diversity of vegetation types and habitat to support viable populations of all fish, wildlife, and plant species. Maintain viability of species dependent upon specific forest features.

Area/Resource	Management Goal
Energy Resources	Facilitate permitting of hydroelectric and other new energy development that reasonably protects all resources.
Mineral Resources	Cooperate and participate with mineral lessees, claimants, and permittees in the development of mineral resources under the laws and regulation that govern them.
Lands	Seek optimum land ownership patterns by means of land adjustments in order to reduce problems related to intermingled private lands.
Fire Prevention	Provide for sufficient level of fire protection and treat natural and activity fuels to assure a continuous flow of projected outputs and amenities for the forest.
Transportation	Develop and maintain the forest transportation system for the through traveling public while providing safe, efficient routes for recreationists.
Facilities	Build and maintain fire, administrative and other facilities (non-recreation) to serve resource and support program needs. Make them functional, energy efficient, and attractive to the public. Remove or replace unsafe, obsolete facilities.

The lands around Sly Creek and Little Grass Valley reservoirs are primarily managed for maintaining recreation areas. Additional management prescriptions include bald eagle habitat, visual quality, and timber. Private lands surround Lost Creek dam and reservoir, and are classified as timber production zones. Part of the Woodleaf development and the Forbestown diversion dam would be managed under the Plumas National Forest minimal management prescription. Adjacent to the project boundary at the Forbestown development, are lands that are managed under the visual retention prescription, further discussed in below in aesthetic resources. Lands at the Kelly Ridge are managed for visual retention, timber, state recreation, public lands, and residential and light commercial uses.

In addition, lands of the Plumas National Forest are managed for fire suppression and prevention. Specific measures include (1) managing fuels to reduce high risk hazards and/or to facilitate cost-effective resource protection; (2) responding with appropriate suppression measures to all wildfires; (3) providing a timely suppression

response to wildfire with appropriate forces; and (4) using prescribed fire to maintain natural character of the area.

State-owned lands account for about 0.5 percent of land inside the project boundary and are managed by the California Department of Parks and Recreation as part of Lake Oroville State Recreation Area. County-owned lands within the project boundary account for only 2.7 acres located within the Kelly Ridge development.

Project facilities in Butte County include Sly Creek reservoir, powerhouse and dam; Lost Creek reservoir and dam; Woodleaf power tunnel, penstock and powerhouse; Forbestown diversion dam, power tunnel, penstock, and powerhouse; Ponderosa reservoir and tunnel; Miners Ranch reservoir and conduit; and Kelly Ridge power tunnel and powerhouse (see figure 2-1 for location of project facilities). Lands in Butte County are subject to the policies detailed in the Butte County General Plan. In Butte County, lands near the project are designated as “Timber Mountain” and “Grazing and Open Lands.” Timber Mountain is defined by areas used for forest management, harvesting, and processing of forest products, as well as animal husbandry, resource extraction, outdoor recreation, and public use. The Grazing and Open Land category is defined by areas used for animal husbandry and livestock grazing, as well as commercial forestry, recreation, and resource conservation.

Project facilities in Plumas County include Little Grass Valley reservoir, South Fork diversion dam and tunnel, and Slate Creek diversion dam and tunnel. Lands in Plumas County are subject to the policies detailed in the Plumas County General Plan. In Plumas County, land use designations include residential and resource production. Specifically, these include secondary suburban, rural development, and timber preserve land uses.

Project facilities in Yuba County include the inlet to the Slate Creek diversion and a small portion of the Sly Creek arm of Sly Creek reservoir. Lands in Yuba County are subject to the policies detailed in the Yuba County General Plan. In Yuba County, land designations include timber production, extractive industrial, public lands, mineral resources, timber/forest, and water resources.

South Feather owns the majority of private lands within and adjacent to the project boundary, with several parcels held by a timber company and residential/recreational communities. The privately owned lands account for about 1,763 acres, with South Feather owning nearly 1,495 acres within the project boundary. The majority of the non-South Feather private land is located around Little Grass Valley reservoir.

Aesthetic Resources

The South Feather Power Project is located in the Sierra Nevada mountain range. This part of the state is largely undeveloped and retains much of its natural character, with scattered rural residences and small communities located along major corridors.

The two larger project reservoirs, where the majority of recreation activities occur, Sly Creek and Little Grass Valley, are storage reservoirs that are slowly drawn down through summer and fall releasing water for power generation, irrigation, and consumptive purposes. Sly Creek reservoir can be drawn down in a typical water year by 100 to 102 feet, with an elevation drawdown of more than 50 feet from the early June to end of August timeframe. For Little Grass Valley, in a typical water year reservoir surface elevation fluctuates by 18 to 31 feet, with a drawdown of up to 20 feet during the early June to end of August period. These reservoir fluctuations result in exposed shorelines that influence the aesthetic views of the project shoreline area, particularly during the higher use recreation season.

Visual aesthetics management of project lands is guided by the general plans for Butte, Plumas, and Yuba counties which include goals and objectives associated with the protection of visual resources; and the Plumas National Forest LRMP. The Plumas National Forest LRMP provides standards and guidelines for the visual quality objectives (VQO) specified for each management area. VQOs are a measure of the degree of acceptable alteration permitted within the natural characteristic landscapes and are applied to all project proposals and activities on National Forest System lands. The VQOs prescribed by the Plumas National Forest LRMP for South Feather Power Project lands include:

Retention—The Retention VQO provides for management activities that are not visually evident. Under retention, activities may only repeat the form, line, color and texture frequently found in the characteristic landscape, but changes in their qualities of size, amount, intensity, direction and pattern should not be evident. The following project areas have a retention VQO: Little Grass Valley reservoir, Ponderosa reservoir, Sly Creek reservoir, and Lost Creek reservoir.

Partial Retention—The partial retention VQO allows for management activities that remain visually subordinate to the characteristic landscape. Activities may repeat the form, line, color, or texture common to the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape. Project areas that have a partial retention VQO include Little Grass Valley reservoir, Ponderosa reservoir, and Sly Creek reservoir.

Modification—Under a modification VQO, management activities may visually dominate the characteristic landscape. However, activities of vegetative and land-form alteration must borrow from naturally established form, line, color, or texture so

completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area character-type. The following project areas have a modification VQO: Little Grass Valley dam reach, South Fork diversion impoundment, South Fork diversion dam reach, SFRR/Lost Creek reach, Forbestown diversion dam impoundment, Forbestown diversion dam reach, Slate Creek diversion dam impoundment, Slate Creek diversion dam reach, and Lost Creek dam reach.

3.3.7.2 Environmental Effects

Fire Prevention and Response Plan

Recreation use at reservoirs and stream reaches, including at project recreation facilities and dispersed sites, could potentially pose a fire risk. In addition, hydroelectric operation along with the presence of project facilities such as generators, construction equipment, and transmission lines can contribute to fire danger in the project area.

South Feather proposes to file with the Commission, within 1 year of license issuance, a fire prevention and response plan that is approved by the Forest Service, and developed in consultation with appropriate state and local fire agencies. The plan would set forth in detail South Feather's responsibility for the prevention, reporting, control, and extinguishing of fires in the vicinity of the project resulting from project operation.

At a minimum the plan would address the following items:

1. Fuels Treatment/Vegetation Management: Identification of fire hazard reduction measures to prevent the escape of project induced fires.
2. Prevention: Availability of fire access roads, community road escape routes, helispots to allow aerial firefighting assistance in the steep canyon, water drafting sites and other fire suppression strategies. Address fire danger and public safety associated with project induced recreation, including fire danger associated with dispersed camping, existing and proposed developed recreation sites, trails, and vehicle access.
3. Emergency Response Preparedness: Analyze fire prevention needs including equipment and personnel availability.
4. Reporting: South Feather would report any project-related fires to the Forest Service within 24 hours.
5. Fire Control/Extinguishing: Provide the Forest Service a list of the locations of available fire suppression equipment and the location and availability of fire suppression personnel.

South Feather also proposes to fully cooperate with the Forest Service in the investigation of all project-related fires. South Feather would produce upon request all

materials and witnesses not subject to the attorney-client or attorney work product privileges, over which the South Feather has control, related to the fire and its investigation. South Feather would preserve all physical evidence, and give custody to the Forest Service of all physical evidence requested. The Forest Service would provide South Feather with reasonable access to the physical evidence and documents that it would require to defend any and all claims that may arise from a fire resulting from project operation, to the extent such access is not precluded by ongoing criminal or civil litigation.

The Forest Service specifies in Condition No. 21 that South Feather develop and implement a fire prevention, response, and investigation plan. The specified components of this plan are consistent with South Feather's proposed measures. However, the Forest Service specifies that South Feather also develop and implement an additional fuel treatment/vegetation management plan (Condition No. 22) to be approved by the Forest Service and filed with the Commission within 1 year of license issuance. The plan would include analysis of live and dead fuel loading and potential fire behavior within 300 feet of project features; treatments to be employed to reduce the hazard; implementation schedule; and provisions for the reassessment of hazard at 5 to 8 year intervals depending on regrowth of vegetation. Treatments extending onto adjacent National Forest System lands would be approved by the Forest Service, and when practicable, South Feather would coordinate implementation and accomplishment of hazard reduction activities with those of the Forest Service.

Our Analysis

The development of a fire prevention, response, and investigation plan that incorporates both the measures proposed by South Feather and specified by the Forest Service, as well as the components of the fuel treatment/vegetation management plan specified by the Forest Service, would provide the means for South Feather to develop and coordinate with the Forest Service effective fire management and prevention strategies. These strategies would include the identification of fire hazard reduction measures and public safety measures associated with project-induced recreation. The fire management and response plan also would provide the means for identifying and coordinating emergency response preparedness, reporting measures associated with fire management, and also would identify the cooperative roles and responsibilities of South Feather and the Forest Service in the investigation of fires on project lands.

Road Management

Some of the roads used to access project facilities for O&M purposes are Forest Service roads that are also used by the Forest Service for land management, and by the public for recreation.

The Forest Service specifies under Condition No. 28, that South Feather file with the Commission within 1 year of license issuance a road management plan that is

approved by the Forest Service. The Forest Service specifies that the road management plan should include: (1) identification of all Forest Service roads and unclassified roads on National Forest System lands needed for project access, including road numbers; (2) a map of all Forest Service Roads on National Forest System lands needed for project access, including digital spatial data accurate to within 40 feet, identification of each road by Forest Service road number; (3) a description of each Forest Service road segment and unclassified roads on Forest Service lands needed for project access, including termini; length; purpose and use; party responsible for maintenance; level of maintenance; structures accessed; location and status of gates and barricades, if any; ownership of road segment and underlying property; instrument of authorization for road use; and assessment of road condition; (4) provisions to consult with the Forest Service in advance of performing any road construction, realignment, or closure involving Forest Service roads or lands; and (5) preparation of a condition survey and a proposed maintenance plan subject to Forest Service approval annually beginning the first full year after the road management plan has been approved.

The Forest Service would require South Feather to obtain appropriate authorization (e.g., a special-use permit, road-use permit, or maintenance agreement) in accordance with the road management plan for use of all roads needed for project access. The plan would also identify South Feather's responsibility for road maintenance and repair costs commensurate with South Feather's use and project-induced use; specify road maintenance and management standards accepted by the Forest Service that provide for traffic safety; and minimize erosion and damage to natural resources.

Our Analysis

As specified by the Forest Service, the road management plan would improve road management throughout the project vicinity, protect natural resources, provide reasonable public access, clearly define maintenance responsibilities, assess road conditions, and enable an annual survey process. The road management plan would establish a forum for coordination of road maintenance activities between South Feather and the Forest Service and would identify South Feather's responsibilities for maintaining roads used for project O&M. In addition, the road management plan would identify measures to ensure that safety, maintenance, and rehabilitation measures associated with project roads are addressed in a consistent manner and so as not to adversely affect environmental resources.

Hazardous Materials

South Feather proposes to prepare, file, and implement a hazardous substance plan within 1 year of license issuance and at least 60 days before starting any activities the Forest Service determines to be of a land-disturbing nature on Forest Service land, file with the Commission a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup on Forest Service lands. At a

minimum, the plan would require South Feather to (1) maintain in the project area a cache of spill cleanup equipment suitable to contain any spill from the project; (2) 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 on Forest Service lands; and (3) inform the Forest Service immediately of the nature, time, date, location, and action taken for any spill on or affecting Forest Service lands.

Forest Service standard Condition No. 5 is consistent with South Feather's proposed hazardous substance plan, but includes an additional provision that South Feather provide an outline of its procedures for reporting and responding to releases of hazardous substances, including names and phone numbers of all emergency response personnel and their assigned responsibilities. Forest Service standard Condition No. 5 requires South Feather to obtain written approval of planned uses of pesticides, and South Feather must describe whether pesticide applications are essential for use on National Forest System lands, specific locations of use, specific herbicides proposed for use, application rates, dose and exposure rates, safety risk and timeframes for application. Exceptions to this schedule may be allowed only when unexpected outbreaks of pests require control measures that were not anticipated at the time the report was submitted. In such an instance, an emergency request and approval may be made. The condition also specifies that pesticide use must be excluded from National Forest System lands within 500 feet of known locations of California red-legged frog, mountain yellow-legged frog, or foothill yellow-legged frog.

Our Analysis

Preparation and implementation of a hazardous substance plan would help to ensure that spills of hazardous substances are promptly contained and cleaned up and minimize the potential extent of adverse environmental effects. Provision of an outline of its procedures for reporting and responding to releases of hazardous substances would facilitate coordination of control efforts in the event of a hazardous substance spill. The requirement to obtain Forest Service approval of any pesticide use would help to ensure that sensitive resources on National Forest System lands are protected.

Aesthetic Resources

Little Grass Valley Reservoir Levels

Project operation includes drawdown of reservoir elevations. Such drawdown can affect the visual quality of the reservoir and adjacent project lands.

South Feather proposes to maintain the water level at Little Grass Valley reservoir no lower than 5,022 feet msl through September 15 in all water years, except Dry water years; and in Dry water years to maintain Little Grass Valley reservoir as high as possible through Labor Day weekend.

The public submitted several letters, including a petition with more than 100 signatures, expressing concerns regarding elevations at Little Grass Valley reservoir mainly relating to recreation resources, but also pertaining to land use and aesthetic resources (see also section 3.3.5, *Recreation Resources*). Public concerns related to land use and aesthetic resources include damage to scenic views, and decrease in overall value of property around Little Grass Valley reservoir. An area of particular concern of the public is the potential additional and extended dewatering of the Pancake Bay area under the proposed project operation and related adverse effects on the aesthetic experiences currently provided in this portion of the reservoir.

Our Analysis

Under the proposed action, South Feather would maintain Little Grass Valley reservoir under existing conditions; however, drawdown at the reservoir would occur starting in mid-September rather than late-September, and during Dry years, in which the reservoir level would be maintained as high as possible through Labor Day.

Various individuals stated concerns regarding the potentially lower water surface elevations at Pancake Bay. South Feather conducted an assessment of the incidence and period of the inundation of Pancake Bay under (1) existing (no-action) conditions; (2) South Feather's alternative 4(e) condition; and (3) the Forest Service preliminary 4(e) condition/Cal Fish & Game's recommended flow regime, as further discussed in section 3.3.5, *Recreation Resources*. According to this assessment, under Below Normal water years the number of days where inundation would occur would be reduced by 4 days under the Forest Service/Cal Fish & Game flow regime; and reduced by about 2 days under South Feather's alternative 4(e) condition flows. Under Dry water years, the area would not be inundated under the Forest Service/Cal Fish & Game flow regime and the number of days where inundation would occur would be reduced by about 15 days under South Feather's alternative 4(e) condition, compared to existing conditions. The Forest Service modified the flows that it specified for the Little Grass Valley dam reach in its final 4(e) conditions filed on March 6, 2009. The flows specified in the final 4(e) condition for Below Normal and Dry years are reduced from the flows specified in the preliminary 4(e) condition, and average annual minimum flows in these water year types fall about mid-way between flows in South Feather's alternative 4(e) condition and flows recommended by Cal Fish & Game, so effects on water levels would fall about mid-way between the effects of the other two flow regimes.

Therefore, there could be short-term increased reduction in reservoir elevations, specifically in Below Normal water years, which would result in some potential minor adverse aesthetic effects due to longer duration of exposed shoreline areas, particularly in the more gentle sloping area of Pancake Bay. However, South Feather's alternative 4(e) condition (adopted in the staff alternative) would result in only an estimated 2 additional days when such lower elevation conditions would occur during Below Normal water years. Therefore, the reservoir area would continue to meet the retention

VQO management objective because these short-term periods of reservoir elevation drawdowns (with resultant exposed shoreline areas) already occur under existing conditions, and therefore, would not likely significantly alter the visual landscape.

Visual Management Plan

Aesthetic resources can be affected by project facilities and operation. Recreation facilities and project facilities, such as project powerhouses and substation facilities, can dominate views, creating contrast with the natural landscape.

The Forest Service specifies under Condition No. 27 that South Feather file a visual management plan 60 days prior to any ground-disturbing activity on National Forest System lands. The plan would address clearing, spoil piles, and project facilities such as diversion structures, penstocks, pipes, ditches, powerhouses, other buildings, transmission lines, corridors, and access roads; facility configuration, alignment, building materials, colors, landscaping, and screening; proposed mitigation and implementation schedule necessary to bring project facilities into compliance with LRMP direction; locating road spoil piles either in approved areas on National Forest System lands or to a location off Forest Service administered lands; removal of all visible non-native materials, including construction debris from pile surfaces on National Forest System lands; and stabilization and revegetation of all native material allowed to be left on National Forest System lands, including compliance with VQOs.

Our Analysis

The development and implementation of a visual resource protection plan, prior to ground-disturbing activities on project lands located within the Plumas National Forest would help to ensure such activities would not adversely affect aesthetic resources within the Plumas National Forest. South Feather proposes rehabilitation and replacement measures to most of the recreation areas on Little Grass Valley and Sly Creek reservoirs (see section 3.3.5, *Recreation Resources*). The visual resource protection plan would help to ensure that the enhancements at the recreation sites would be consistent with the management directions of the Plumas National Forest LRMP.

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, and the existing trout populations would not be enhanced as a result of increased minimum flows. The continued operation of existing South Feather facilities would continue to be of importance to water supply, recreation, generation of renewable energy, and minimization of atmospheric pollutants. The continued operation of the existing facilities under the no-action alternative would, on average, result in the annual generation of 498,472 MWh of clean energy.

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FERC/EIS-0225F

Final Environmental Impact Statement

SECTION 4 - DEVELOPMENTAL ANALYSIS



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the South Feather Power Project’s use of the water resources of the Feather River basin to generate power, estimate the economic benefits of the South Feather facilities, and estimate the cost of various environmental measures and the effects of these measures on project operation.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECTS

4.1.1 Economic Assumptions

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission’s economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

For our economic analysis of the South Feather alternatives, we used the assumptions, values and sources shown in table 4-1.

Table 4-1. Staff assumptions for economic analysis of the South Feather Power Project. (Source: Staff)

Assumption	Value	Source
Base year for costs and benefits	2008	Staff and South Feather
Peak energy value (mills/kWh) ^a	79.72	South Feather 2008
Off-peak energy value (mills/kWh) ^a	54.61	South Feather 2008
Dependable capacity value (\$/kW-yr) ^b	Included in energy value	
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	0%	Staff

Assumption	Value	Source
2006 to 2008 inflation for most final license application costs	5.16%	Staff
Insurance rate	Included in O&M costs	
Discount rate	6.2%	Staff
Interest rate	6.2%	South Feather

^a South Feather in its May 29, 2008, filing estimated the value of peak and off-peak energy using the low and high end-of-week Electricity Price Index for California's North Path 15 as provided by Dow Jones at <http://www.newsdata.com/wps/index.html>. To calculate peak and off-peak energy prices, South Feather averaged the high and low values for peak and off-peak energy for the past year resulting in \$79.72/MWh for peak energy and \$54.61/MWh for off-peak.

^b South Feather did not provide dependable capacity rates or effects of measures on dependable capacity; however, energy values reflect a capacity component since they were developed from market based pricing.

4.1.2 Current Annual Costs and Future Capital Costs under the No-action Alternative

Total annualized costs for the no-action alternative for the South Feather Power Project amounts to \$8,710,800, as table 4-2 shows.

Table 4-2. Summary of current annual costs and future costs under the no-action alternative for the South Feather Power Project. (Source: South Feather, 2007, staff)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
Total original net investment ^a	\$20,389,700		\$1,513,100
Future non-license capital costs ^b	\$13,475,200		\$1,000,000
Total relicensing cost ^c	\$6,000,000		\$445,300
Subtotal	\$39,864,900		\$2,958,400

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
O&M including insurance		\$4,259,100	\$4,259,100
Transmission		\$315,500	\$315,500
Taxes and Fees		\$525,800	\$525,800
Operating reserves		\$631,000	\$631,000
Power Purchase Contract Management		\$21,000	\$21,000
Subtotal annual costs		\$5,752,400	\$5,752,400
Total	\$39,864,900		\$8,710,800

^a Based on South Feathers total investment of \$87,257,979 less \$61,844,549 in depreciation adjusted to the end of 2005 and 2 years additional depreciation at \$2,511,885 per year.

^b South Feather estimates future capital expenses to maintain the Project will equal \$1,000,000 per year. We divided that by the capital recovery factor of 0.07421 to convert to an equivalent 2008 capital cost.

^c Based on estimated relicensing costs projected by South Feather including additional ongoing costs of \$1,000,000 beyond the \$5,000,000 already spent.

4.2 COMPARISON OF ALTERNATIVES

South Feather provided an estimate of average annual output of the project under the no-action alternative (current conditions) of 498,972 MWh, which would provide annual power benefits of \$37,113,800. Subtracting the current costs of \$8,710,800 (see table 4-2) yields an annual net benefit of \$28,403,000. Using the CHEOPS²⁸ operations model, South Feather estimated project generation under South Feather's proposed project, the staff alternative, and the staff alternative with mandatory conditions that is summarized in table 4-4. These modeling results serve as the basis for our analysis of project economic benefits. The project's generation output is sold to the Pacific Gas and Electric Company.

²⁸ Computerized Hydro Electric Operations Planning Software, a proprietary program developed by Devine Tarbell & Associates.

Table 4-3 compares the power value, annual costs, and net benefits of the no-action alternative, South Feather’s proposed action, the staff alternative, and the staff alternative with mandatory conditions. In section 5, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the staff alternative, and explain why we conclude the environmental benefits are worth the cost increases and benefit reductions. The decrease in net benefits from \$56.92/MWh under the no action alternative to \$55.37/MWh for the proposed action represents a decrease of 3.0 percent. The decrease in net benefits from \$56.92/MWh under the no-action alternative to \$54.31/MWh for the proposed action with staff-adopted measures represents a decrease of 4.7 percent. The decrease in net benefits from \$56.92/MWh under the no-action alternative to \$54.28/MWh for the staff alternative with mandatory 4 (e) conditions represents a decrease of 4.9 percent.

Table 4-3. Summary of annual net benefits for the no-action, proposed action, staff alternative, and staff alternative with mandatory conditions for the South Feather Power Project. (Source: Staff)

	No Action	South Feather’s Proposed Action	Staff Alternative	Staff Alternative with Mandatory Conditions
Annual power value (\$)	\$37,113,800	\$36,473,600	\$35,502,100	\$35,285,800
Annual power value (\$/MWh)	\$74.38	\$74.53	\$74.60	\$74.57
Annualized cost of plant and current environmental measures (\$)	\$8,710,800	\$8,710,800	\$8,710,800	\$8,710,800
Annualized cost of new environmental measures (including energy losses contained in the power values above) (\$)	\$0.00	\$1,307,900	\$2,546,410	\$2,752,710

	No Action	South Feather's Proposed Action	Staff Alternative	Staff Alternative with Mandatory Conditions
Annualized cost of new environmental measures (excluding energy losses contained in the power values above)(\$)	\$0.00	\$667,700	\$934,610	\$934,610
Annual cost (\$)	\$8,710,800	\$9,378,500	\$9,645,410	\$9,645,410
Annual cost (\$/MWh)	17.46	19.16	20.27	20.38
Annual net benefit (\$)	\$28,403,000	\$27,095,100	\$25,860,110	\$25,643,810
Annual net benefit (\$/MWh)	56.92	55.37	54.33	54.19

The measures that South Feather proposes, summarized in table 4-5, increase the annualized costs from \$8,710,800 to \$9,378,500 relative to the no-action alternative. South Feather proposes some operational changes which would reduce annual generation by 9,316 to 489,359 MWh, resulting in annual power benefits of \$36,473,600 and an annual net benefit of \$27,095,100. This equals an overall reduction in annual net benefits of \$1,307,900 relative to the no-action alternative.

The measures included in the staff alternative, summarized in table 4-5, would increase annualized costs from \$8,710,800 to \$9,645,410 relative to the no-action alternative. Operational changes would reduce annual generation, which would decrease by 23,068 to 475,904 MWh. The staff alternative would provide annual power benefits of \$35,502,100 and an annual net benefit of \$25,810,110. This represents an overall reduction in annual net benefits of \$2,546,410 relative to the no-action alternative.

The measures included in the staff alternative with mandatory conditions, summarized in table 4-5, would increase annualized costs from \$8,710,800 to \$9,645,410 relative to the no-action alternative. Operational changes would reduce annual generation, which would decrease by 25,781 to 473,191 MWh. The staff alternative with mandatory conditions would provide annual power benefits of

\$35,285,800 and an annual net benefit of \$25,643,810. This represents an overall reduction in annual net benefits of \$2,762,710 relative to the no-action alternative.

4.3 COST OF ENVIRONMENTAL MEASURES

4.3.1 Cost of Environmental Measures for the South Feather Power Project

South Feather provided costs for environmental measures in current dollars. Costs are taken from the final license application filed in 2007, and the South Feather reply comments on comments, recommendations, terms, and conditions (South Feather, 2008). Table 4-4 summarizes the capital and O&M costs by major resource area. Changes in power benefits are addressed in section 4.2.2.

Appendix D includes capital and O&M costs for individual measures proposed by South Feather and in terms, conditions, and recommendations received from agencies and other interested parties.

Table 4-4. Summary of annualized costs by resource area for measures included in the proposed action and proposed action with staff modifications for the South Feather Power Project. (Source: Staff)

Resource Area	South Feather's Proposed Action			Staff Alternative			Staff Alternative with Mandatory Conditions		
	Annualized Capital Cost	Annualized O&M Cost	Total Annualized Cost (including energy)	Annualized Capital Cost	Annualized O&M Cost	Total Annualized Cost (including energy)	Annualized Capital Cost	Annualized O&M Cost	Total Annualized Cost (including energy)
Geology and soils	\$0	\$11,000	\$11,000	\$0	\$11,000	\$11,000	\$0	\$11,000	\$11,000
Aquatic resources	\$2,300	\$98,200	\$677,200	\$6,000	\$123,200	\$1,677,400	\$6,000	\$123,200	\$1,893,700
Terrestrial resources	\$3,100	\$91,100	\$94,200	\$5,800	\$211,800	\$217,600	\$5,800	\$211,800	\$217,600
Recreation	\$82,800	\$357,800	\$504,100	\$82,800	\$392,000	\$538,300	\$82,800	\$392,000	\$538,300
Cultural resources	\$0	\$20,300	\$20,300	\$13,810	\$79,400	\$93,210	\$13,810	\$79,400	\$93,210
Land use	\$0	\$1,100	\$1,100	\$2,200	\$6,700	\$8,900	\$2,200	\$6,700	\$8,900
Total	\$88,200	\$579,500	\$1,307,900	\$110,610	\$824,100	\$2,546,410	\$110,610	\$824,100	\$2,762,710

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4.3.2 Effect of Environmental Measures on Energy Generation

Several measures proposed by South Feather or included in the terms and conditions filed by the agencies and other parties would affect energy generation. For the South Feather Power Project, increased minimum flows proposed for the five river reaches are the only measure that would have a substantive effect on energy generation. Estimates of the effects of measures proposed by South Feather and by other parties were estimated by applying the CHEOPS operations model to optimize and simulate the system by South Feather. Estimates of the power benefits under South Feather's proposed action, the staff alternative (which includes South Feather's alternative 4(e) flows) and in the staff alternative with mandatory conditions (which includes the Forest Service's final 4(e) flows) are shown in table 4-5.

Table 4-5. Summary of the effect of environmental measures on energy for the no-action, proposed action, staff alternative, and staff alternative with mandatory conditions for the South Feather Power Project. (Source: Staff)

Power Benefits Effects	No Action	South Feather's Proposed Action	Staff Alternative	Staff Alternative with Mandatory Conditions
Peak power (MWh)	392,870	387,862	378,433	375,723
Peak power value (\$)	\$31,319,600	\$30,920,400	\$30,168,700	\$29,952,600
Off-peak power (MWh)	106,102	101,497	97,471	97,468
4-9 Off-peak power value (\$)	\$5,794,200	\$5,542,800	\$5,322,900	\$5,322,900
Total power (MWh)	498,972	489,359	475,904	473,191
Power lost relative to no action (MWh)	0	9,613	23,068	25,781
Power value (\$)	\$37,113,800	\$36,473,600	\$35,502,100	\$35,285,800
Reduction in power value relative to no action (\$)	\$0	\$640,200	\$1,611,700	\$1,828,000

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SECTION 5 - STAFF CONCLUSIONS



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

5.0 STAFF'S CONCLUSIONS

5.1 COMPARISON OF EFFECTS OF PROPOSED ACTION AND ALTERNATIVES

In this section, we compare the developmental and non-developmental effects of South Feather's proposal, South Feather's proposal as modified by staff (staff alternative), the staff alternative with mandatory conditions, and the no-action alternative.

We estimate the annual net benefits of operating and maintaining the South Feather Power Project under the four alternatives identified above. Our analysis shows that the annual net benefit would be \$27,095,100 for the proposed action; \$25,860,110 for the staff alternative; \$25,643,810 for the staff alternative with mandatory conditions; and \$28,403,000 for the no-action alternative.

We summarize the environmental effects of the different alternatives in the following section.

Geology and Soils—Under South Feather's proposal: (1) LWD would be passed downstream of the Little Grass Valley, Sly Creek, and Lost Creek reservoirs, enhancing downstream aquatic habitat; (2) supplemental streamflows would continue to be passed into Lost Creek to cleanse accumulated fine sediment from spawning gravels, reduce encroachment of riparian vegetation, and enhance geomorphic characteristics in Lost Creek; and (3) sediment pass-through measures at the Slate Creek diversion would restore sediment transport processes and improve the reliability of minimum flow releases and diversion operations by preventing excessive sediment accumulation upstream of the dam.

With our modifications to South Feather's proposal and under the staff alternative with mandatory conditions, development and implementation of soil erosion control and revegetation plans during construction of any facilities would ensure that native species revegetate disturbed areas and minimize any potential adverse effects from erosion or sediment deposition.

Aquatic Resources—Under South Feather's proposal: (1) minimum instream flows in project-affected reaches would be increased to benefit trout and other aquatic biota, but would cause a minor reduction in water levels in Little Grass Valley reservoir, resulting in minor adverse effects on fish habitat; (2) streamflows and habitat for trout in Slate Creek would be enhanced during critical high temperature periods; (3) a wild trout supplementation program would enhance trout populations in reaches where recruitment does not meet fisheries objectives; and (4) fish and invertebrate populations would be monitored to assess trends and guide adaptive management under the new project operating regimes.

With our modifications to South Feather's proposal: (1) minimum instream flows and trout habitat in project-affected reaches would be further enhanced, but would cause a slight additional reduction in water levels in Little Grass Valley reservoir; (2) ramping

rates would be implemented to reduce stranding mortality of trout and invertebrates; (3) streamflow measurement capabilities would be ensured for the term of the license; and (4) real-time flow and water temperature information would be provided to DWR to assist it in its decision-making process for meeting water temperature objectives specified in the Oroville Settlement Agreement to protect anadromous fish downstream of the Oroville Project's fish barrier dam.

Under the staff alternative with mandatory conditions, the amount of physical trout habitat in project-affected reaches would be slightly enhanced as a result of higher minimum instream flows, but water temperatures would become less suitable (colder than optimal) for trout spawning and rearing in the reaches downstream of Little Grass Valley and Lost Creek dams, and for hardhead in the Forbestown bypassed reach. Similarly, higher summer flow releases required downstream of Little Grass Valley and Lost Creek dams would likely reduce invertebrate diversity and production due to the influence of coldwater outflows. In addition, higher minimum flows would cause a greater reduction in water levels in Little Grass Valley reservoir, which would cause some minor adverse effects on reservoir fish habitat.

Terrestrial Resources—Under South Feather's proposal, annual training of employees, consultation with the Forest Service, and development and implementation of vegetation and invasive weed management plans would further the protection of sensitive areas and sensitive species and help to control the spread of noxious weeds; controllable pulse flows that could adversely affect sensitive amphibian species would be avoided; and the effectiveness of wildlife crossings and escape facilities would be maintained through design consultation with Cal Fish & Game when they are replaced or retrofitted.

With our modifications to South Feather's proposal, ramping rates developed to protect amphibians would minimize adverse effects on reproduction; amphibian surveys would allow the effects of operation on sensitive amphibians to be monitored; and additional data collection on habitat conditions, population size, and growth rates would inform adaptive management decisions and enhance conservation efforts for amphibians within the project area. Also, South Feather would be required to maintain all wildlife crossings and escape facilities that are necessary to protect wildlife.

Under the staff alternative with mandatory conditions, the higher flows specified by the Forest Service in the South Fork diversion dam and Forbestown diversion dam reaches would likely reduce habitat suitability for amphibians by reducing water temperatures below levels required for breeding and by providing less stable flows.

Threatened and Endangered Species—Although valley elderberry longhorn beetle and the California red-legged frog are not likely to occur in the project area, their presence cannot be ruled out. Therefore, we conclude that the alternatives considered in this EIS may affect, but are not likely to adversely affect, these threatened and endangered species. On December 12, 2008, FWS filed a letter concurring with our determination.

Under South Feather’s proposal, continued operation of Kelly Ridge powerhouse, including its flow releases of variable temperature and magnitude during the summer months, may result in incrementally higher water temperatures in the upper portion of the Oroville Project’s Thermalito diversion pool. However, because of the small volume of these releases in comparison with the volume of the Thermalito diversion pool and the effects of Oroville project operation, it is unlikely that any temperature effects would be detectable at or below the Oroville fish barrier dam, the upstream limit of listed salmonids and their critical habitat.

Under the staff alternative and staff alternative with mandatory conditions, South Feather would provide real-time water temperature monitoring and flow data to DWR to help it in its decision-making process for meeting its water temperature objectives, thereby improving temperature conditions for Central Valley spring Chinook salmon and California Central Valley steelhead. Therefore, we conclude that all three of the alternatives considered in this EIS may affect, but are unlikely to adversely affect, these threatened and endangered species or their critical habitat.

Recreation—Under South Feather’s proposal, South Feather would be responsible for the following measures to maintain and enhance recreational opportunities: (1) O&M of recreational facilities; (2) rehabilitation of existing recreational facilities; (3) construction of a new multi-use trail below Little Grass Valley dam to improve access to the SFFR for recreational boating and angling; (4) management of reservoir levels to facilitate recreational use while achieving project purposes; (5) provision of whitewater boating flows in the Little Grass Valley dam reach during the fall in all water years; (6) provision of whitewater boating flows in the spring in Above Normal and Wet water years in the South Fork diversion dam and Forbestown diversion dam reaches; (7) provision of flow information for whitewater boating to the public; and (8) maintenance and enhancement of public safety by installation of safety buoys each year in Little Grass Valley and Sly Creek reservoirs.

With our modifications to South Feather’s proposal, higher minimum flow releases would cause some adverse effects on reservoir recreation by increasing the drawdown of Little Grass Valley reservoir, and would reduce the amount of water that is available for whitewater releases.

Under the staff alternative with mandatory conditions, the adverse effects of drawdown on reservoir recreation would be increased, and the amount of water available for whitewater releases would be further reduced.

Cultural Resources—Under South Feather’s proposal, cultural resources would be protected under provisions specified in the HPMP included in South Feather’s license application.

With our modifications to South Feather’s proposal, additional measures would be incorporated into the HPMP that would provide a higher level of assurance that important cultural resources are adequately protected.

Land Use and Aesthetics Resources—Under South Feather’s proposal, public safety would be maintained and enhanced by developing and implementing a fire prevention, response, and investigation plan.

With our modifications to South Feather’s proposal, fire risk would be further reduced by developing and implementing a fuel treatment/vegetation management plan, road management would be improved throughout the project vicinity, and aesthetics would be protected and improved by implementing a visual management plan that would bring project facilities into compliance with land resource management plan direction.

Under the staff alternative with mandatory conditions, the adverse effects of drawdown on aesthetic conditions at Little Grass Valley reservoir would be increased.

General—With our modifications to South Feather’s proposal, annual consultation with the management agencies would assist with interpretation of monitoring results and adaptive management.

Under the no-action alternative, environmental conditions would remain the same, and there would not be any enhancement of environmental resources.

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 all uses of the waterway on which a project is located. When we review a hydropower project, recreation, fish, wildlife, and other non-developmental values of the waterway are given equal consideration with the project’s electric energy and other developmental values. In deciding whether, and under what circumstances, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved in that decision. This section contains the basis for, and a summary of, our recommendations for relicensing the South Feather Power Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review and evaluation of the environmental and economic effects of the proposed action, the staff alternative, the staff alternative with mandatory conditions, and no-action, we recommend the staff alternative as the preferred alternative for the South Feather Power Project.

We recommend this alternative because (1) issuing a new license would allow South Feather to continue operating the project as a beneficial, dependable source of water and electric energy; (2) the project, with a total installed capacity of 117.3 MW may eliminate the need for an equivalent amount of fossil fuel-produced energy, which helps conserve these non-renewable resources and limits atmospheric pollution; (3) our recommended environmental measures would protect water quality and quantity, enhance fish and wildlife resources, protect cultural resources; and improve public use of the project’s recreational facilities and resources; and (4) the public benefit of these measures

would exceed those of the other alternatives. Although we did not adopt all of the Forest Service's 4(e) conditions, we recognize that the Commission must include these conditions in any license due to their mandatory nature.

In the staff alternative, we include the following environmental measures proposed by South Feather, based on our analyses included in sections 3 and 4. In some cases (*italicized*), we modified or supplemented South Feather's proposed measures.

Geology and Soils

- Annually return LWD to the SFFR downstream of Little Grass Valley dam and to Lost Creek downstream of Lost Creek dam by allowing the LWD to pass through the Little Grass Valley, Sly Creek, and Lost Creek dam spillways during spill periods. LWD, as used in this measure, refers to downed, dead, or dying wood at least 20 feet long. If spills are not adequate to pass the LWD and LWD is collected from Little Grass Valley, Sly Creek, and Lost Creek reservoirs, consult with the Forest Service concerning alternative means and a schedule to return the LWD to the river.
- Provide a supplemental streamflow below Lost Creek dam, as needed, to ensure that a flow of at least 390 cfs (measured as the average flow over any continuous 24-hour period as measured at USGS gage 11396000) occurs at least once every 4 years.
- Within 2 years of license issuance, file a report on measures implemented to pass sediment at Slate Creek diversion dam. The report must describe the results of procedures used to determine whether smaller flow releases and releases timed to occur on the ascending limb of the hydrograph would allow accumulated sediment to pass through Slate Creek diversion dam more frequently, and include recommendations for future operations. The report must document consultation with the Forest Service, U.S. Army Corps of Engineers, Water Board, and Cal Fish & Game on the methods used to pass sediments, and these agencies must be allowed 90 days to review and comment on the report. The filed report must include comments received and the draft report from these agencies and describe how these comments were addressed in the report.

Aquatic Resources

- Determine water year type as described in the Forest Service's Condition No. 18, part 2, annually and apply to appropriate minimum flow release schedule and other measures that are dependent on water year type.
- Install and maintain a gaging station, monitor water temperature, and cease diversions at Slate Creek diversion dam when mean daily water temperature reaches 20°C to protect downstream cold freshwater habitat.

- Implement a minimum flow release schedule for the Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam reaches. *This measure is modified to incorporate the streamflows identified for each reach in South Feather's alternative to the Forest Service's preliminary Condition No. 18, part 1, shown in appendix C, tables C-1 through C-20.*
- When drought conditions may require deviation from minimum flows or other license conditions, consult with the Forest Service and other agencies to develop and implement an operating plan to manage drought conditions.
- Develop and implement a wild fish supplementation program to augment fish populations, when warranted, in the SFFR, Slate Creek, and in Sly Creek and Lost Creek reservoirs.
- Develop and implement a fish population monitoring plan approved by the Forest Service describing sampling to be conducted in the project-affected bypassed reaches to monitor fish species composition and relative abundance, including data on species size/age distributions and condition factors at eight of the locations previously established during the relicensing. Monitoring will be conducted in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach, or at a frequency jointly agreed to by the agencies. If sampling is scheduled in years with high peak flows, the survey may be postponed by 2 years to avoid confounding effects of high peak flows on fish recruitment and populations.
- Develop and implement a benthic macroinvertebrate monitoring plan approved by the Forest Service describing sampling to be conducted in the project-affected bypassed reaches. Monitoring will be conducted in the same years that fish population monitoring is conducted.

Terrestrial Resources

- Conduct annual employee awareness training to familiarize staff with special-status, aquatic, wildlife, and plant species, including noxious weeds/non-native invasive plants, as well as sensitive locations including PACs, potential erosion areas, and cultural sites to allow avoidance/minimization of impacts.
- Prepare and implement an invasive weed management plan. *This measure is modified to address both aquatic and terrestrial invasive weeds; include protocols for locating, monitoring, and controlling weed populations; include a public education program and facilities for public use to reduce the spread of aquatic weed species; and provide information on noxious weed populations in a data format compatible with the Forest Service GIS database.*

- Annually review with the Forest Service the list of species within the project area that are formally proposed for listing or are listed under federal or state endangered species acts or are Forest Service Sensitive, Watch List, or Management Indicator Species. If an added species has the potential to be adversely affected by the project, prepare a study plan to reasonably assess the effects of the project on the species, recommend reasonable resource management measures, and provide an implementation schedule, where appropriate.²⁹
- Maintain all bat exclusion devices in proper working condition.
- Consult with Cal Fish & Game and FWS prior to replacing or retrofitting Miners Ranch conduit wildlife bridge crossings and deer escape facilities. *This measure is modified to require that South Feather maintain and operate all devices and measures necessary for the protection of wildlife along the Miners Ranch conduit.*

Recreational Resources

- Develop and implement facility master plans that illustrate the layouts, locations, sizes, shapes, and relationships between existing and proposed improvements for the Little Grass Valley reservoir recreation area and the Sly Creek reservoir recreation area.
- Develop and implement individual site development plans for each existing recreation facility on Forest Service lands within the existing project boundary.
- Within 3 years of license issuance and after consultation with the Forest Service, construct a multi-use trail below Little Grass Valley dam to provide better access to the SFFR, primarily for recreational boating and angling.
- Finalize and implement a Little Grass Valley and Sly Creek reservoir recreation area routine maintenance and operating plan.
- Every 6 years file a report on recreational use at the developed recreational facilities at Little Grass Valley and Sly Creek reservoir recreation areas.

²⁹ In addition, South Feather plans to avoid high flow releases from project dams (with the exception of the Little Grass Valley dam) associated with sediment pass-through, valve exercises, or supplemental flow releases for channel maintenance or recreational purposes during critical periods for FYLF (roughly April 15 - October 31, annually).

- Every 18 years file a report on recreational user surveys at developed recreational facilities at Little Grass Valley and Sly Creek reservoir recreation areas. *This measure is modified to require the filing of the report every 12 years.*
- Maintain the water level at Little Grass Valley reservoir no lower than elevation 5,022 feet msl through September 15 in all water years, except Dry water years,³⁰ to facilitate the use of Little Grass Valley boat launch facilities. *This measure is modified to specify that the restriction applies only from May 21 through September 15, and does not apply in drought years if the reservoir does not fill to elevation 5,022 feet msl.*
- Provide supplemental streamflow in Little Grass Valley dam reach for recreational boating from September 16 of each year until the date that Little Grass Valley reservoir elevation is 5,017 feet msl. In August of each year, South Feather would consult with the Forest Service, Water Board, American Whitewater, and other interested parties to set the target streamflow between 230 and 460 cfs for the upcoming September. The actual streamflow may vary from the target streamflow by up to 15 percent but may not be less than 230 cfs.
- Provide a supplemental streamflow in the spring of Above Normal and Wet water years downstream of the South Fork diversion dam for recreational purposes. A continuous flow of at least 190 cfs but not more than 700 cfs will be released for two consecutive weekend days between April 1 and June 15, as measured at USGS gage 11395200. A continuous water temperature monitor will be installed near the Woodleaf powerhouse, and the supplemental streamflows will be discontinued if the water temperature reaches 13°C. *This measure is modified to require that supplemental streamflows be discontinued if the water temperature reaches or exceeds 12°C.*
- Provide supplemental streamflow in the spring during Above Normal and Wet water years at Forbestown diversion dam reach to improve opportunities for Class IV and V whitewater boating in the spring. A continuous flow of at least 215 cfs but not more than 400 cfs will be released for two consecutive weekend days between April 1 and June 15, as measured at USGS gage 11395200. A continuous water temperature monitor will be installed near the Forbestown powerhouse, and the supplemental streamflows will be discontinued if the water temperature reaches 13°C. *This measure is modified to require that supplemental*

³⁰ In Dry water years, South Feather indicates that it will maintain the water level in Little Grass Valley reservoir as high as possible through Labor Day weekend.

streamflows be discontinued if the water temperature reaches or exceeds 12°C.

- Provide streamflow information to the public within 1 year of license issuance, to include the anticipated dates and magnitude of recreational streamflow releases.
- Install public safety buoys in Little Grass Valley and Sly Creek reservoirs as soon as practical after access roads are clear of snow, and maintain the buoys through September 15 of each year.

Cultural Resources

- Upon issuance of license, finalize and, following Commission approval, implement the HPMP included in the application. *This measure is modified to implement the HPMP provided in the license application, with staff's additional measures.*

Land Use

- Prepare, file with the Commission within 1 year of license issuance, and implement a fire prevention and response plan.
- Develop and implement a hazardous materials management plan to reduce the potential effects of hazardous materials spills.

General

- Consult with the Forest Service annually to coordinate project and Forest Service activities. *This measure is modified to include annual consultation regarding the status of measure implementation, the results of monitoring studies, discussion of both routine and non-routine maintenance, foreseeable changes in project facilities, review of any necessary revisions or modification of plans included in the project license, and discussion of any measures needed to protect sensitive species or changes to existing management plans. This measure is further modified to require that FWS, Cal Fish & Game, and the Water Board be afforded the opportunity to participate in the consultation meeting and included in the distribution of all monitoring reports and correspondence relating to the meeting, and that recommendations by these agencies be included in the record of the meeting.*

In addition to the foregoing, the staff alternative also includes the following additional measures identified by staff based on agency, tribal, and non-governmental organization specifications, recommendations, and our analysis.

Aquatic Resources

- Implement a maximum ramping rate of 0.5 foot per hour when making any controlled increases or decreases in flow releases into the Little Grass Valley dam, South Fork diversion dam, Lost Creek dam, and the Forbestown diversion dam reaches.
- Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflows downstream of Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam.
- Develop and implement a plan, in consultation with Cal Fish & Game, NMFS, and DWR to monitor the effects of flow releases on water temperatures in the Little Grass Valley dam, South Fork diversion dam, Lost Creek dam, and the Forbestown diversion dam reaches, and to provide real-time information on the temperature and quantity of water discharged from the Kelly Ridge powerhouse.
- Reserve NMFS authority to prescribe fishways.

Terrestrial Resources

- Monitor selected areas between the South Fork diversion dam and Ponderosa reservoir for riparian encroachment, and treat if warranted based on FYLF monitoring results.
- Prepare a Biological Evaluation before taking actions that may affect Forest Service special status species on National Forest System lands, update and implement the Bald Eagle Management Plan, and develop and implement a bat management plan.
- Conduct surveys for FYLF over the full length of the Little Grass Valley dam, South Fork diversion dam, SFFR/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam reaches in year 1 and every 10 years thereafter, supplemented by representative surveys in years 2-6, every 4 years thereafter, and during the final 3 years of the license to assess effectiveness of measures implemented to protect FYLF.
- Develop a temperature and growth rate monitoring protocol, a habitat monitoring protocol to include habitat measurements in year one and every ten years thereafter, and a protocol to determine appropriate ramping rates suitable for FYLF.

Recreational Resources

- Incorporate several additional measures specified by the Forest Service for the facility master plans including:

- provisions for an annual coordination meeting to review the status of the implementation of the master plan;
- provisions to ensure consistency with other management plans, including measures associated with potential effects of the proposed recreation rehabilitation on cultural resources within the project;
- incorporation of provisions to re-vegetate disturbed vegetation associated with the proposed rehabilitation and enhancement measures at the recreation sites as part of the facility master plans; and
- provisions to improve interpretive features for the public (i.e., kiosks or trail placards), as part of the individual site plans.

Land Use and Aesthetics

- Develop and implement a fuel treatment/vegetation management plan as part of South Feather’s fire prevention and response plan, after consultation with the Forest Service. File the plan with the Commission within 1 year of license issuance.
- Develop and implement a road management plan for roads within the project boundary that are used primarily for project purposes, including access to project facilities and recreational facilities. File with the Commission within 1 year of license issuance and after Forest Service approval of the plan.
- Develop and implement a visual management plan within 60 days prior to any ground-disturbing activity (including the construction or new facilities or modification of existing facilities, which could affect visual aesthetics) on National Forest System lands.

5.2.1 Discussion of Key Issues

The following paragraphs describe the basis for staff-recommended measures as well as the basis for not recommending some of the measures recommended by other entities. Under each major issue, we discuss our recommendations for the South Feather Power Project.

Geology and Soils

Large Woody Debris

Because LWD can benefit fish habitat, South Feather proposes to make a reasonable effort to annually return LWD that collects in the Little Grass Valley, Sly Creek, and Lost Creek reservoirs to the river below each reservoir. LWD contributes to productive aquatic ecosystems, and is an important component in the formation of

complex aquatic habitat units and channel maintenance. Although much of the steep and confined channel network in the project area offers limited opportunity for LWD retention, it may be retained locally in lower gradient areas or where valley and/or channel width narrows. Compared to reference reaches upstream of the impoundments, the number of LWD pieces per mile was considerably lower in the reaches downstream of Little Grass Valley dam on the SFFR and below Sly Creek dam on Lost Creek. Passing LWD that accumulates in the Little Grass Valley and Sly Creek reservoirs to downstream reaches would increase the abundance of LWD in these reaches and provide a substantial benefit to trout habitat in areas where LWD is retained within the active stream channel. We estimate that passing LWD that accumulates in these reservoirs into downstream reaches would have an annualized cost of \$5,300. Because increasing the amount of LWD in downstream reaches could provide a substantial benefit to fish habitat at a reasonable cost, we recommend adopting this measure.

Lost Creek Geomorphic Flows

Lack of seasonal high flow events may contribute to the accumulation of fine sediment in spawning gravels, which may adversely affect trout spawning and incubation success and contribute to the encroachment of riparian vegetation into the stream channel. Although most of the project reaches have limited potential to retain fine sediments, Lost Creek is a reach that can retain fine sediment that originates below Lost Creek dam (i.e., a response reach), and this sediment may affect aquatic habitat. Based on a study conducted in 1991, the current project license stipulates that flushing flows between 390 and 740 cfs be released from Lost Creek dam at least once every 4 years. South Feather has studied the effects of these flushing flows to evaluate its effect on the reach as a continuation of the 1991 study, and found that the reach benefits from these geomorphic flow releases. South Feather therefore proposes to continue flushing flows in Lost Creek by spilling flows of at least 390 cfs for a period of 24 hours at least once every 4 years. Continuing these periodic flushing flows would serve to enhance geomorphic characteristics in Lost Creek and protect aquatic habitat, and we recommend that this measure be continued. Because these flow releases are stipulated in the current license, continuation of the measure would have no incremental cost.

Sediment Pass-Through at Slate Creek

Accumulation of sediment upstream of the Slate Creek diversion dam interferes with operation of the low-level outlet used to release minimum instream flows, affects the operation of the diversion tunnel, and impedes the transport of spawning gravel into the reach downstream of the diversion. South Feather is currently testing alternative methods of operation to facilitate the passage of sediment past the dam, and within 2 years of license issuance, proposes to file a report with the Commission that would describe the results of ongoing testing.

Until 1986, the Slate Creek diversion dam was operated to allow sediment to pass through a low-level outlet during high flows. Sediment pass-through activities were

suspended from 1986 to 2002 because of resource agency concerns about potential effects on water quality from toxins that may have collected in the accumulated sediment, although, as discussed in section 3.3.1.2, sampling of sediments and water demonstrated that this contamination had not occurred. South Feather attempted to resume sediment pass-through activities in 2002. It was unsuccessful because of the armored sediment accumulation that had built up against the outlet's trashrack. In 2005, South Feather removed 500 cubic yards of the accumulated sediments by manual excavation, and sediment was successfully passed through the structure, but testing was suspended because of concerns about abrasion damage to the diversion's outlet works. South Feather is currently testing new procedures to determine whether smaller flow releases would allow accumulated sediment to pass through Slate Creek diversion dam more frequently, and is assessing the size of storm events (rainfall amount and rate) that result in Slate Creek flows more than 1,000 cfs, so that sediment pass-through can be timed to occur on the ascending limb of the hydrograph, to allow both coarse and fine materials to be carried into the downstream reaches and enhance aquatic habitat.

South Feather's proposal to file a report 2 years after new license issuance would allow the Commission to review the results of the current sediment pass-through efforts and any proposed modifications to the sediment pass-through program. Continuing sediment pass-through and refining successful procedures would enhance downstream habitat by restoring sediment transport processes, and would improve the reliability of minimum flow releases and diversion operations by preventing further accumulation of sediment upstream of the dam. We estimate that the annualized cost of preparing the proposed sediment pass-through report would be \$5,700. Because the report would help to determine the success of and develop effective sediment pass-through procedures, and would benefit aquatic habitat at a minimal cost, we recommend that this measure be adopted.

Water and Fisheries Resources

Minimum Flows and Reservoir Levels

Flow regulation at Little Grass Valley and Sly Creek reservoirs and diversion of water to the project powerhouses affect aquatic biota and recreational opportunities in five riverine reaches. These reaches are the Little Grass Valley dam, South Fork diversion dam, and Forbestown diversion dam reaches of the SFFR; Slate Creek below the Slate Creek diversion dam; Lost Creek below Lost Creek reservoir; and the SSFR/Lost Creek reach (downstream of the confluence of Lost Creek with the SSFR). Flows released into downstream reaches also affect water levels in project impoundments, especially in the Little Grass Valley and Sly Creek reservoirs, which provide seasonal storage.

In its final license application, South Feather proposed a minimum flow regime for each of the project reaches³¹ that varies by month for four water year types. In all cases the proposed flows are equal to or greater than the flows that are required in the current project license. Cal Fish & Game filed a 10(j) recommendation and the Forest Service filed a preliminary 4(e) condition specifying seasonal flow regimes for each reach and water year type. South Feather filed an alternative 4(e) condition specifying minimum flows that were in some cases consistent with the Forest Service's 4(e) flows, but in most cases were intermediate between the flows proposed in the license application and the Forest Service's 4(e) flows.

The Forest Service filed its final 4(e) conditions on March 6, 2009. The Forest Service adopted South Feather's alternative 4(e) flows for Above Normal, Below Normal, and Wet water year types in the Lost Creek reach, and reduced its preliminary 4(e) flow conditions to be more consistent with South Feather's alternative 4(e) conditions in several other reaches and water year types. The flows recommended by Cal Fish & Game are higher than the other proposed or specified flow regimes in most reaches, months, and water year types. Flows included in each of these flow regimes, and their effects on trout habitat and wetted area, are presented in appendix C, and average annual values are summarized and compared in section 3, tables 3-10 to 3-12.

South Feather also proposes that instantaneous flows be allowed to deviate below the specified minimum flow releases by up to 10 percent or 3 cfs, whichever is less. The Forest Service specifies that the instantaneous flow be at least 80 percent of the specified mean daily flow for minimum flows less than or equal to 10 cfs, and at least 90 percent of the specified mean daily flow for minimum flows greater than 10 cfs. Cal Fish & Game did not state whether any short-term deviations would be allowed from its recommended minimum flows.

In the draft EIS, we analyzed the effect of all alternative flow regimes on habitat for adult rainbow trout (as represented by modeled WUA), water temperature suitability for rainbow trout, hardhead and FYLF, and effects on water levels in Little Grass Valley reservoir. Our analysis of effects on fish habitat included consideration of static WUA values associated with each minimum flow regime, as well as South Feather's habitat time series analysis, which included incorporation of accretion flows within each reach and comparison of habitat availability under each of the proposed flow regimes for four water year types.

In its comments on the draft EIS, Cal Fish & Game provided additional information on the trout lifestages and other parameters that were given priority in different seasons and water year types when it developed its recommended flow regime

³¹ Although flows in the SFFR/Lost Creek reach are not specified, the reach would receive the combined minimum flows from the South Fork diversion dam and Lost Creek reaches, plus accretion.

for each reach. We revised our analysis in section 3.2, *Aquatic Resources*, to include this new information, and also to reflect changes in the flows that were specified by the Forest Service in its final 4(e) conditions.³² The results of our analysis of effects on WUA available for trout lifestages and on wetted area is presented in detail in that section, and is summarized as annual averages across in table 5-1, below. As indicated in the table, the flows included in South Feather's alternative 4(e) condition provide substantial overall increases in habitat for all lifestages of trout and moderate increases in wetted area, which would increase macroinvertebrate production, enhancing the food resources available to trout. Although the higher flows recommended by Cal Fish & Game and specified by the Forest Service would provide additional increases in trout habitat and in wetted area, the incremental gains are relatively small in relation to the increase in minimum flows and associated losses of power production.

The Forest Service identified channel maintenance functions including maintenance of spawning gravel quality and preventing riparian encroachment as one of its priorities in determining minimum flows in the spring high flow period. Although minimum flows proposed or specified by the agencies are higher than those that are included in South Feather's alternative 4(e) condition in some reaches and water year types, these differences are small in relation to the magnitude of spill flows that would normally occur in most years, and as a result we conclude that the higher minimum flow releases provided in the agency flow regimes would not provide a detectable improvement in channel maintenance functions.

Both agencies identified ecological objectives of retaining a natural hydrograph to provide ecological cues, and of buffering the effects of flow changes by providing higher minimum base flows. Although it is difficult to quantify the benefits that are associated with providing a more natural flow regime, we note that the flow regimes included in South Feather's alternative 4(e) condition reflect the natural flow regime much more closely than the flows that are included in the existing license and the flows that were originally proposed in the license application. The substantial increase in minimum flows that would be provided in the alternative 4(e) condition would also serve to buffer adverse effects associated with sudden increases or decreases in river flow by reducing the magnitude of changes in water depth and velocity when flows are increased and the amount of habitat that is dewatered when flows are reduced. The higher minimum flows in the agency flow regimes would provide some additional protection from these adverse

³² As we discuss in that section, we also focused our analysis on static minimum flows instead of South Feather's habitat time series analysis. In their comments on the draft EIS, Cal Fish & Game and the Forest Service note that, because the magnitude and timing of releases that are made to meet downstream consumptive needs may vary between years, the average flow statistics that South Feather used in its time series analysis may not represent the actual minimum flow levels that occur in some time periods and years.

effects. However, the higher agency flows would also adversely affect the suitability of water temperatures for some species and lifestages of biota and on water levels in Little Grass Valley reservoir, as we discuss below.

Table 5-1. Summary of annual percent increase in average minimum flow, wetted area, trout rearing WUA, and spawning WUA for each flow regime compared to the minimum flows included in the current license.

Reach	Flow regime	Percent increase from existing flow regime				
		Flow (cfs)	Wetted area (1,000 sq ft)	Juvenile trout WUA	Adult trout WUA	Trout spawning WUA
Little Grass Valley	SF FLA	110%	9%	48%	70%	101%
	SF Alt 4(e)	183%	14%	67%	105%	107%
	FS final 4(e)	262%	18%	90%	151%	140%
	Cal F & G	317%	20%	94%	170%	153%
	SF FLA	149%	14%	33%	62%	113%
South Fork Diversion	SF Alt 4(e)	242%	20%	45%	87%	123%
	FS final 4(e)	274%	22%	48%	95%	126%
	Cal F & G	369%	25%	51%	107%	135%
	SF FLA	17%	1%	5%	-2%	-1%
	SF Alt 4(e)	69%	3%	15%	15%	96%
Slate Creek	FS final 4(e)	69%	3%	15%	15%	96%
	Cal F & G	69%	3%	15%	15%	96%
	SF FLA	67%	3%	11%	25%	15%
	SF Alt 4(e)	242%	10%	32%	73%	121%
	FS final 4(e)	262%	10%	33%	77%	121%
Forbestown Diversion	Cal F & G	398%	13%	40%	101%	138%
	SF FLA	0%	NA ^a	-9%	-14%	-3%
	SF Alt 4(e)	112%	NA ^a	26%	55%	30%
	FS final 4(e)	122%	NA ^a	27%	58%	30%
	Cal F & G	178%	NA ^a	30%	86%	28%

^a Wetted area information not available for the Lost Creek diversion reach.

Modeling of water temperatures in the Forbestown reach conducted by South Feather indicates that increasing minimum flows during the summer months would help to maintain water temperatures below 20°C throughout the length of the reach upstream of the migration barrier. Although the higher releases recommended by Cal Fish &

Game would likely provide even more favorable summer water temperatures for trout, these flows may reduce maximum summer water temperatures to levels that are below the optimal range for hardhead.

Higher summer flow releases that would occur downstream of each of the project's larger storage reservoirs under the flows recommended by Cal Fish & Game and specified by the Forest Service would likely increase the length of the portion of each of the reaches below each reservoir where invertebrate diversity and production is reduced by the influence of coldwater outflows. The higher agency flow releases are also likely to reduce habitat suitability for trout in the Little Grass Valley dam reach, for FYLF in South Fork diversion dam and Forbestown reaches, and for rainbow trout and FYLF in the Lost Creek reach.

The higher minimum flows recommended by Cal Fish & Game and specified by the Forest Service for the reach below Little Grass Valley dam would cause Little Grass Valley reservoir to be drawn down to lower levels in the summer and to not fill to as high a level as currently occurs, particularly during Below Normal and Dry water years. These reduced water levels and surface area could cause some adverse effects on bald eagle foraging and on reservoir recreation and aesthetics. Although the flows specified in the Forest Service's preliminary 4(e) condition in the Little Grass Valley dam reach were identical to the flows recommended by Cal Fish & Game, the flows specified by the Forest Service in its final 4(e) condition are lower than Cal Fish & Game's flows, and, as a result, would have less effect on water levels in Little Grass Valley reservoir. South Feather's alternative 4(e) flows in the Little Grass Valley dam reach are generally between 30 and 80 percent less than Cal Fish & Game's flows during the spring and summer months, and would have a proportionately smaller effect on drawdown levels. To minimize any potential adverse effects on reservoir-based recreation, South Feather proposes to maintain water surface elevations in Little Grass Valley reservoir above 5,022 feet msl through September 15. Although the peak recreation season extends from about May 21 through October 15 at Little Grass Valley reservoir, use decreases after the Labor Day weekend, so South Feather's proposed measure should minimize adverse effects on recreation during the period of highest use.

South Feather proposed and the Forest Service specified releasing higher flows to compensate for any instances when flow releases do not meet the minimum flows required in a new license. However, neither party has provided a basis for including a provision to allow for the under-release of minimum flows. Without such a basis, we see no need to include this provision, and recommend that compliance be based upon meeting the instantaneous and daily average flow volumes identified in South Feather's alternative 4(e) condition. If some variation in flow release is anticipated, this is normally accommodated by providing a slight over-release, and if releases are found to be insufficient, the licensee is usually required to notify the Commission of the under-release, and to take immediate action to return to compliance.

We recommend including South Feather's alternative 4(e) flows in the staff alternative because they would provide: (1) substantial increases in habitat for all lifestages of trout in all reaches compared to the flows included in the current license and proposed in the license application; (2) lower potential for causing adverse temperature effects on rainbow trout spawning, hardhead rearing, and FYLF breeding than the higher Forest Service and Cal Fish & Game flows; and (3) lower potential for adverse effects on recreation use and bald eagle foraging from low water levels in Little Grass Valley reservoir than the higher Forest Service and Cal Fish & Game flows.

We estimate that the flow regime proposed by South Feather in its license application would reduce the average annual power generated at the project by 8,685 MWh and would reduce the annual net benefit of the project by \$587,200 compared to current operation, while the flow regime defined in South Feather's alternative 4(e) condition would reduce the average annual power generated at the project by 22,139 MWh and would reduce the annual net benefit of the project by \$1,558,700 compared to current operations. Due to the substantial improvement that would be provided to trout habitat in a total of 38 miles of stream in six stream reaches, we conclude that the benefit of implementing the alternative 4(e) flows is worth its costs. We estimate that implementing the minimum flows specified by the Forest Service and recommended by Cal Fish & Game would reduce average annual project generation by 24,853 and 33,636 MWh, respectively, and would reduce the annual net benefit by \$1,775,000 and \$2,432,300, respectively. Because of the additional reduction in energy generation, adverse temperature effects on trout and aquatic productivity in the Little Grass Valley dam and Lost Creek dam reaches, on hardhead in the Forbestown diversion dam reach, on FYLF habitat in several reaches, and on water levels in Little Grass Valley reservoir, we conclude that the Forest Service and Cal Fish & Game flows are not warranted, due to these negative impacts and higher costs.

Ramping Rates

Rapid changes in streamflow have the potential to strand and kill young fish and macroinvertebrates, and may cause adverse effects on amphibians including FYLF. Because each of the powerhouses discharge into reservoirs or diversion pools, peaking operation of the South Feather Power Project does not cause flows or water levels in riverine reaches to fluctuate. However, rapid flow changes in riverine reaches would occur occasionally during spills and when high flow releases are made from project dams for geomorphic purposes, to meet downstream consumptive needs, or to support whitewater recreation. Cal Fish & Game recommends that ramping rates be limited to a maximum of 0.5 foot per hour to minimize fish stranding. Because whitewater flow releases would occur only once per year in each reach and the release of geomorphic flows into Lost Creek would occur only once every 4 years, the cost associated with implementing this ramp rate in the Little Grass Valley dam, Slate Creek diversion dam, South Fork diversion dam, Lost Creek dam, and Forbestown diversion dam reaches is negligible, and we conclude that the benefits to fish populations are worth its cost.

Because implementing ramping constraints at Slate Creek could limit the effectiveness of sediment pass-through activities, we recommend that an exception to this ramping rate be allowed when these activities are conducted at the Slate Creek diversion. Also, because the rate of flow change during naturally occurring spills at project dams is not controllable, the ramp rate should be applied only to flow changes that are controllable by South Feather.

Flow Monitoring and Water Management during Extended Drought Conditions

South Feather proposes to monitor compliance with its proposed minimum flows using existing USGS flow gages in each reach. Cal Fish & Game recommended and Forest Service specified that South Feather operate, maintain, and modify (if needed) existing gages that are needed to determine the river stage and minimum streamflow in each project-affected reach. The Forest Service also filed preliminary and revised 4(e) conditions specifying the methodology that would be followed to determine the water year type that would guide the implementation of minimum flows, and to consult with stakeholders to develop an operating plan to manage flows during drought conditions. South Feather indicated in its reply comments that it did not object to the revised 4(e) measures, which were incorporated without change in the Forest Service's final 4(e) conditions.

Continued operation of the USGS gages in each of the affected reaches, including any modifications that may be required to accurately measure minimum flows or ramping rates that are included in a new license, would help to ensure that these gages remain functional and can be used to effectively monitor compliance with flow-related measures included in the license. The gages also would help to ensure that flow data continues to be available to other water users in the basin and to the general public. Provision of flow data recorded at 15-minute intervals to the agencies upon request would help to verify compliance with any instantaneous flows and ramping rates that are included in the license. We estimate that funding the continued operation of the USGS gages would have an annualized cost of \$20,000. Because continued operation of these gages is needed to verify license compliance and to ensure that the benefits of implementing minimum flows to the project-affected reaches are realized, we conclude that the benefits of this measure are worth its costs.

Yuba River Reopener

Diversion of water from Slate Creek to Sly Creek reservoir reduces the volume of water that is contributed to the Yuba River via Slate Creek. The Yuba County Water Agency recommends that the Commission reserve authority to require South Feather to make reasonable provisions for modifying project facilities or operation as necessary to mitigate or avoid cumulative effects identified in any environmental analysis of the Yuba River Project (FERC No. 2246). They indicate that this reservation would be applicable in the context of any relicensing or license amendment proceeding involving the downstream Yuba River Project.

We include analysis in this document of the cumulative effects of relicensing the South Feather Power Project on water resources, and adopt several measures that we consider to be appropriate to address the project's contribution to cumulative effects on water resources in the Yuba River basin. If additional measures are needed because of proposed changes in the operation of the Yuba River Project, it would be appropriate to consider the need to mitigate for the effects of those changes in the proceeding that would implement those changes. If it is determined in the future that a change in South Feather's operations may be needed, this can be addressed through the Commission's standard license reopener provision. For this reason, we conclude that a specific reopener provision to address cumulative effects is not needed, and we do not recommend that it be adopted.

Water Temperatures Downstream of Kelly Ridge Powerhouse

The release of warm water from the Kelly Ridge powerhouse has the potential, depending on Oroville Project operation, to incrementally increase water temperatures in the upstream portion of the Thermalito diversion pool. DWR, Cal Fish & Game, NMFS, and SWC/MWD recommend that South Feather be required to curtail or cease power generation at the Kelly Ridge powerhouse when the temperature of waters released from the powerhouse exceed specified values. The purpose of this shutdown would be to ensure that South Feather project operation does not jeopardize DWR's ability to meet its water temperature objectives established in the Oroville Settlement Agreement for the protection of adult broodstock, eggs, or juvenile salmon and steelhead below the fish barrier dam and at the Feather River Hatchery, located about 5 miles downstream from the Kelly Ridge powerhouse. The hatchery was built as mitigation for the effects of the construction of the Oroville Project on anadromous fishes.

In their comments on the draft EIS, SWC/MWD recommended that installation of temperature control curtains in Miners Ranch reservoir to direct outflows from the Miners Ranch conduit to the powerhouse intake be considered as a means to reduce the amount of warming that occurs as water passes through the reservoir. Similarly, Cal Fish & Game noted that a pipeline could be used for the same purpose. Both of these approaches would limit mixing with warmer water in the reservoir and would likely provide some reduction in the temperature and temperature variability of water that is discharged from Kelly Ridge powerhouse. Some degree of warming during passage through Miners Creek reservoir would still occur, however, and as a result these approaches would likely be less effective than shutdown of the Kelly Ridge powerhouse as a means to assist with meeting the downstream water temperature objectives.

Implementing the recommended operational constraints at Kelly Ridge or installation of temperature control curtains or a pipeline in Miners Ranch reservoir could assist DWR with efficiently meeting the temperature objectives identified in its Settlement Agreement, by reducing uncertainty concerning the thermal characteristics of water in the upper portion of the Thermalito diversion pool. In addition, shutting down Kelly Ridge powerhouse during the high temperature summer period could provide up to

31,149 acre-feet of water that would then be available to DWR for generation, consumptive water supply, or for meeting downstream environmental objectives, which could include DWR's temperature objectives, or water quality objectives further downstream, including the Bay-Delta. Clearly, such a shutdown would have a detrimental affect on South Feather's generation.

Our analysis, as presented in section 3.3.2 shows that, while generation at Kelly Ridge powerhouse during the summer months can increase water temperatures in the upper portion of the Thermalito diversion pool when Oroville's Hyatt powerhouse is not generating or near minimum generation, the small volume of the releases in comparison to the volume of the diversion pool make it unlikely that any such temperature increases would be detectable downstream at the fish barrier dam or hatchery.

In addition, whether or not downstream temperature objectives are met ultimately depends on DWR's operation of the Oroville Project and not on Kelly Ridge powerhouse releases. When DWR is generating at its Hyatt powerhouse, releases from Kelly Ridge powerhouse have a negligible effect on downstream water temperatures due to the higher volume of flows that are released from the Hyatt powerhouse, which has a typical generation flow range of 4,000 to 8,000 cfs and a minimum generating flow of 2,400 cfs. If South Feather shut down the Kelly Ridge powerhouse completely, DWR still may not meet its temperature objectives during hot weather conditions if the Hyatt powerhouse is not generating or if pumpback operations are occurring. Conversely, under the same hot weather conditions, if the Hyatt powerhouse is generating, the Kelly Ridge powerhouse could be operated at full capacity and DWR could meet its downstream temperature objectives. Compliance with the temperature objectives in the Oroville Settlement Agreement, which DWR agreed to and to which South Feather is not a party, is clearly within DWR's ability to control using Oroville Project facilities.

We estimate that the annualized cost of curtailing or ceasing operation of the Kelly Ridge powerhouse according to the temperature criteria proposed by these parties would reduce the average annual generation by about 5,462 to 15,696 MWh and reduce the annual benefit of the project by about \$397,600 to \$1,002,000 per year.³³ Based on costs reported for the construction of temperature control curtains at Whiskeytown reservoir, we estimate that these could be constructed in Miners Ranch reservoir at a cost of approximately \$1.2 million. Assuming that the curtains would need to be replaced every 15 years, this equates to an annualized cost of \$175,000. We estimate that installing a pipeline to convey flow through Miners Ranch reservoir would have an annualized cost of \$950,000. Because achievement of the targets depends on Oroville Project operation,

³³ The lower bound of the cost range is based on information provided by South Feather Water Power Authority on April 17, 2009 (e-mail from R. Jones, Devine Tarbell, to J. Mudre, FERC) on the cost of implementing DWR's proposed condition. The higher bound of the cost range was estimated by staff assuming that a 60-day annual shutdown would be required to meet Cal Fish & Game and NMFS recommendations.

and because the potential temperature benefits of any measures that could be implemented by South Feather may not be realized at the downstream fish barrier dam or fish hatchery, we do not recommend that any limitation on the quantity or temperature of water that can be discharged from the Kelly Ridge powerhouse be included in the license.

Water Temperature Monitoring

South Feather proposes to install and maintain a continuous water temperature monitor at USGS gage 11413300 (RM 9.1) downstream of the Slate Creek diversion dam and to cease diversions from Slate Creek whenever the mean daily water temperature is greater than 20°C for three consecutive days between June 1 and September 15. South Feather also proposes to install continuous temperature monitors in the downstream ends of the South Fork diversion dam reach near the Woodleaf powerhouse (RM 7.9) and in the Forbestown diversion dam reach near the Forbestown powerhouse (RM 1.8) to provide information needed to ensure that whitewater flow releases do not occur during the FYLF breeding season. South Feather also monitors water temperatures at the Miners Ranch water treatment facility on Miners Ranch reservoir.

Cal Fish & Game recommends that South Feather monitor water temperatures in the SFFR immediately above the fish passage barrier (RM 3.7) in the Forbestown diversion dam reach to demonstrate whether the recommended flows in the reach are adequate to reduce temperatures below 20°C. Cal Fish & Game recommends that South Feather also install and maintain continuous water temperature monitors at RM 8.9 on Slate Creek, at RM 28.3 on the Little Grass Valley dam reach of the SFFR, at RMs 8.1 and 9.1 on the South Fork diversion dam reach, and in the Kelly Ridge powerhouse. The monitors would be used to record water temperatures at 1-hour intervals from May 1 through September 15 annually, and the data would be provided to Cal Fish & Game and other interested agencies in a technical report within 6 months following completion of each sampling effort.

NMFS recommends that South Feather maintain a temperature monitoring station in Miners Ranch reservoir at the Kelly Ridge intake and provide temperature data at 15-minute intervals in a format that is available to the public.

Water temperature data collected from the proposed monitoring site on Slate Creek would provide information that would be needed to implement South Feather's proposed flow regime for Slate Creek, which includes shutdown when daily average water temperatures exceed 20°C for three consecutive days. We estimate that monitoring Slate Creek water temperatures would have an annualized cost of \$7,600. Although we are not able to estimate the generation that would be foregone due to cessation of diversions from Slate Creek, South Feather stated that the volume of water diverted during the summer is small, and the amount of lost generation would be minor. Ceasing diversions from Slate Creek when average water temperatures exceed 20°C would benefit trout populations in Slate Creek downstream of the diversion, and would ensure the project has no adverse effects on the beneficial use of supporting coldwater aquatic life,

and we conclude that these benefits outweigh the costs of this measure. Installing the temperature monitor at the USGS gage, as proposed by South Feather, would provide a secure location for temperature data to be collected and transmitted in real-time to inform the project operators when diversions should be discontinued and resumed. We see no substantial advantage of installing the temperature monitor at the location recommended by Cal Fish & Game, 0.2 mile downstream of the gage, where a secure mounting location and data telemetry system would be more costly and would involve placement of a small structure that would adversely affect the aesthetics of the stream environment.

Cal Fish & Game's proposal to monitor water temperature data at five additional locations, and to provide annual technical reports summarizing monitoring results would help to document any changes in water temperatures that occur under the minimum flow regimes that are implemented in a new license, and NMFS' proposal to monitor water temperatures at the Kelly Ridge powerhouse could help DWR in its decision-making process for meeting its water temperature objectives, specified in the Oroville Settlement Agreement. South Feather's provision of water temperature and flow information to DWR operators could help them meet the temperature objectives while also meeting system needs concerning the quantity and timing of hydroelectric generation and consumptive water supply.

We recommend that South Feather consult with Cal Fish & Game, NMFS, and DWR to develop a water temperature monitoring plan designed to determine the effects of the implemented flow regime on water temperatures in each reach and the temperature and quantity of water discharged from the Kelly Ridge powerhouse. Consultation with DWR would ensure that the monitoring data is collected at locations and in a manner that will be useful to DWR, including the collection frequency, data format, and months when data will be collected. We estimate the annualized cost of developing and implementing such a temperature monitoring plan to be \$8,700, and because it would help to ensure the effective use of the hydropower facilities in the basin to meet regional energy demands, we conclude that the measure is worth its cost.

Selective Withdrawal

Flows released from Little Grass Valley reservoir are drawn from deep in the reservoir, resulting in cool water temperatures in the SFFR downstream from the reservoir. Cal Fish & Game recommends that South Feather develop and implement a plan to allow water to be selectively withdrawn from the entire water column in Little Grass Valley reservoir so that the water temperature of release flows can be more closely matched to the optimum temperatures for trout.

Although water temperatures in the Little Grass Valley reservoir reach are below the optimum range identified in the literature for growth of rainbow trout, we note that rainbow trout populations prosper in habitats that include a very wide range of temperature regimes, and that fish population sampling conducted by South Feather indicates that trout populations downstream from Little Grass Valley reservoir are in very

good condition. We also note that releasing warmer water from Little Grass Valley reservoir would contribute to high water temperatures further downstream in the Forbestown diversion dam reach of the SFFR, and could adversely affect trout populations in that reach. We estimate that the annualized cost of implementing selective withdrawal at Little Grass Valley reservoir would be about \$295,200. Because the available data indicate that the low temperature of water released from Little Grass Valley reservoir is not having a substantial adverse effect on trout populations in downstream reaches, we conclude that the benefits of this measure are not worth its costs.

Fish Entrainment

Entrainment of fish into project intakes removes fish from upstream populations, and may cause injury or mortality to a portion of the fish that would otherwise be recruited to downstream populations. South Feather evaluated the potential for fish entrainment at project intakes in its license application, concluded that effects of the project on trout populations were likely to be minor, and did not propose any measures to reduce or mitigate for fish entrainment. Cal Fish & Game recommends that South Feather develop and implement a plan to screen the intakes at the South Fork diversion dam, Slate Creek diversion dam, and the Woodleaf powerhouse intake in Lost Creek reservoir with fish screens acceptable to Cal Fish & Game and in accordance with its screening criteria. The Forest Service specifies, in its revised 4(e) conditions, that South Feather develop and implement a wild fish supplementation program to mitigate for lost fish resources in the SFFR, Slate Creek, and Sly Creek and Lost Creek reservoirs. The basis for determining the number of fish to be planted would be determined by reviewing age class distributions of rainbow trout in the Little Grass Valley dam and the upper Slate Creek diversion dam reaches, and estimating the numbers of fry that are needed to attain density and biomass levels observed in streams surrounding the project area.

South Feather developed and implemented a study in consultation with the agencies to assess the potential for entrainment losses to affect fish populations in the project area. The study focused on rainbow and brown trout, and included a literature review, a review of the likelihood of entrainment based on the physical characteristics of each intake, and an assessment of trout populations upstream and downstream of each intake. Although it is likely that some fish are entrained into each of the intakes and that some fish are killed during turbine passage, the results of South Feather's literature review and analysis indicate that entrainment potential at two of the three intakes may be limited. The entrainment potential at the Sly Creek reservoir power tunnel intake is probably reduced by the depth of the intake, and the potential for entrainment into the intake to the Woodleaf power tunnel in Lost Creek reservoir is limited by the relatively low water velocity at the trashrack. Although the Forbestown power tunnel intake may have a greater potential to entrain fish than the intakes in Sly Creek and Lost Creek reservoirs, the relatively high average biomass of trout in the SFFR/Lost Creek reach upstream of the Forbestown diversion indicates that entrainment is not having a substantial adverse effect on the trout population upstream of the diversion.

Construction of effective fish screening facilities at each diversion as recommended by Cal Fish & Game would minimize entrainment mortality, and would likely provide some benefit to trout populations. However, construction of an effective screening facility at Slate Creek is probably not feasible given the stream's high sediment load, which has filled in most of the diversion pool.

While we recognize the limited entrainment potential at the project intakes, implementing the wild fish supplementation program specified by the Forest Service and supported by South Feather would serve to augment fish populations in any reaches where entrainment losses may be limiting recruitment to levels that are not adequate to meet the carrying capacity of available habitat. Using population assessment data to guide the stocking program would ensure that stocking only occurs in reaches and years when trout populations have been affected. We also recommend that South Feather file annual reports on its stocking program. The report should include the population data that is used to assess stocking needs and the numbers of fish stocked at each location. We estimate that screening the project diversions as recommended by Cal Fish & Game would have an annualized cost of about \$3,041,100, while implementing the Forest Service's revised 4(e) measure would provide a comparable benefit to trout populations with an annualized cost of \$15,900. Because it would provide a comparable benefit at a much lower cost, we recommend implementing the wild trout stocking measure specified by the Forest Service.

Fish Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan a plan to monitor fish populations at eight sites in the project-affected bypassed reaches, in consultation with the Forest Service and other interested governmental agencies. Fish surveys would be conducted in two successive years and begin in the fifth full year after implementation of new license streamflows. Fish surveys would be conducted in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach, or at a frequency jointly agreed to by the agencies. If sampling is scheduled in years with high peak flows, the survey may be postponed by 2 years to avoid confounding effects of high peak flows on fish recruitment and populations. South Feather indicated in its reply comments that it fully supports all of the Forest Service revised 4(e) conditions, including the fish monitoring plan. Cal Fish & Game filed a similar plan, but it did not include a provision to defer sampling in high flow years, and it did include monitoring at all 11 sites sampled during South Feather's licensing studies.

Monitoring fish populations would assist with determining the effects of any changes in operation or other measures that are implemented in the new license, and with assessing whether any modifications or additional measures are needed. South Feather's analysis of fish population data indicates that fish populations can be substantially reduced during and following severe flood events. Postponing sampling by up to 2 years after a flood event as specified by the Forest Service would improve data consistency,

which would help to identify population effects associated with the measures or operational changes that are implemented in the new license.

In its reply comments, South Feather indicates that the smaller number of study sites specified by the Forest Service is more appropriate than the 11 sites recommended by Cal Fish & Game. South Feather reports that the sites that are not included in the Forest Service-specified plan include two sites that are dominated by warmwater fish, which are not an agency management priority, and one Lost Creek site that has been affected by local site disturbance and excessive angling pressure.

We estimate the annualized cost of the Forest Service and Cal Fish & Game fish monitoring plans at \$35,300 and \$48,500, respectively. Because fish monitoring would help to document the effectiveness of the new flow regime and whether or not it is having the intended effects on aquatic resources, we conclude that fish monitoring is worth the cost. Because deferring sampling in high flow years would provide a better assessment of the response of fish populations to the new flow regime and because of the limited benefit that would be provided by sampling at the three additional sites included under Cal Fish & Game's monitoring plan, we recommend implementing the Forest Service's fish monitoring plan.

Benthic Macroinvertebrate Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan, in consultation with the Forest Service and other interested governmental agencies, to monitor benthic macroinvertebrates in affected bypassed reaches. South Feather indicated in its reply comments that it fully supports all of the Forest Service revised 4(e) conditions, including the benthic macroinvertebrate monitoring plan. The plan specified by the Forest Service would involve conducting surveys in the same years as fish population monitoring (years 5, 6, 11, 12, 17, 18, 23, 24, and 29).

Cal Fish & Game recommends a benthic macroinvertebrate monitoring plan that is identical to the Forest Service plan, except that sampling would be conducted in years 1 through 4 and in years 8, 12, 16, and 24, unless an alternative monitoring schedule is approved in consultation with the agencies. In addition, Cal Fish & Game recommends that South Feather follow the most recent Cal Fish & Game protocols for sampling benthic macroinvertebrate species composition and abundance.

We estimate the annualized cost of the Forest Service and Cal Fish & Game benthic macroinvertebrate monitoring plans at \$23,500 and \$44,700, respectively, assuming that both plans would include monitoring the same number of sites that each agency recommended for fish monitoring (8 sites for the Forest Service and 11 sites for Cal Fish & Game). Similar to fish monitoring, benthic macroinvertebrate monitoring would assist with determining the effectiveness of measures implemented in the new license for enhancing trout populations, and we conclude that the benefits of implementing a benthic invertebrate monitoring plan are worth its costs. 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, which would improve understanding of the effects of implemented measures on aquatic productivity. Using the same sampling procedures over time would ensure that comparable data are collected over the period of monitoring, and would avoid any confounding effects that may result from any changes in Cal Fish & Game's sampling protocols. Because of these added benefits, we recommend adopting the plan as specified by the Forest Service.

Terrestrial Resources

Noxious Weeds

Project operation may potentially affect vegetation through the introduction and spreading of noxious weed species. Any O&M activities that disturb soil or remove existing vegetation could increase the spread of noxious weeds and would have a direct effect on vegetation. Potential indirect project effects could come from recreational users that spread noxious weed seeds or other regenerative plant materials from colonized to non-colonized areas.

South Feather proposes several measures to prevent and control the spread of noxious weeds on National Forest System lands within the project boundary. South Feather also would implement control measures where contiguous populations continue on National Forest System lands outside of the project boundary, as long as the majority of the treated area is on project lands. The measures proposed by South Feather include training staff to recognize noxious species, monitoring populations, sharing information on new populations with the Forest Service, and implementing several best management practices aimed at reducing the spread of noxious weeds.

The Forest Service's final 4(e) condition is consistent with South Feather's proposed plan but also would require South Feather to (1) address both aquatic and terrestrial invasive weeds; (2) include protocols for locating, monitoring, and controlling weed populations; (3) include a public education program and facilities for public use to reduce the spread of aquatic species; and (4) provide information on noxious weed populations in a data format compatible with the Forest Service GIS database.

Implementing South Feather's proposed invasive weed and vegetation management plan would help to control current populations and future infestations of noxious weeds on project lands. The additional measures specified by the Forest Service would provide a more comprehensive level of control, help to address the spread of noxious weeds by recreational users, and improve information-sharing on the occurrence and spread of noxious weeds. Additionally, including Q-rated and any additional C-rated species for which the County Agricultural Commissioner's Office has implemented additional control measures into the list of species managed as noxious weeds would further minimize project effects on vegetation. We estimate that South Feather's proposed plan would have an annualized cost of \$7,600, and that the expanded plan

specified by the Forest Service would have an annualized cost of \$9,800. Because it would improve the control of noxious weeds at a reasonable cost, we recommend adopting the plan as specified by the Forest Service.

Foothill Yellow-legged Frog

South Feather proposes several measures to minimize effects on FYLF including implementing minimum flows that take into consideration FYLF habitat needs and avoiding high pulse flows during critical time periods. South Feather proposes to avoid the release of controlled high flows during the FYLF breeding season, which it defines as starting on April 15 or when water temperatures reach 13°C (whichever is later) and extending until October 31.

South Feather filed an alternative 4(e) condition that would include both full reach and representative reach surveys to determine whether FYLF populations change as a result of changes in project operations. The full reach surveys would be conducted in the first year after relicensing and then every 10 years, and would include all reasonably accessible FYLF habitat in the SFFR/Lost Creek, Forbestown, and Slate Creek reaches. Representative surveys would be conducted at one site within each of the three reaches once every 10 years starting on the fifth year after relicensing.

The survey methods described in South Feather's alternative 4(e) condition would be similar to those used for the re-licensing studies. The surveys would consist of visual encounter surveys for counts of egg masses, tadpole groups, and young-of-year frogs. The full reach surveys would document the overall distribution of FYLF in each reach and detect shifts in the spatial distribution of FYLF in relation to project effects.

Based on the results of these surveys, South Feather would evaluate project effects on FYLF. If adverse project-related effects are evident, South Feather would recommend studies targeted on ramping rates, water temperatures, population viability, or other appropriate studies to determine the mechanisms of these adverse effects. South Feather would then use the results of these targeted studies to identify appropriate mitigation measures.

Cal Fish & Game recommends that South Feather develop a FYLF monitoring plan that would include annual monitoring surveys of FYLF adult, tadpole, and egg mass numbers in the SFFR/Lost Creek reach, Forbestown diversion dam reach, and the Slate Creek diversion dam reach. for the first 10 years after relicensing, followed with similar surveys every 5 years for the remainder of the license.

In its final 4(e) conditions, the Forest Service expanded the scope of its amphibian monitoring plan to include all six project reaches. The specified sampling would include full reach surveys reaches in year 1 and every ten years thereafter, supplemented with representative surveys in years 2-6 and once every 4 years thereafter. In addition to these visual encounter surveys, Forest Service prescribes that South Feather collect data to support population viability analysis, temperature influence on development rates, and habitat monitoring.

The Forest Service also specifies and Cal Fish & Game recommends that South Feather conduct video surveys to identify areas of vegetation channel encroachment in the fourth year after license issuance to be repeated every 10 years. South Feather would conduct the surveys by helicopter along the South Fork diversion dam and Forbestown diversion dam reaches and identify up to three segments within the South Fork diversion dam reach and up to five segments in the Forbestown reach where vegetation is encroaching into the channel. South Feather would then treat these reaches with vegetation removal measures, and evaluate the effectiveness of the treatments every 5 years to determine if conditions would warrant another treatment.

The increased flows specified by the Forest Service and proposed by South Feather are designed to improve trout habitat and provide for whitewater recreation. On the other hand, these flows also have the potential to affect FYLF by reducing water temperature and changing channel morphology. Proposed flow increases would alter the existing hydrograph in stream channels downstream from project facilities. Low flows reduce available habitat and can increase mortality of egg masses and tadpoles stranded in dry areas, while high flows and rapid changes in flow can wash egg masses, tadpoles, and adults downstream to unsuitable habitat.

The flows proposed by South Feather in its license application and in its alternative 4(e) condition are not as high as the Forest Service specifications, and therefore would have less potential to disrupt FYLF habitat and breeding patterns. South Feather's proposal to avoid high flow releases during FYLF breeding periods would reduce the potential displacement of egg masses, tadpoles, and adults to unsuitable habitat. Following the Forest Service-specified methodology to map suitable habitat and identify appropriate ramping rates for each water year type would further reduce the potential for displacement during flow increases and the potential for stranding during flow decreases.

While these protection measures are expected to limit effects on FYLF, continued monitoring would help to ensure they are effective and that new project operations do not detrimentally affect this species. We note that in the draft EIS, we did not recommend adopting all of the amphibian monitoring provisions included in the Forest Service's preliminary 4(e) Condition No. 19, part 2 in the licenses, finding that developing a population model, monitoring habitat, and determining effects of temperature on FYLF development were not needed to determine project effects and were not worth the estimated costs of these measures. In its final 4(e) condition, Forest Service explicitly defines the data collection methods South Feather would use to support the evaluation of project effects on population dynamics, habitat abundance, and development rates. The specified methodologies would be conducted concurrently with other survey efforts, would not require South Feather to develop a population model, and would not require extensive, controlled laboratory studies.

In addition, the data collection specified by the Forest Service to support population viability models, physiological studies related to water temperature, and

monitoring of changes in geomorphology are necessary to determine the presence of project-related effects. We consider Forest Service's prescribed approach to be cost effective, while providing accurate data needed to ensure the project does not have adverse effects on FYLF. Additionally, South Feather's riparian encroachment study indicates that riparian vegetation is present within the active channel in some locations, but is limited in extent. The studies indicate the timing and intensity of high flows over the time frame of the current project license have largely controlled vegetation encroachment through channel scour. As such, we conclude that implementing treatments to remove riparian vegetation as specified by the Forest Service would be premature. We conclude, however, that helicopter surveys over the South Fork diversion dam and Forbestown diversion dam reaches, as recommended by Cal Fish & Game and specified by the Forest Service, would assist with identifying areas of potential riparian encroachment and with guiding ground-level assessment of effects of encroachment on FYLF habitat, and should be incorporated into the FYLF survey protocol. If monitoring results indicate that encroachment is affecting FYLF, then treatment to remove riparian vegetation may be considered at that time. These measures would maintain or enhance the physical and biological characteristics of riparian areas to ensure their continued ecological functions; which is an overarching goal of the Plumas National Forest Management Plan.

We estimate that this approach would have an annualized cost of \$108,700 (\$93,700 for visual encounter surveys and \$15,000 for additional data collection that would occasionally occur simultaneously with these surveys). Our recommended approach would assist with determining the effectiveness and possible refinement (if needed) of measures implemented to protect FYLF, and would address multiple components of FYLF life history and habitat requirements. Therefore, we conclude that these benefits warrant the costs of this measure.

Controlling the rate of flow and stage changes during critical time periods would limit the potential for mortality of early lifestages of FYLF. South Feather has proposed to stop the release of high pulse flows during periods of FYLF breeding activity. In addition, we recommend that South Feather implement the methodology specified by the Forest Service to identify appropriate ramping rates to protect FYLF. The Forest Service methodology would identify velocity and stage-discharge relationships, and map available habitat at FYLF study sites for different water year types to determine appropriate ramping rates between low and high flows. We estimate that implementing the Forest Service's approach would have an annualized cost of \$10,200, and conclude that the benefits of this measure are worth this modest additional cost.

Recreation Resources

Replace and Rehabilitate Existing Recreation Facilities

South Feather proposes to develop and implement conceptual facility master plans for Little Grass Valley and Sly Creek reservoir recreation areas comprising an overall

conceptual plan that illustrates the layouts, locations, and relationships between existing facilities and proposed improvements. In addition, South Feather proposes to develop and implement individual site development plans and proposes site rehabilitation measures for each existing recreation facility within the existing project boundary, as discussed in section 3.3.5, *Recreation Resources*.

South Feather's proposal would allow the Forest Service and other stakeholders to have input in the development of these plans and would ensure the proposed measures would be implemented in a manner consistent with the Forest Service's management goals and other resource management plans at the project. Although coordination among the licensee, governmental agencies, and interested stakeholders is encouraged in developing and implementing the proposed recreation measures, the licensee is ultimately responsible for the construction, operation, and maintenance of the project's recreation facilities.

In addition to the facility master plans and individual site plans described above, South Feather's proposed capital improvements, including constructing a recreation access trail below Little Grass Valley dam and minor maintenance measures, such as replacing fire rings and improving parking, would improve existing facilities and increase public access at the project.

We estimate the annualized cost associated with implementing the facility master plans, the individual site rehabilitation measures, the minor maintenance measures, and the access trail (capital improvement) at \$78,000. Given the benefits identified above, we conclude that these benefits are worth the costs. We also recommend that the plans for the renovation or construction of new facilities include best management practices to minimize effects on sensitive resources and the potential for water quality degradation of adjacent water bodies.

South Feather's proposed development of facility master plans and individual site plans are consistent with the Forest Service's specified conditions, except they do not propose the additional Forest Service measures for public interpretive facilities, and measures to develop and implement a re-vegetation plan that would be submitted within 5 years of license issuance for all developed recreation facilities within the project boundary. The Forest Service also specifies that South Feather consult with the Forest Service and other appropriate agencies to ensure that the recreation rehabilitation and enhancements are consistent with the overall goals of other resource conditions and management plans required under the FERC license.

The re-vegetation plan would help to ensure that any disturbed areas resulting from implementation of the recreation enhancements are adequately mitigated through reestablishment of vegetation as necessary. Implementation of interpretive features would help to provide the means to enhance the public's knowledge and use of the recreation resources at the project. Therefore, we recommend these measures be adopted. The Forest Service additional measures would have an additional annualized cost of \$50,000, and we conclude that the benefits exceed the costs.

The Forest Service specified several additional capital improvement measures, including constructing a potable water well and providing a horse watering system at Horse Camp campground. Currently, there is no groundwater well at the project and no water for drinking or for horses at Horse Camp campground. Although South Feather proposes to upgrade the water systems, the Forest Service's proposed improvements to construct a groundwater well and implement a horse watering supply and distribution system would further improve existing facilities by providing a reliable source for drinking water to all recreation sites, including Horse Camp campground. Therefore, we recommend adopting these measures. We find that adding these components would have a negligible increase in the cost of South Feather's proposed water system upgrades.

The Forest Service also specified measures involving an OHV facility development. The proposed OHV site amenities would be associated with a potential new facility located near the Sly Creek Campground that is under consideration, but yet to be developed. We note that OHV use at the project is low and future demand is low for this type of activity. In addition, if the OHV site amenities were constructed this could stimulate increased OHV use in the project area, with associated increases in noise levels, exhaust emissions, and soil erosion. Therefore, we do not recommend these additional OHV measures specified by the Forest Service.

O'Rourke Outdoor Adventures recommends that South Feather implement rehabilitation and enhancement measures at several boat ramps and campgrounds at Little Grass Valley reservoir, as well as road maintenance measures around the project. South Feather's proposal to enhance and rehabilitate project recreation facilities includes all of O'Rourke Outdoor Adventures recommendations, with the exception of extending the boat ramps. Combined with its recent upgrades at the boat ramps, South Feather's proposal would adequately improve existing facilities and access to the project. In addition, the proposed road maintenance measures are located either on roads that are already maintained on a regular basis or are outside of the project boundary. Therefore, we do not see the need for the additional boat ramp enhancement measures or road maintenance recommended by O'Rourke Outdoor Adventures.

Maintenance and Operation of Recreation Facilities

South Feather's proposed draft operation plan for Little Grass Valley and Sly Creek reservoir recreation facilities provides specific guidelines for the operation and daily and annual maintenance of these project facilities. Implementation of the proposed plan would provide measures to help ensure that these facilities are adequately maintained over the term of a new license. We estimate the annualized cost of implementation of the proposed operation plan at \$278,700 and conclude the benefits are worth the costs.

Monitoring Recreation Use

South Feather's proposed recreation report, to be filed concurrently with the FERC Form 80 filings every 6 years, would provide periodic review of recreation facilities at

the project. The FERC Form 80 already requires facility capacity and demand to be reported every 6 years; however, South Feather's additional recreation report would determine trends of use, condition of facilities, parking capacity, and whether or not resource damage is occurring. South Feather proposes to conduct the recreation user survey every 18 years (every third filing of the Form 80) and recreation user preferences could change significantly over an 18-year timeframe. Conducting the recreation user survey every 12 years (every other filing of the Form 80) would provide the means for periodic review in a shorter timeframe, which would allow for enhanced assessment of the adequacy of public recreation facilities and access at the project. South Feather's proposed recreation monitoring measures and associated recreation reports are consistent with the Forest Service's specified condition that South Feather file a recreation use and facilities condition report; however, the Forest Service specifies in the final 4(e) conditions that South Feather conduct the recreation user survey every 6 years, rather than the staff recommendation of every 12 years. At this time, we determine that conducting and filing the recreation user survey report every 12 years, along with the filing of the Form 80 reports every 6 years, would provide the means for adequate monitoring of recreational use at the project over the term of a new license.

Both the recreational use report and the recreation user preference report would be submitted to the Commission for review and approval, which would provide the mechanism to help ensure that recreation facilities are provided to meet project needs and purposes over the term of a new license. Therefore, we are recommending South Feather's proposed measures for monitoring and reporting recreation use, with the modification of conducting the recreation user survey every 12 years, instead of 18 years. We estimate that the annualized costs for the recreation report that would be filed every 6 years to be \$10,000 and that the annualized cost of the recreation user survey monitoring would be \$5,600, and consider the benefits of these measures to be worth the costs.

Whitewater Boating Flows

South Feather proposes to provide a supplemental recreation streamflow into the Little Grass Valley dam reach, in all water years, from September 16 of each year until the date that Little Grass Valley reservoir elevation is drafted to 5,017 feet msl. We estimate the annualized cost of this measure to be \$13,000. South Feather also proposes to provide a supplemental streamflow, in the spring of Above Normal and Wet water years, downstream of the South Fork diversion dam for recreational purposes and to install a continuous water temperature monitor near the Woodleaf powerhouse that would allow flow releases to be stopped before the start of the foothill yellow-legged frog breeding. We estimate the annualized cost of this measure to be \$54,300, including an average annual reduction in power generation of 620 MWh. Similarly, South Feather proposes a supplemental streamflow in the spring during Above Normal and Wet water years at Forbestown diversion dam reach to improve opportunities for Class IV and V whitewater boating in the spring, and it proposes to install a continuous water temperature monitor near the Forbestown powerhouse. We estimate the annualized cost

for this measure would be \$34,600, including an average annual reduction in power generation of 308 MWh.

South Feather's proposed supplemental streamflows would provide for enhanced whitewater boating opportunities in project reaches during a time of year when whitewater boating is in high demand. The provision of supplemental flows in the fall season at Little Grass Valley dam reach would provide opportunities for increased whitewater boating during a period when alternative whitewater boating opportunities within the region are scarce. We conclude that the benefits associated with these measures outweigh the costs and recommend implementation of these measures. To ensure that adverse effects on FYLF breeding are avoided, we recommend that releases in the South Feather diversion dam and Forbestown diversion dam reaches be discontinued when water temperatures rise to 12°C.

Provision of Streamflow Information

Accurate and timely stream flow information is valuable information for recreational visitors planning water-related visits to the project. South Feather's proposed provision of streamflow information to the public would provide the means for the public to gain information regarding streamflow for specific stream reaches. This would allow the public to take better advantage of opportunities for public recreational use of these stream reaches; therefore we recommend implementation of this measure. We estimate the annualized cost for this measure to be \$2,500, and conclude that the benefits outweigh the costs.

Public Safety

Public information at key locations on Little Grass Valley and Sly Creek reservoirs provides area users with information on acceptable and prohibited activities, as well as dangerous or restricted areas. South Feather took over responsibility for installing safety buoys from the local county sheriff departments in 2002, and proposes to continue to install and maintain these buoys. This measure would continue to provide recreation visitors at the reservoirs with warnings regarding boat speed, dangerous areas, and other safety information, and would help to protect the safety of the public at Little Grass Valley and Sly Creek reservoirs. We recommend implementation of this measure and conclude the benefits are worth the estimated annualized cost of \$11,600.

Cultural Resources Management

Continued operation of the South Feather Power Project without adequate protection measures could adversely affect properties that are eligible for listing on the National Register. South Feather filed an HPMP for the purpose of protecting and interpreting historic properties with its license application. The Forest Service filed a 4(e) condition specifying that South Feather file a Forest Service-approved HPMP with the Commission within 1 year of license issuance. The HPMP would take into account project effects on National Register-eligible properties located on Forest Service lands,

provide measures to mitigate effects, and provide for a monitoring program and management protocols.

We find the HPMP adequately identifies the APE, describes the cultural resources inventories that were conducted within the APE, identifies existing project-related effects that could occur on potentially significant cultural resources, and provides general management measures to address these effects. The HPMP also provides procedures for handling unanticipated discoveries and the proper treatment of human remains and sacred objects, if they are encountered. The HPMP provides protocols for emergency undertakings, periodic reporting and meetings, and appropriate review and revisions of the HPMP based upon changing conditions over the period of a new license. However, our review of the HPMP reveals that it does not provide enough site-specific measures to ensure that project-related adverse effects on historic properties resulting from operation, maintenance, recreational, or other activities would be adequately addressed over the term of the new license.

We recommend that the HPMP include the following additional measures:

- a report on archaeological surveys conducted in the six project stream reaches within the APE;³⁴
- National Register evaluations on archaeological sites that have been or are being adversely affected by project-related erosion, especially the 10 archaeological sites located at the Little Grass Valley reservoir, and including any discovered during survey of the stream reaches;
- a provision for evaluation of project features that may become eligible for listing on the National Register during the term of any new license issued for the project; and
- a detailed discussion of Lost Creek dam, regarding the structure's National Register status,³⁵ and measures to address potential adverse effects to this potentially eligible structure as a result of project operations and maintenance activities.

³⁴ In some areas within the reaches, unsafe conditions may warrant using a stratified sample survey. Such sampling techniques are standard practice. Should a stratified survey be necessary, the California SHPO and the other involved parties should be consulted on the survey design prior to implementation of fieldwork to ensure that the APE will be adequately inventoried.

³⁵ Lost Creek dam may have significance under National Register criterion A because of its association with early 20th century development of irrigation and hydroelectric power (period of significance, 1920s-1930s) in California. Additionally, it may be eligible under National Register criterion C as an example of a constant arch dam designed by Laris Jorgensen, the inventor of this style of construction.

Implementation of the HPMP, with staff's additional measures, would ensure that adverse effects on historic properties as a result of project operation, maintenance, recreational, or other project-related activities would be addressed over the term of the new license. We anticipate that any new license issued for the project would include a condition to implement a PA executed among the Commission, the SHPO, and the Advisory Council, should the Council choose to participate. South Feather, the Forest Service, and others would be invited to sign the PA as concurring parties. The PA would include a measure to implement the HPMP.

We estimate that implementation of the protective measures proposed in South Feather's HPMP would have an annualized cost of \$20,300. We estimate that the additional measures that we list above would increase the annualized cost of measures included in the HPMP by \$72,910 to \$93,210. Considering the extent of cultural heritage that is present in the project area, we consider the benefits to cultural resources to be worth the costs.

Land Use and Aesthetic Resources

Fire Prevention and Response Plan

The development of a fire prevention, response, and investigation plan as proposed by South Feather and specified by the Forest Service, as well as the fuel treatment/vegetation management plan specified by the Forest Service, would provide the means for South Feather to develop and coordinate fire management and prevention strategies with the Forest Service. The fire management and response plan also would provide the means for coordinating emergency response preparedness, reporting measures associated with fire management, and the investigation of fires on project lands. We estimate that that developing a fire prevention, response, and investigation plan would have an annualized cost of \$1,100, and that development of a fuel/vegetation management plan would have an annualized cost of \$2,100. 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 their costs.

Road Management

Some of the roads used to access project facilities for O&M purposes are Forest Service roads that are also used by the Forest Service for land management, and by the public for recreation. The road management plan specified by the Forest Service would help to improve road management throughout the project vicinity, protect natural resources, provide reasonable public access, clearly define maintenance responsibilities, assess road conditions, and enable an annual survey process. In addition, the road management plan would identify measures to ensure that safety, maintenance, and rehabilitation measures associated with project roads are addressed in a consistent manner and so as not to adversely affect environmental resources. We note that it is the Commission's practice to include in the project boundary only those roads used primarily

for project purposes. Therefore, the road management plan should clearly identify the roads either already within or proposed to be included in the project boundary that are necessary to access project facilities, including recreational facilities, and limit South Feather's responsibilities to those access roads or portions of roads that are used primarily for project purposes. We estimate that the annualized cost of developing and implementing the road management plan would be \$3,500, and we conclude that the benefits of this measure warrant the costs.

Visual Management Plan

Aesthetic resources can be affected by project facilities and operations. Recreation facilities and project facilities, such as project powerhouses and substation facilities, can dominate views, creating contrast with the natural landscape. The development and implementation of a visual resource protection plan, as specified by the Forest Service, prior to ground-disturbing activities on project lands located within the Plumas National Forest, would help to ensure such activities would not adversely affect aesthetic resources within the Plumas National Forest. We estimate an annualized cost of \$2,200 and recommend implementation of this measure.

General

Annual Consultation

The Forest Service specifies that South Feather consult with the Forest Service each year with regard to measures that are needed to ensure protection and utilization of the National Forest resources affected by the project. The date of the consultation meeting would be mutually agreed to by South Feather and the Forest Service but in general would be held 60 days prior to the beginning of the recreation season, and representatives from other interested agencies would be able to request to attend the meeting. The meeting would include: (1) the review of a status report regarding implementation of license conditions; (2) 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; (3) review of any non-routine maintenance; (4) any foreseeable changes to project facilities or features; (5) any necessary revisions or modifications to plans approved as part of this license; (6) 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 information about a species requiring protection; and (7) discussion of elements of current year maintenance plans, such as those for road maintenance.

Cal Fish & Game recommends that South Feather, in consultation with the agencies, develop and implement an adaptive management plan that would allow Cal Fish & Game and other interested agencies to recommend changes to project operation during the license term based on the results of biological monitoring. The plan would include a process for identifying whether changes to project operation including, but not

limited to, operation of fish screens, operation of a thermal control device, riparian vegetation management, ramping rates, and the amount and timing of flow releases from project features are required, and a mechanism for implementing those changes.

We estimate that implementing the Forest Service and the Cal Fish & Game measure would both have an annualized cost of \$30,000. As we discuss in section 3.3.2, *Aquatic Resources*, 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 important environmental resources are protected, and we conclude that the benefits of this consultation would be worth its costs. Opening the meeting to all interested agencies and other parties would assist with interpretation of monitoring results, ensure that the full range of effects of any changes in operation or measures are fully considered, and accomplish the goals of Cal Fish & Game's adaptive recommended adaptive management plan. Any changes to license conditions that are warranted based on monitoring results could be implemented via the Commission's standard license amendment or reopener processes.

5.3 UNAVOIDABLE ADVERSE EFFECTS

The continued operation of the project would result in some minor unavoidable adverse effects on geologic, soil, and geomorphic resources. These could include some minor continued erosion associated with project operation and renovation of recreational facilities and interruption of sediment transport at project reservoirs. Most of these effects would be reduced by proposed resource enhancement measures, including: (1) preparation and implementation of an erosion and sediment control plan, (2) passage of LWD at Lower Grass Valley and Sly Creek dams, (3) provision of geomorphic flows in the Lost Creek below Sly Creek dam, and (4) sediment pass-through activities at Slate Creek diversion dam.

Under the proposed action, the continued operation of the project would continue to adversely affect some archaeological sites. The execution of a PA and implementation of the final HPMP with staff's additional measures would ensure proper protection and management of significant cultural resources within the project's APE and also would provide satisfactory resolution of any project-related adverse effects.

We have identified no other unavoidable adverse effects on resources influenced by project operation.

5.4 SUMMARY OF SECTION 10(J) RECOMMENDATIONS AND 4(E) CONDITIONS

5.4.1 Recommendations of Fish and Wildlife Agencies

Section 10(j) of the FPA requires the Commission to include license conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and 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 the agency. If the Commission still does not adopt a recommendation, it must explain how the recommendation is inconsistent with Part I of the FPA, or other applicable law and how the conditions imposed by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife resources.

In response to the Commission’s ready for environmental analysis notice, issued February 14, 2008, Cal Fish & Game and NMFS filed letters providing comments and terms and conditions for the South Feather Power Project, pursuant to section 10(j). Table 5-2 summarizes the agency recommendations made under section 10(j), as well as whether the recommendations are adopted under the staff alternative.

Table 5-2. Analysis of fish and wildlife agency section 10(j) recommendations for the South Feather Power Project. (Source: Staff)

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
1. Implement Cal Fish & Game’s recommended minimum flows	Cal Fish & Game	Yes	\$2,432,300	No, adopt South Feather’s alternative 4(e) flows instead
2. Develop ramping rates to protect FYLF within 5 years after license issuance	Cal Fish & Game	Yes	\$10,200	Yes
3. Implement selective withdrawal at Little Grass Valley reservoir	Cal Fish & Game	Yes	\$295,200 ³⁶	No, trout populations not adversely affected

³⁶ Our cost estimate for this measure in the draft EIS was based on a selective withdrawal structure sized to pass minimum flows of up to 50 cfs. We revised our estimate to account for construction of a larger structure to accommodate higher flow releases of up to 200 cfs that occur during the summer period when releases are increased to meet downstream consumptive water requirements.

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
4. Screen diversions at the South Fork diversion, Slate Creek diversion, and the Woodleaf powerhouse intake	Cal Fish & Game	Yes	\$3,041,100	No, adopt Forest Service's wild fish stocking program instead
5. Take all reasonable actions to assure conformance with water temperatures specified in the Oroville Settlement Agreement	Cal Fish & Game	Yes	\$606,400	No, recommend developing plan in consultation with DWR, NMFS, and Cal Fish & Game to monitor and provide information on water temperatures, flows, and reservoir levels to assist DWR with flow management decisions
6. Maintain water levels in Little Grass Valley and Sly Creek reservoirs as high as possible to protect beneficial uses of the reservoirs, while recognizing the need for protection of ecological resources, power production, and consumptive water supply	Cal Fish & Game	No, not a specific fish and wildlife measure; measure is intended to provide boating access	\$0	Yes, the minimum flow regime adopted by staff maintains Little Grass Valley reservoir at levels equal to or higher than Cal Fish & Game's proposed flow regime
7. Develop and implement an aquatic biological monitoring plan	Cal Fish & Game	Yes	\$30,000	Yes

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
8. Monitor fish populations in 2 successive years every 5 years in all affected bypassed reaches	Cal Fish & Game	Yes	\$48,500	No, we adopt the monitoring plan specified by the Forest Service instead
9. Develop and implement a FYLF monitoring plan	Cal Fish & Game	Yes	\$66,900	Yes
10. Monitor benthic macroinvertebrates in affected bypassed reaches in years 1 through 4 and every 4 years thereafter	Cal Fish & Game	Yes	\$44,700	No, we adopt the monitoring plan specified by the Forest Service instead
11. Monitor water temperatures at seven locations and provide monitoring results in a technical report within 6 months following each monitoring season	Cal Fish & Game	Yes	\$8,700	Yes, but we recommend that the specific sites to be monitored by selected in consultation with DWR, NMFS, and Cal Fish & Game
12. Riparian vegetation monitoring and treatment	Cal Fish & Game	Yes	\$2,400	Yes, but treatment would be implemented only if warranted based on the results of FYLF monitoring
13. Develop and implement a bat management plan	Cal Fish & Game	Yes	\$1,000	Yes

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
14. Monitor and maintain in functioning condition bridges, culverts, and exit ramps designed to provide wildlife crossing points or escape from the above-ground portion of the Miners Ranch conduit twice annually prior to the spring and fall migration season for local deer populations	Cal Fish & Game	Yes	\$10,500	Yes
15. Implement ramping rate of 0.5 foot/hour	Cal Fish & Game	Yes	\$0	Yes
16. Monitor water temperatures at the Kelly Ridge Power Plant intake and cease operation when temperatures exceed specified targets	NMFS	Yes	\$1,002,000	No, recommend developing a plan in consultation with DWR, NMFS, and Cal Fish & Game to monitor and provide information on water temperatures, flows and reservoir levels to assist DWR with flow management decisions

The Commission staff makes a preliminary determination that six of the recommendations by Cal Fish & Game and one recommendation by NMFS may be inconsistent with the purpose and requirements of the FPA or other applicable law. We also consider one of Cal Fish & Game's recommendations to be outside of the scope of section 10(j) of the FPA.

We do not recommend adopting Cal Fish & Game's recommended minimum flow regimes for the Little Grass Valley dam, South Fork diversion dam, Slate Creek diversion dam, Lost Creek dam, and Forbestown diversion dam reaches. Our analysis in sections 3.3.2.2 and 5.2 indicates that South Feather's alternative 4(e) flows, which we adopt in the staff alternative, would provide a substantial level of enhancement of trout populations over current license conditions, and that the additional habitat gains that would be provided by Cal Fish & Game's recommended flows are relatively small in comparison to the additional amount of water that would need to be released. We also identified several potential adverse effects associated with the higher minimum flows recommended by Cal Fish & Game, including increased drawdown of Little Grass Valley reservoir and reduced suitability of water temperatures for FYLF in the South Fork diversion dam and Lost Creek dam reaches and for hardhead in the Forbestown diversion dam reach. Lastly, we estimate that implementing the minimum flows recommended by Cal Fish & Game would reduce generation by 33,636 MWh, and would cost \$873,600 more than the flows that we adopt in the staff alternative. Because of the additional reduction in energy generation, adverse temperature effects on trout and aquatic productivity in the Little Grass Valley dam and Lost Creek dam reaches, on hardhead in the Forbestown diversion dam reach, on FYLF habitat in several reaches, and on water levels in Little Grass Valley reservoir, we find that Cal Fish & Game's recommended minimum 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.

We do not recommend adopting NMFS' recommendation to cease power generation at Kelly Ridge powerhouse when the temperature at Kelly Ridge powerhouse exceeds 56°F from October 1 to May 15, 63°F from May 16 to August 31 or 58°F from September 1 to September 30, or Cal Fish & Game's recommendation that South Feather take all reasonable actions (including curtailing releases from the Kelly Ridge powerhouse) to assure conformance with water temperatures specified in the Oroville Settlement Agreement. Our analysis in section 3.3.2 suggests that Kelly Ridge powerhouse releases do not result in appreciable increases in water temperatures of Oroville Project water at the downstream compliance points.

Furthermore, these measures would not by themselves necessarily achieve the desired temperature outcome. It is clear that DWR has several options for meeting its obligations under the Settlement Agreement through changes in Oroville Project operations using its own facilities, including releasing more cold water from Lake Oroville or limiting pumpback operations. However, knowledge of the temperature and quantity of Kelly Ridge releases into the upper portion of the diversion pool could help DWR more efficiently comply with downstream temperature objectives established in the Settlement Agreement to protect anadromous fish. Accordingly, we adopt a recommendation that South Feather consult with NMFS, DWR, and Cal Fish & Game to develop a temperature monitoring plan. We do not consider it to be reasonable to require South Feather to curtail its operations when there is no guarantee that such a curtailment would result in attainment of downstream water temperature targets, since that is

dependent on Oroville Project operation. Therefore, we have determined that NMFS and Cal Fish & Game's recommendations, which we estimate would have an annualized cost of \$1,002,000, and \$606,400, respectively, may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

We do not recommend adopting Cal Fish & Game's recommendation to implement selective withdrawal to control the temperature of water that is released from Little Grass Valley reservoir to more closely match the optimum temperatures for trout. Although our analysis in section 3.3.2 suggests that water temperatures below Little Grass Valley reservoir are below the optimum range identified in the literature for growth of rainbow trout, we noted that rainbow trout populations prosper in habitats with a very wide range of temperature regimes, and that fish population sampling conducted by South Feather indicates that trout populations downstream from Little Grass Valley reservoir are in good condition. Releasing warmer water from Little Grass Valley reservoir also would contribute to high water temperatures further downstream in the Forbestown diversion dam reach, which could adversely affect trout populations in that reach. Lastly, we estimate that implementing selective withdrawal at Little Grass Valley reservoir would cost approximately \$295,200 per year. Based on this information, we find that Cal Fish & Game's recommendation to implement selective withdrawal may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

We do not recommend adopting Cal Fish & Game's recommendation to install fish screens at the intakes at the South Fork diversion dam, Slate Creek diversion dam, and the Woodleaf powerhouse intake in Lost Creek reservoir. Our analysis in section 3.3.2 suggests that the number of fish entrained at the Sly Creek reservoir power tunnel intake is probably low due to the depth of the intake, and that the potential for entrainment into the intake to the Woodleaf power tunnel in Lost Creek reservoir is limited by the relatively low water velocity at the trashrack. Although the Forbestown power tunnel intake may have a greater potential to entrain fish than the intakes in Sly Creek and Lost Creek reservoirs, we concluded that the relatively high average biomass of trout in the SFFR/Lost Creek reach upstream of the Forbestown diversion indicates that entrainment is not having a substantial adverse effect on the trout population upstream of the diversion. We also conclude that construction of an effective screening facility at Slate Creek is probably not feasible given the stream's high sediment load, which has filled in most of the diversion pool. Lastly, the annualized cost of implementing Cal Fish & Game's recommendation to screen the project intakes would cost approximately \$3,041,100, about 200 times more than the estimated annual cost of \$15,900 to implement the Forest Service's revised 4(e) specification for a wild fish supplementation plan, which we conclude would provide a similar benefit. Based on this information, we find that Cal Fish & Game's recommendation to install fish screens at project intakes may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

We do not recommend adopting Cal Fish & Game's recommendation to conduct fish population monitoring at 11 sites in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach. Based on our analysis in section 3.3.2, we adopt the monitoring plan specified by the Forest Service instead, which would monitor 8 sites and defer sampling by up to 2 years after major flood events. Deferring sampling after a flood would provide better data on long-term population trends by avoiding sampling when populations may be depressed following severe high flow events. In its reply comments, South Feather indicated that the smaller number of study sites specified by the Forest Service is more appropriate than the 11 sites recommended by Cal Fish & Game, which included two sites dominated by warmwater fish, which are not an agency management priority, and one Lost Creek site that has been affected by local site disturbance and excessive angling pressure. Lastly, implementation of Cal Fish & Game's recommendation would cost approximately \$48,500, or \$13,200 more than the annualized cost of the monitoring plan specified by the Forest Service. Based on this information, we find that Cal Fish & Game's recommended fish monitoring 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.

We do not recommend adopting Cal Fish & Game's recommendation to conduct benthic macroinvertebrate monitoring, using its latest sampling protocols, at all affected reaches in years in years 1 through 4 and in years 8, 12, 16, and 24. Based on our analysis in section 3.3.2, we adopt the monitoring plan specified by the Forest Service instead, which would conduct monitoring in the same years and locations where fish population monitoring is conducted, and provide better information on the relationship between the abundance of benthic macroinvertebrates and the health of fish populations. In addition, using the same sampling protocol in all years would provide comparable data among years. Lastly, implementation of Cal Fish & Game's recommendation would cost approximately \$44,700, or \$21,200 more than the annualized cost of the monitoring plan specified by the Forest Service. Based on this information, we find that Cal Fish & Game's recommended benthic macroinvertebrate monitoring 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.

5.4.2 Forest Service 4(e) Conditions

In section 2.2.5.3, *Section 4(e) Federal Land Management Conditions*, we note that section 4(e) of the FPA, 16 U.S.C. §797(e), 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 may be included in a license issued by the Commission, regardless of whether we include the condition in our staff alternative.

In section 2.2.5.3 we identify seven Forest Service 4(e) conditions that we consider to be administrative or legal in nature and not specific environmental measures. We therefore do not analyze these seven conditions in our EIS. Table 5-3 summarizes staff conclusions with respect to the 4(e) conditions that we consider to be environmental measures. Of the twenty 4(e) conditions that we do not consider to be administrative or legal in nature, we include in the staff alternative all but two of these conditions. Our reasons for not including measures in the staff alternative are summarized in table 5-2 and are discussed in more detail in section 5.2, *Discussion of Key Issues*.

Table 5-3. Forest Service final 4(e) conditions for the South Feather Power Project.

Condition	Annualized Cost	Adopted?
1. Consult with the Forest Service on measures needed to ensure protection and utilization of the National Forest resources affected by the project. To include discussion of the status of measure implementation, the results of monitoring studies, routine and non-routine maintenance, foreseeable changes in project facilities, review of any necessary revisions or modification of plans included in the project license, and discussion of any measures that are needed to protect sensitive species or changes to existing management plans. [Condition No. 3]	\$30,000	Yes, modified to require consultation with FWS, Cal Fish & Game, the Water Board and any other interested agencies

Condition	Annualized Cost	Adopted?
<p>2. Maintain minimum streamflows in project reaches specified in tables A-1 through A-5 provided in the Forest Service filing. The minimum instantaneous 15-minute streamflow shall be at least 80 percent of the prescribed mean daily flow for those minimum streamflows less than or equal to 10 cfs and at least 90% of the prescribed mean daily flow for those minimum streamflows 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, licensee should begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release. [Condition No. 18, part 1]</p>	\$2,031,900	No, adopt South Feather's alternative 4(e) flows instead
<p>3. Determine the water year type for minimum flow compliance based on the DWR Bulletin 120 water year forecast except for the months of October through January, which should be based on the Department of Water Resources' Full Natural Flow record for the Feather River at Oroville. Provide notice to the Forest Service, Commission, and other interested governmental agencies of the final water year type determination within 30 days of making the determination.</p>	\$5,000	Yes
<p>The water year types are defined as follows: Wet = greater than or equal to 7.1 MAF; Above Normal = greater than or equal to 4.0 MAF but less than 7.1 MAF; Below Normal = greater than 2.4 MAF or equal to but less than 4.0 MAF; and Dry = less than or equal to 2.4 MAF. [Condition No. 18, part 2]</p>		

Condition	Annualized Cost	Adopted?
4. Develop an operating plan to manage drought conditions when they occur. [Condition No. 18, part 3]	\$1,600	Yes
5. Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflows. [Condition No. 18, part 4]	\$20,000	Yes
6. Develop and implement ramping rates that meet Forest Service targets for water velocity and stage changes to protect FYLF egg masses and tadpoles. [Condition No. 18, part 5]	\$10,200	Yes
7. Develop and implement a wild fish supplementation program to enhance fisheries in the SFFR, Slate Creek, and in Sly Creek and Lost Creek reservoirs. The basis for the amount of fish to be planted would be determined by reviewing age class distributions of rainbow trout in the Little Grass Valley dam and upper Slate Creek diversion dam reaches, estimating the numbers of fry needed to enhance rainbow trout production towards the density and biomass levels observed in streams surrounding the project area. [Condition No. 18, part 6]	\$15,900	Yes

Condition	Annualized Cost	Adopted?
<p>8. Develop and implement a fish population monitoring plan in affected project reaches to monitor fish species composition and relative abundance, including data on species size/age distributions and condition factors at eight of the locations previously established during the relicensing. Surveys would be conducted in two successive years and begin in the fifth full year after implementation of new license streamflows or at a frequency jointly agreed to by the agencies. [Condition No. 19, part 1]</p>	\$35,300	Yes
<p>9. Develop and implement an amphibian monitoring plan including monitoring of FYLF adult, tadpole, and egg mass numbers. In year 1, full reach surveys would be conducted in the Little Grass Valley dam, South Fork diversion dam, SFFR/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam reaches and representative surveys would be conducted in these reaches in years 2-6, followed with representative surveys every 4 years and full reach surveys occurring every 10 years for the remainder of the license. [Condition No. 19, part 2.1]</p>	\$66,400	Yes
<p>10. Develop and implement a temperature monitoring protocol; an FYLF habitat monitoring protocol; and a protocol to determine relationships between discharge and velocity and discharge and stage at FYLF breeding sites, to be used in determining appropriate ramping rates. [Condition No. 19, part 2.2 through 2.4]</p>	\$12,360	Yes

Condition	Annualized Cost	Adopted?
11. Treat and monitor selected areas between the South Fork diversion dam and Ponderosa reservoir to reduce riparian encroachment. [Condition No. 19, part 3]	\$2,400	Yes, but treatment would be implemented only if warranted based on the results of FYLF monitoring
12. Develop and implement a benthic macroinvertebrate monitoring plan for affected bypassed reaches to be conducted in the same years as fish population monitoring, unless an alternative monitoring schedule is agreed upon with the agencies. [Condition No. 19, part 4]	\$23,500	Yes
13. Prepare a recreation facility master plan and site plans to include provisions to hold annual coordination meetings, to ensure consistency with other management plans, for re-vegetation measures for disturbed vegetation, for improving interpretive signs & kiosks, and to explore opportunities to extend paved or native trails to increase pedestrian connectivity. [Condition No. 20, part 1 and 2]	\$78,000	Yes, except for OHV parking and off-loading ramps at Sly Creek campground
14. Prepare, file and implement a fire prevention, response and investigation plan, including fuels treatment/vegetation management, prevention, emergency response preparedness, reporting, fire control/extinguishing. [Condition No. 21]	\$1,100	Yes
15. Develop and implement a fuel treatment/vegetation management plan. [Condition No. 22]	\$2,100	Yes

Condition	Annualized Cost	Adopted?
16. Develop and implement a Heritage Properties Management Plan, approved by the Forest Service, for the purpose of protecting and interpreting heritage resources. [Condition No. 23]	\$79,400	Yes
17. Annually review the current list of special status plant and wildlife species and implement a study on effects of the project on any newly added species if suitable habitat for the species is likely to occur on National Forest System lands and identify and implement resource measures where appropriate. [Condition No. 24]	\$21,600	Yes
18. Prepare a Biological Evaluation before taking actions that may affect Forest Service special status species on National Forest System lands, update and implement the Bald Eagle Management Plan, and develop and implement a bat management plan. [Condition No. 25]	\$1,500	Yes
19. Prepare and implement an invasive weed management plan to address both aquatic and terrestrial invasive weeds within the project boundary and adjacent to project features directly affecting National Forest System lands including roads, and distribution and transmission lines. [Condition No. 26]	\$9,800	Yes
20. Develop and implement a visual management plan within 60 days prior to any ground-disturbing activity on National Forest System lands. [Condition No. 27]	\$2,200	Yes

Condition	Annualized Cost	Adopted?
21. Develop and implement a road management plan. File with the Commission within 1 year of license issuance a road management plan after Forest Service approval of the plan. [Condition No. 28]	\$3,500	Yes

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, and conserving waterways affected by a project. Under this section, federal and state agencies filed numerous qualifying comprehensive plans, of which we identified 11 California and 6 federal that are applicable to the project. We have recommended numerous measures that are intended to maintain or enhance ecological functions, protect plant and wildlife resources, and provide recreational opportunities. The continued operation of the South Feather Power Project as recommended in this EIS is consistent with the 17 state and federal plans listed below that are applicable to the project.

California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance: 1988 annual report. Sausalito, CA.

California Department of Fish and Game, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Bureau of Reclamation. 1988. Cooperative agreement to implement actions to benefit winter-run Chinook salmon in the Sacramento River basin. Sacramento, CA. May 20. 10 pp. and exhibit.

California Department of Fish and Game. Fish and steelhead restoration and enhancement plan. Sacramento, CA. May 20. 10 pp.

California Department of Fish and Game. 1990. Central Valley streams: a plan. Sacramento, CA. April. 115 pp.

California Department of Fish and Game. 1996. Steelhead restoration and management plan for California. February. 234 pp.

California Department of Parks and Recreation. 1998. Public opinions and attitudes on outdoor recreation in California. Sacramento, CA. March.

California Department of Parks and Recreation. 1994. California Outdoor Recreation Plan (SCORP) -1993. Sacramento, CA. April.

- California Department of Water Resources. 1983. The California water plan: projected use and available water supplies to 2010. Bulletin 160-83. Sacramento, CA. December 1983. 268 pp.
- California Department of Water Resources. 1994. California water plan update. Bulletin 160-93. Sacramento, CA. October 1994. Two volumes and Executive Summary.
- California State Water Resources Control Board. 1995. Water quality control plan report. Sacramento, CA. Nine volumes.
- California – The Resources Agency. Department of Parks and Recreation. 1983. Recreation needs in California. Sacramento, CA. March 1983. 39 pp.
- California – The Resources Agency. 1989. Upper Sacramento Fisheries and Riparian Habitat Management Plan. Sacramento, CA. January 1989.
- Forest Service. 1988. Plumas National Forest Land and Resource Management Plan. Department of Agriculture, Quincy, CA. August 26. 342 pp. and appendices.
- Fish and Wildlife Service. 1992. Lassen National Forest Land and Resource Management Plan, including Record of Decision. Department of Agriculture, Susanville, CA. Appendices and maps.
- National Park Service. 1982. The nationwide rivers inventory. Department of the Interior. Washington, DC. January 1982.
- State Water Resources Control Board. 1999. Water quality control plans and policies adopted as part of the state comprehensive plan. April 1999.
- U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.
- U.S. Fish and Wildlife Service. Undated. Fisheries U.S.A.: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, DC. 11 pp.
- U.S. Fish and Wildlife Service. 2001. Final restoration plan for the anadromous fish restoration program. Department of the Interior. Sacramento, CA. January 9, 2001.
- Plumas County. 1997. Plumas County General Plan. 2nd Edition, as amended. Plumas County Planning Department. Quincy, CA.

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**Federal Energy
Regulatory
Commission**

**Office of
Energy
Projects**

June 2009

FERC/EIS-0225F

Final Environmental Impact Statement

SECTION 5 - STAFF CONCLUSIONS



**South Feather Power Project
FERC Project No. 2088-068, California**

**Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426**

5.0 STAFF'S CONCLUSIONS

5.1 COMPARISON OF EFFECTS OF PROPOSED ACTION AND ALTERNATIVES

In this section, we compare the developmental and non-developmental effects of South Feather's proposal, South Feather's proposal as modified by staff (staff alternative), the staff alternative with mandatory conditions, and the no-action alternative.

We estimate the annual net benefits of operating and maintaining the South Feather Power Project under the four alternatives identified above. Our analysis shows that the annual net benefit would be \$27,095,100 for the proposed action; \$25,860,110 for the staff alternative; \$25,643,810 for the staff alternative with mandatory conditions; and \$28,403,000 for the no-action alternative.

We summarize the environmental effects of the different alternatives in the following section.

Geology and Soils—Under South Feather's proposal: (1) LWD would be passed downstream of the Little Grass Valley, Sly Creek, and Lost Creek reservoirs, enhancing downstream aquatic habitat; (2) supplemental streamflows would continue to be passed into Lost Creek to cleanse accumulated fine sediment from spawning gravels, reduce encroachment of riparian vegetation, and enhance geomorphic characteristics in Lost Creek; and (3) sediment pass-through measures at the Slate Creek diversion would restore sediment transport processes and improve the reliability of minimum flow releases and diversion operations by preventing excessive sediment accumulation upstream of the dam.

With our modifications to South Feather's proposal and under the staff alternative with mandatory conditions, development and implementation of soil erosion control and revegetation plans during construction of any facilities would ensure that native species revegetate disturbed areas and minimize any potential adverse effects from erosion or sediment deposition.

Aquatic Resources—Under South Feather's proposal: (1) minimum instream flows in project-affected reaches would be increased to benefit trout and other aquatic biota, but would cause a minor reduction in water levels in Little Grass Valley reservoir, resulting in minor adverse effects on fish habitat; (2) streamflows and habitat for trout in Slate Creek would be enhanced during critical high temperature periods; (3) a wild trout supplementation program would enhance trout populations in reaches where recruitment does not meet fisheries objectives; and (4) fish and invertebrate populations would be monitored to assess trends and guide adaptive management under the new project operating regimes.

With our modifications to South Feather's proposal: (1) minimum instream flows and trout habitat in project-affected reaches would be further enhanced, but would cause a slight additional reduction in water levels in Little Grass Valley reservoir; (2) ramping

rates would be implemented to reduce stranding mortality of trout and invertebrates; (3) streamflow measurement capabilities would be ensured for the term of the license; and (4) real-time flow and water temperature information would be provided to DWR to assist it in its decision-making process for meeting water temperature objectives specified in the Oroville Settlement Agreement to protect anadromous fish downstream of the Oroville Project's fish barrier dam.

Under the staff alternative with mandatory conditions, the amount of physical trout habitat in project-affected reaches would be slightly enhanced as a result of higher minimum instream flows, but water temperatures would become less suitable (colder than optimal) for trout spawning and rearing in the reaches downstream of Little Grass Valley and Lost Creek dams, and for hardhead in the Forbestown bypassed reach. Similarly, higher summer flow releases required downstream of Little Grass Valley and Lost Creek dams would likely reduce invertebrate diversity and production due to the influence of coldwater outflows. In addition, higher minimum flows would cause a greater reduction in water levels in Little Grass Valley reservoir, which would cause some minor adverse effects on reservoir fish habitat.

Terrestrial Resources—Under South Feather's proposal, annual training of employees, consultation with the Forest Service, and development and implementation of vegetation and invasive weed management plans would further the protection of sensitive areas and sensitive species and help to control the spread of noxious weeds; controllable pulse flows that could adversely affect sensitive amphibian species would be avoided; and the effectiveness of wildlife crossings and escape facilities would be maintained through design consultation with Cal Fish & Game when they are replaced or retrofitted.

With our modifications to South Feather's proposal, ramping rates developed to protect amphibians would minimize adverse effects on reproduction; amphibian surveys would allow the effects of operation on sensitive amphibians to be monitored; and additional data collection on habitat conditions, population size, and growth rates would inform adaptive management decisions and enhance conservation efforts for amphibians within the project area. Also, South Feather would be required to maintain all wildlife crossings and escape facilities that are necessary to protect wildlife.

Under the staff alternative with mandatory conditions, the higher flows specified by the Forest Service in the South Fork diversion dam and Forbestown diversion dam reaches would likely reduce habitat suitability for amphibians by reducing water temperatures below levels required for breeding and by providing less stable flows.

Threatened and Endangered Species—Although valley elderberry longhorn beetle and the California red-legged frog are not likely to occur in the project area, their presence cannot be ruled out. Therefore, we conclude that the alternatives considered in this EIS may affect, but are not likely to adversely affect, these threatened and endangered species. On December 12, 2008, FWS filed a letter concurring with our determination.

Under South Feather’s proposal, continued operation of Kelly Ridge powerhouse, including its flow releases of variable temperature and magnitude during the summer months, may result in incrementally higher water temperatures in the upper portion of the Oroville Project’s Thermalito diversion pool. However, because of the small volume of these releases in comparison with the volume of the Thermalito diversion pool and the effects of Oroville project operation, it is unlikely that any temperature effects would be detectable at or below the Oroville fish barrier dam, the upstream limit of listed salmonids and their critical habitat.

Under the staff alternative and staff alternative with mandatory conditions, South Feather would provide real-time water temperature monitoring and flow data to DWR to help it in its decision-making process for meeting its water temperature objectives, thereby improving temperature conditions for Central Valley spring Chinook salmon and California Central Valley steelhead. Therefore, we conclude that all three of the alternatives considered in this EIS may affect, but are unlikely to adversely affect, these threatened and endangered species or their critical habitat.

Recreation—Under South Feather’s proposal, South Feather would be responsible for the following measures to maintain and enhance recreational opportunities: (1) O&M of recreational facilities; (2) rehabilitation of existing recreational facilities; (3) construction of a new multi-use trail below Little Grass Valley dam to improve access to the SFFR for recreational boating and angling; (4) management of reservoir levels to facilitate recreational use while achieving project purposes; (5) provision of whitewater boating flows in the Little Grass Valley dam reach during the fall in all water years; (6) provision of whitewater boating flows in the spring in Above Normal and Wet water years in the South Fork diversion dam and Forbestown diversion dam reaches; (7) provision of flow information for whitewater boating to the public; and (8) maintenance and enhancement of public safety by installation of safety buoys each year in Little Grass Valley and Sly Creek reservoirs.

With our modifications to South Feather’s proposal, higher minimum flow releases would cause some adverse effects on reservoir recreation by increasing the drawdown of Little Grass Valley reservoir, and would reduce the amount of water that is available for whitewater releases.

Under the staff alternative with mandatory conditions, the adverse effects of drawdown on reservoir recreation would be increased, and the amount of water available for whitewater releases would be further reduced.

Cultural Resources—Under South Feather’s proposal, cultural resources would be protected under provisions specified in the HPMP included in South Feather’s license application.

With our modifications to South Feather’s proposal, additional measures would be incorporated into the HPMP that would provide a higher level of assurance that important cultural resources are adequately protected.

Land Use and Aesthetics Resources—Under South Feather’s proposal, public safety would be maintained and enhanced by developing and implementing a fire prevention, response, and investigation plan.

With our modifications to South Feather’s proposal, fire risk would be further reduced by developing and implementing a fuel treatment/vegetation management plan, road management would be improved throughout the project vicinity, and aesthetics would be protected and improved by implementing a visual management plan that would bring project facilities into compliance with land resource management plan direction.

Under the staff alternative with mandatory conditions, the adverse effects of drawdown on aesthetic conditions at Little Grass Valley reservoir would be increased.

General—With our modifications to South Feather’s proposal, annual consultation with the management agencies would assist with interpretation of monitoring results and adaptive management.

Under the no-action alternative, environmental conditions would remain the same, and there would not be any enhancement of environmental resources.

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 all uses of the waterway on which a project is located. When we review a hydropower project, recreation, fish, wildlife, and other non-developmental values of the waterway are given equal consideration with the project’s electric energy and other developmental values. In deciding whether, and under what circumstances, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved in that decision. This section contains the basis for, and a summary of, our recommendations for relicensing the South Feather Power Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review and evaluation of the environmental and economic effects of the proposed action, the staff alternative, the staff alternative with mandatory conditions, and no-action, we recommend the staff alternative as the preferred alternative for the South Feather Power Project.

We recommend this alternative because (1) issuing a new license would allow South Feather to continue operating the project as a beneficial, dependable source of water and electric energy; (2) the project, with a total installed capacity of 117.3 MW may eliminate the need for an equivalent amount of fossil fuel-produced energy, which helps conserve these non-renewable resources and limits atmospheric pollution; (3) our recommended environmental measures would protect water quality and quantity, enhance fish and wildlife resources, protect cultural resources; and improve public use of the project’s recreational facilities and resources; and (4) the public benefit of these measures

would exceed those of the other alternatives. Although we did not adopt all of the Forest Service's 4(e) conditions, we recognize that the Commission must include these conditions in any license due to their mandatory nature.

In the staff alternative, we include the following environmental measures proposed by South Feather, based on our analyses included in sections 3 and 4. In some cases (*italicized*), we modified or supplemented South Feather's proposed measures.

Geology and Soils

- Annually return LWD to the SFFR downstream of Little Grass Valley dam and to Lost Creek downstream of Lost Creek dam by allowing the LWD to pass through the Little Grass Valley, Sly Creek, and Lost Creek dam spillways during spill periods. LWD, as used in this measure, refers to downed, dead, or dying wood at least 20 feet long. If spills are not adequate to pass the LWD and LWD is collected from Little Grass Valley, Sly Creek, and Lost Creek reservoirs, consult with the Forest Service concerning alternative means and a schedule to return the LWD to the river.
- Provide a supplemental streamflow below Lost Creek dam, as needed, to ensure that a flow of at least 390 cfs (measured as the average flow over any continuous 24-hour period as measured at USGS gage 11396000) occurs at least once every 4 years.
- Within 2 years of license issuance, file a report on measures implemented to pass sediment at Slate Creek diversion dam. The report must describe the results of procedures used to determine whether smaller flow releases and releases timed to occur on the ascending limb of the hydrograph would allow accumulated sediment to pass through Slate Creek diversion dam more frequently, and include recommendations for future operations. The report must document consultation with the Forest Service, U.S. Army Corps of Engineers, Water Board, and Cal Fish & Game on the methods used to pass sediments, and these agencies must be allowed 90 days to review and comment on the report. The filed report must include comments received and the draft report from these agencies and describe how these comments were addressed in the report.

Aquatic Resources

- Determine water year type as described in the Forest Service's Condition No. 18, part 2, annually and apply to appropriate minimum flow release schedule and other measures that are dependent on water year type.
- Install and maintain a gaging station, monitor water temperature, and cease diversions at Slate Creek diversion dam when mean daily water temperature reaches 20°C to protect downstream cold freshwater habitat.

- Implement a minimum flow release schedule for the Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam reaches. *This measure is modified to incorporate the streamflows identified for each reach in South Feather's alternative to the Forest Service's preliminary Condition No. 18, part 1, shown in appendix C, tables C-1 through C-20.*
- When drought conditions may require deviation from minimum flows or other license conditions, consult with the Forest Service and other agencies to develop and implement an operating plan to manage drought conditions.
- Develop and implement a wild fish supplementation program to augment fish populations, when warranted, in the SFFR, Slate Creek, and in Sly Creek and Lost Creek reservoirs.
- Develop and implement a fish population monitoring plan approved by the Forest Service describing sampling to be conducted in the project-affected bypassed reaches to monitor fish species composition and relative abundance, including data on species size/age distributions and condition factors at eight of the locations previously established during the relicensing. Monitoring will be conducted in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach, or at a frequency jointly agreed to by the agencies. If sampling is scheduled in years with high peak flows, the survey may be postponed by 2 years to avoid confounding effects of high peak flows on fish recruitment and populations.
- Develop and implement a benthic macroinvertebrate monitoring plan approved by the Forest Service describing sampling to be conducted in the project-affected bypassed reaches. Monitoring will be conducted in the same years that fish population monitoring is conducted.

Terrestrial Resources

- Conduct annual employee awareness training to familiarize staff with special-status, aquatic, wildlife, and plant species, including noxious weeds/non-native invasive plants, as well as sensitive locations including PACs, potential erosion areas, and cultural sites to allow avoidance/minimization of impacts.
- Prepare and implement an invasive weed management plan. *This measure is modified to address both aquatic and terrestrial invasive weeds; include protocols for locating, monitoring, and controlling weed populations; include a public education program and facilities for public use to reduce the spread of aquatic weed species; and provide information on noxious weed populations in a data format compatible with the Forest Service GIS database.*

- Annually review with the Forest Service the list of species within the project area that are formally proposed for listing or are listed under federal or state endangered species acts or are Forest Service Sensitive, Watch List, or Management Indicator Species. If an added species has the potential to be adversely affected by the project, prepare a study plan to reasonably assess the effects of the project on the species, recommend reasonable resource management measures, and provide an implementation schedule, where appropriate.²⁹
- Maintain all bat exclusion devices in proper working condition.
- Consult with Cal Fish & Game and FWS prior to replacing or retrofitting Miners Ranch conduit wildlife bridge crossings and deer escape facilities. *This measure is modified to require that South Feather maintain and operate all devices and measures necessary for the protection of wildlife along the Miners Ranch conduit.*

Recreational Resources

- Develop and implement facility master plans that illustrate the layouts, locations, sizes, shapes, and relationships between existing and proposed improvements for the Little Grass Valley reservoir recreation area and the Sly Creek reservoir recreation area.
- Develop and implement individual site development plans for each existing recreation facility on Forest Service lands within the existing project boundary.
- Within 3 years of license issuance and after consultation with the Forest Service, construct a multi-use trail below Little Grass Valley dam to provide better access to the SFFR, primarily for recreational boating and angling.
- Finalize and implement a Little Grass Valley and Sly Creek reservoir recreation area routine maintenance and operating plan.
- Every 6 years file a report on recreational use at the developed recreational facilities at Little Grass Valley and Sly Creek reservoir recreation areas.

²⁹ In addition, South Feather plans to avoid high flow releases from project dams (with the exception of the Little Grass Valley dam) associated with sediment pass-through, valve exercises, or supplemental flow releases for channel maintenance or recreational purposes during critical periods for FYLF (roughly April 15 - October 31, annually).

- Every 18 years file a report on recreational user surveys at developed recreational facilities at Little Grass Valley and Sly Creek reservoir recreation areas. *This measure is modified to require the filing of the report every 12 years.*
- Maintain the water level at Little Grass Valley reservoir no lower than elevation 5,022 feet msl through September 15 in all water years, except Dry water years,³⁰ to facilitate the use of Little Grass Valley boat launch facilities. *This measure is modified to specify that the restriction applies only from May 21 through September 15, and does not apply in drought years if the reservoir does not fill to elevation 5,022 feet msl.*
- Provide supplemental streamflow in Little Grass Valley dam reach for recreational boating from September 16 of each year until the date that Little Grass Valley reservoir elevation is 5,017 feet msl. In August of each year, South Feather would consult with the Forest Service, Water Board, American Whitewater, and other interested parties to set the target streamflow between 230 and 460 cfs for the upcoming September. The actual streamflow may vary from the target streamflow by up to 15 percent but may not be less than 230 cfs.
- Provide a supplemental streamflow in the spring of Above Normal and Wet water years downstream of the South Fork diversion dam for recreational purposes. A continuous flow of at least 190 cfs but not more than 700 cfs will be released for two consecutive weekend days between April 1 and June 15, as measured at USGS gage 11395200. A continuous water temperature monitor will be installed near the Woodleaf powerhouse, and the supplemental streamflows will be discontinued if the water temperature reaches 13°C. *This measure is modified to require that supplemental streamflows be discontinued if the water temperature reaches or exceeds 12°C.*
- Provide supplemental streamflow in the spring during Above Normal and Wet water years at Forbestown diversion dam reach to improve opportunities for Class IV and V whitewater boating in the spring. A continuous flow of at least 215 cfs but not more than 400 cfs will be released for two consecutive weekend days between April 1 and June 15, as measured at USGS gage 11395200. A continuous water temperature monitor will be installed near the Forbestown powerhouse, and the supplemental streamflows will be discontinued if the water temperature reaches 13°C. *This measure is modified to require that supplemental*

³⁰ In Dry water years, South Feather indicates that it will maintain the water level in Little Grass Valley reservoir as high as possible through Labor Day weekend.

streamflows be discontinued if the water temperature reaches or exceeds 12°C.

- Provide streamflow information to the public within 1 year of license issuance, to include the anticipated dates and magnitude of recreational streamflow releases.
- Install public safety buoys in Little Grass Valley and Sly Creek reservoirs as soon as practical after access roads are clear of snow, and maintain the buoys through September 15 of each year.

Cultural Resources

- Upon issuance of license, finalize and, following Commission approval, implement the HPMP included in the application. *This measure is modified to implement the HPMP provided in the license application, with staff's additional measures.*

Land Use

- Prepare, file with the Commission within 1 year of license issuance, and implement a fire prevention and response plan.
- Develop and implement a hazardous materials management plan to reduce the potential effects of hazardous materials spills.

General

- Consult with the Forest Service annually to coordinate project and Forest Service activities. *This measure is modified to include annual consultation regarding the status of measure implementation, the results of monitoring studies, discussion of both routine and non-routine maintenance, foreseeable changes in project facilities, review of any necessary revisions or modification of plans included in the project license, and discussion of any measures needed to protect sensitive species or changes to existing management plans. This measure is further modified to require that FWS, Cal Fish & Game, and the Water Board be afforded the opportunity to participate in the consultation meeting and included in the distribution of all monitoring reports and correspondence relating to the meeting, and that recommendations by these agencies be included in the record of the meeting.*

In addition to the foregoing, the staff alternative also includes the following additional measures identified by staff based on agency, tribal, and non-governmental organization specifications, recommendations, and our analysis.

Aquatic Resources

- Implement a maximum ramping rate of 0.5 foot per hour when making any controlled increases or decreases in flow releases into the Little Grass Valley dam, South Fork diversion dam, Lost Creek dam, and the Forbestown diversion dam reaches.
- Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflows downstream of Little Grass Valley dam, South Fork diversion dam, Forbestown diversion dam, Lost Creek dam, and Slate Creek diversion dam.
- Develop and implement a plan, in consultation with Cal Fish & Game, NMFS, and DWR to monitor the effects of flow releases on water temperatures in the Little Grass Valley dam, South Fork diversion dam, Lost Creek dam, and the Forbestown diversion dam reaches, and to provide real-time information on the temperature and quantity of water discharged from the Kelly Ridge powerhouse.
- Reserve NMFS authority to prescribe fishways.

Terrestrial Resources

- Monitor selected areas between the South Fork diversion dam and Ponderosa reservoir for riparian encroachment, and treat if warranted based on FYLF monitoring results.
- Prepare a Biological Evaluation before taking actions that may affect Forest Service special status species on National Forest System lands, update and implement the Bald Eagle Management Plan, and develop and implement a bat management plan.
- Conduct surveys for FYLF over the full length of the Little Grass Valley dam, South Fork diversion dam, SFFR/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam reaches in year 1 and every 10 years thereafter, supplemented by representative surveys in years 2-6, every 4 years thereafter, and during the final 3 years of the license to assess effectiveness of measures implemented to protect FYLF.
- Develop a temperature and growth rate monitoring protocol, a habitat monitoring protocol to include habitat measurements in year one and every ten years thereafter, and a protocol to determine appropriate ramping rates suitable for FYLF.

Recreational Resources

- Incorporate several additional measures specified by the Forest Service for the facility master plans including:

- provisions for an annual coordination meeting to review the status of the implementation of the master plan;
- provisions to ensure consistency with other management plans, including measures associated with potential effects of the proposed recreation rehabilitation on cultural resources within the project;
- incorporation of provisions to re-vegetate disturbed vegetation associated with the proposed rehabilitation and enhancement measures at the recreation sites as part of the facility master plans; and
- provisions to improve interpretive features for the public (i.e., kiosks or trail placards), as part of the individual site plans.

Land Use and Aesthetics

- Develop and implement a fuel treatment/vegetation management plan as part of South Feather’s fire prevention and response plan, after consultation with the Forest Service. File the plan with the Commission within 1 year of license issuance.
- Develop and implement a road management plan for roads within the project boundary that are used primarily for project purposes, including access to project facilities and recreational facilities. File with the Commission within 1 year of license issuance and after Forest Service approval of the plan.
- Develop and implement a visual management plan within 60 days prior to any ground-disturbing activity (including the construction or new facilities or modification of existing facilities, which could affect visual aesthetics) on National Forest System lands.

5.2.1 Discussion of Key Issues

The following paragraphs describe the basis for staff-recommended measures as well as the basis for not recommending some of the measures recommended by other entities. Under each major issue, we discuss our recommendations for the South Feather Power Project.

Geology and Soils

Large Woody Debris

Because LWD can benefit fish habitat, South Feather proposes to make a reasonable effort to annually return LWD that collects in the Little Grass Valley, Sly Creek, and Lost Creek reservoirs to the river below each reservoir. LWD contributes to productive aquatic ecosystems, and is an important component in the formation of

complex aquatic habitat units and channel maintenance. Although much of the steep and confined channel network in the project area offers limited opportunity for LWD retention, it may be retained locally in lower gradient areas or where valley and/or channel width narrows. Compared to reference reaches upstream of the impoundments, the number of LWD pieces per mile was considerably lower in the reaches downstream of Little Grass Valley dam on the SFFR and below Sly Creek dam on Lost Creek. Passing LWD that accumulates in the Little Grass Valley and Sly Creek reservoirs to downstream reaches would increase the abundance of LWD in these reaches and provide a substantial benefit to trout habitat in areas where LWD is retained within the active stream channel. We estimate that passing LWD that accumulates in these reservoirs into downstream reaches would have an annualized cost of \$5,300. Because increasing the amount of LWD in downstream reaches could provide a substantial benefit to fish habitat at a reasonable cost, we recommend adopting this measure.

Lost Creek Geomorphic Flows

Lack of seasonal high flow events may contribute to the accumulation of fine sediment in spawning gravels, which may adversely affect trout spawning and incubation success and contribute to the encroachment of riparian vegetation into the stream channel. Although most of the project reaches have limited potential to retain fine sediments, Lost Creek is a reach that can retain fine sediment that originates below Lost Creek dam (i.e., a response reach), and this sediment may affect aquatic habitat. Based on a study conducted in 1991, the current project license stipulates that flushing flows between 390 and 740 cfs be released from Lost Creek dam at least once every 4 years. South Feather has studied the effects of these flushing flows to evaluate its effect on the reach as a continuation of the 1991 study, and found that the reach benefits from these geomorphic flow releases. South Feather therefore proposes to continue flushing flows in Lost Creek by spilling flows of at least 390 cfs for a period of 24 hours at least once every 4 years. Continuing these periodic flushing flows would serve to enhance geomorphic characteristics in Lost Creek and protect aquatic habitat, and we recommend that this measure be continued. Because these flow releases are stipulated in the current license, continuation of the measure would have no incremental cost.

Sediment Pass-Through at Slate Creek

Accumulation of sediment upstream of the Slate Creek diversion dam interferes with operation of the low-level outlet used to release minimum instream flows, affects the operation of the diversion tunnel, and impedes the transport of spawning gravel into the reach downstream of the diversion. South Feather is currently testing alternative methods of operation to facilitate the passage of sediment past the dam, and within 2 years of license issuance, proposes to file a report with the Commission that would describe the results of ongoing testing.

Until 1986, the Slate Creek diversion dam was operated to allow sediment to pass through a low-level outlet during high flows. Sediment pass-through activities were

suspended from 1986 to 2002 because of resource agency concerns about potential effects on water quality from toxins that may have collected in the accumulated sediment, although, as discussed in section 3.3.1.2, sampling of sediments and water demonstrated that this contamination had not occurred. South Feather attempted to resume sediment pass-through activities in 2002. It was unsuccessful because of the armored sediment accumulation that had built up against the outlet's trashrack. In 2005, South Feather removed 500 cubic yards of the accumulated sediments by manual excavation, and sediment was successfully passed through the structure, but testing was suspended because of concerns about abrasion damage to the diversion's outlet works. South Feather is currently testing new procedures to determine whether smaller flow releases would allow accumulated sediment to pass through Slate Creek diversion dam more frequently, and is assessing the size of storm events (rainfall amount and rate) that result in Slate Creek flows more than 1,000 cfs, so that sediment pass-through can be timed to occur on the ascending limb of the hydrograph, to allow both coarse and fine materials to be carried into the downstream reaches and enhance aquatic habitat.

South Feather's proposal to file a report 2 years after new license issuance would allow the Commission to review the results of the current sediment pass-through efforts and any proposed modifications to the sediment pass-through program. Continuing sediment pass-through and refining successful procedures would enhance downstream habitat by restoring sediment transport processes, and would improve the reliability of minimum flow releases and diversion operations by preventing further accumulation of sediment upstream of the dam. We estimate that the annualized cost of preparing the proposed sediment pass-through report would be \$5,700. Because the report would help to determine the success of and develop effective sediment pass-through procedures, and would benefit aquatic habitat at a minimal cost, we recommend that this measure be adopted.

Water and Fisheries Resources

Minimum Flows and Reservoir Levels

Flow regulation at Little Grass Valley and Sly Creek reservoirs and diversion of water to the project powerhouses affect aquatic biota and recreational opportunities in five riverine reaches. These reaches are the Little Grass Valley dam, South Fork diversion dam, and Forbestown diversion dam reaches of the SFFR; Slate Creek below the Slate Creek diversion dam; Lost Creek below Lost Creek reservoir; and the SSFR/Lost Creek reach (downstream of the confluence of Lost Creek with the SSFR). Flows released into downstream reaches also affect water levels in project impoundments, especially in the Little Grass Valley and Sly Creek reservoirs, which provide seasonal storage.

In its final license application, South Feather proposed a minimum flow regime for each of the project reaches³¹ that varies by month for four water year types. In all cases the proposed flows are equal to or greater than the flows that are required in the current project license. Cal Fish & Game filed a 10(j) recommendation and the Forest Service filed a preliminary 4(e) condition specifying seasonal flow regimes for each reach and water year type. South Feather filed an alternative 4(e) condition specifying minimum flows that were in some cases consistent with the Forest Service's 4(e) flows, but in most cases were intermediate between the flows proposed in the license application and the Forest Service's 4(e) flows.

The Forest Service filed its final 4(e) conditions on March 6, 2009. The Forest Service adopted South Feather's alternative 4(e) flows for Above Normal, Below Normal, and Wet water year types in the Lost Creek reach, and reduced its preliminary 4(e) flow conditions to be more consistent with South Feather's alternative 4(e) conditions in several other reaches and water year types. The flows recommended by Cal Fish & Game are higher than the other proposed or specified flow regimes in most reaches, months, and water year types. Flows included in each of these flow regimes, and their effects on trout habitat and wetted area, are presented in appendix C, and average annual values are summarized and compared in section 3, tables 3-10 to 3-12.

South Feather also proposes that instantaneous flows be allowed to deviate below the specified minimum flow releases by up to 10 percent or 3 cfs, whichever is less. The Forest Service specifies that the instantaneous flow be at least 80 percent of the specified mean daily flow for minimum flows less than or equal to 10 cfs, and at least 90 percent of the specified mean daily flow for minimum flows greater than 10 cfs. Cal Fish & Game did not state whether any short-term deviations would be allowed from its recommended minimum flows.

In the draft EIS, we analyzed the effect of all alternative flow regimes on habitat for adult rainbow trout (as represented by modeled WUA), water temperature suitability for rainbow trout, hardhead and FYLF, and effects on water levels in Little Grass Valley reservoir. Our analysis of effects on fish habitat included consideration of static WUA values associated with each minimum flow regime, as well as South Feather's habitat time series analysis, which included incorporation of accretion flows within each reach and comparison of habitat availability under each of the proposed flow regimes for four water year types.

In its comments on the draft EIS, Cal Fish & Game provided additional information on the trout lifestages and other parameters that were given priority in different seasons and water year types when it developed its recommended flow regime

³¹ Although flows in the SFFR/Lost Creek reach are not specified, the reach would receive the combined minimum flows from the South Fork diversion dam and Lost Creek reaches, plus accretion.

for each reach. We revised our analysis in section 3.2, *Aquatic Resources*, to include this new information, and also to reflect changes in the flows that were specified by the Forest Service in its final 4(e) conditions.³² The results of our analysis of effects on WUA available for trout lifestages and on wetted area is presented in detail in that section, and is summarized as annual averages across in table 5-1, below. As indicated in the table, the flows included in South Feather's alternative 4(e) condition provide substantial overall increases in habitat for all lifestages of trout and moderate increases in wetted area, which would increase macroinvertebrate production, enhancing the food resources available to trout. Although the higher flows recommended by Cal Fish & Game and specified by the Forest Service would provide additional increases in trout habitat and in wetted area, the incremental gains are relatively small in relation to the increase in minimum flows and associated losses of power production.

The Forest Service identified channel maintenance functions including maintenance of spawning gravel quality and preventing riparian encroachment as one of its priorities in determining minimum flows in the spring high flow period. Although minimum flows proposed or specified by the agencies are higher than those that are included in South Feather's alternative 4(e) condition in some reaches and water year types, these differences are small in relation to the magnitude of spill flows that would normally occur in most years, and as a result we conclude that the higher minimum flow releases provided in the agency flow regimes would not provide a detectable improvement in channel maintenance functions.

Both agencies identified ecological objectives of retaining a natural hydrograph to provide ecological cues, and of buffering the effects of flow changes by providing higher minimum base flows. Although it is difficult to quantify the benefits that are associated with providing a more natural flow regime, we note that the flow regimes included in South Feather's alternative 4(e) condition reflect the natural flow regime much more closely than the flows that are included in the existing license and the flows that were originally proposed in the license application. The substantial increase in minimum flows that would be provided in the alternative 4(e) condition would also serve to buffer adverse effects associated with sudden increases or decreases in river flow by reducing the magnitude of changes in water depth and velocity when flows are increased and the amount of habitat that is dewatered when flows are reduced. The higher minimum flows in the agency flow regimes would provide some additional protection from these adverse

³² As we discuss in that section, we also focused our analysis on static minimum flows instead of South Feather's habitat time series analysis. In their comments on the draft EIS, Cal Fish & Game and the Forest Service note that, because the magnitude and timing of releases that are made to meet downstream consumptive needs may vary between years, the average flow statistics that South Feather used in its time series analysis may not represent the actual minimum flow levels that occur in some time periods and years.

effects. However, the higher agency flows would also adversely affect the suitability of water temperatures for some species and lifestages of biota and on water levels in Little Grass Valley reservoir, as we discuss below.

Table 5-1. Summary of annual percent increase in average minimum flow, wetted area, trout rearing WUA, and spawning WUA for each flow regime compared to the minimum flows included in the current license.

Reach	Flow regime	Percent increase from existing flow regime				
		Flow (cfs)	Wetted area (1,000 sq ft)	Juvenile trout WUA	Adult trout WUA	Trout spawning WUA
Little Grass Valley	SF FLA	110%	9%	48%	70%	101%
	SF Alt 4(e)	183%	14%	67%	105%	107%
	FS final 4(e)	262%	18%	90%	151%	140%
	Cal F & G	317%	20%	94%	170%	153%
	SF FLA	149%	14%	33%	62%	113%
South Fork Diversion	SF Alt 4(e)	242%	20%	45%	87%	123%
	FS final 4(e)	274%	22%	48%	95%	126%
	Cal F & G	369%	25%	51%	107%	135%
	SF FLA	17%	1%	5%	-2%	-1%
	SF Alt 4(e)	69%	3%	15%	15%	96%
Slate Creek	FS final 4(e)	69%	3%	15%	15%	96%
	Cal F & G	69%	3%	15%	15%	96%
	SF FLA	67%	3%	11%	25%	15%
	SF Alt 4(e)	242%	10%	32%	73%	121%
	FS final 4(e)	262%	10%	33%	77%	121%
Forbestown Diversion	Cal F & G	398%	13%	40%	101%	138%
	SF FLA	0%	NA ^a	-9%	-14%	-3%
	SF Alt 4(e)	112%	NA ^a	26%	55%	30%
	FS final 4(e)	122%	NA ^a	27%	58%	30%
	Cal F & G	178%	NA ^a	30%	86%	28%

^a Wetted area information not available for the Lost Creek diversion reach.

Modeling of water temperatures in the Forbestown reach conducted by South Feather indicates that increasing minimum flows during the summer months would help to maintain water temperatures below 20°C throughout the length of the reach upstream of the migration barrier. Although the higher releases recommended by Cal Fish &

Game would likely provide even more favorable summer water temperatures for trout, these flows may reduce maximum summer water temperatures to levels that are below the optimal range for hardhead.

Higher summer flow releases that would occur downstream of each of the project's larger storage reservoirs under the flows recommended by Cal Fish & Game and specified by the Forest Service would likely increase the length of the portion of each of the reaches below each reservoir where invertebrate diversity and production is reduced by the influence of coldwater outflows. The higher agency flow releases are also likely to reduce habitat suitability for trout in the Little Grass Valley dam reach, for FYLF in South Fork diversion dam and Forbestown reaches, and for rainbow trout and FYLF in the Lost Creek reach.

The higher minimum flows recommended by Cal Fish & Game and specified by the Forest Service for the reach below Little Grass Valley dam would cause Little Grass Valley reservoir to be drawn down to lower levels in the summer and to not fill to as high a level as currently occurs, particularly during Below Normal and Dry water years. These reduced water levels and surface area could cause some adverse effects on bald eagle foraging and on reservoir recreation and aesthetics. Although the flows specified in the Forest Service's preliminary 4(e) condition in the Little Grass Valley dam reach were identical to the flows recommended by Cal Fish & Game, the flows specified by the Forest Service in its final 4(e) condition are lower than Cal Fish & Game's flows, and, as a result, would have less effect on water levels in Little Grass Valley reservoir. South Feather's alternative 4(e) flows in the Little Grass Valley dam reach are generally between 30 and 80 percent less than Cal Fish & Game's flows during the spring and summer months, and would have a proportionately smaller effect on drawdown levels. To minimize any potential adverse effects on reservoir-based recreation, South Feather proposes to maintain water surface elevations in Little Grass Valley reservoir above 5,022 feet msl through September 15. Although the peak recreation season extends from about May 21 through October 15 at Little Grass Valley reservoir, use decreases after the Labor Day weekend, so South Feather's proposed measure should minimize adverse effects on recreation during the period of highest use.

South Feather proposed and the Forest Service specified releasing higher flows to compensate for any instances when flow releases do not meet the minimum flows required in a new license. However, neither party has provided a basis for including a provision to allow for the under-release of minimum flows. Without such a basis, we see no need to include this provision, and recommend that compliance be based upon meeting the instantaneous and daily average flow volumes identified in South Feather's alternative 4(e) condition. If some variation in flow release is anticipated, this is normally accommodated by providing a slight over-release, and if releases are found to be insufficient, the licensee is usually required to notify the Commission of the under-release, and to take immediate action to return to compliance.

We recommend including South Feather's alternative 4(e) flows in the staff alternative because they would provide: (1) substantial increases in habitat for all lifestages of trout in all reaches compared to the flows included in the current license and proposed in the license application; (2) lower potential for causing adverse temperature effects on rainbow trout spawning, hardhead rearing, and FYLF breeding than the higher Forest Service and Cal Fish & Game flows; and (3) lower potential for adverse effects on recreation use and bald eagle foraging from low water levels in Little Grass Valley reservoir than the higher Forest Service and Cal Fish & Game flows.

We estimate that the flow regime proposed by South Feather in its license application would reduce the average annual power generated at the project by 8,685 MWh and would reduce the annual net benefit of the project by \$587,200 compared to current operation, while the flow regime defined in South Feather's alternative 4(e) condition would reduce the average annual power generated at the project by 22,139 MWh and would reduce the annual net benefit of the project by \$1,558,700 compared to current operations. Due to the substantial improvement that would be provided to trout habitat in a total of 38 miles of stream in six stream reaches, we conclude that the benefit of implementing the alternative 4(e) flows is worth its costs. We estimate that implementing the minimum flows specified by the Forest Service and recommended by Cal Fish & Game would reduce average annual project generation by 24,853 and 33,636 MWh, respectively, and would reduce the annual net benefit by \$1,775,000 and \$2,432,300, respectively. Because of the additional reduction in energy generation, adverse temperature effects on trout and aquatic productivity in the Little Grass Valley dam and Lost Creek dam reaches, on hardhead in the Forbestown diversion dam reach, on FYLF habitat in several reaches, and on water levels in Little Grass Valley reservoir, we conclude that the Forest Service and Cal Fish & Game flows are not warranted, due to these negative impacts and higher costs.

Ramping Rates

Rapid changes in streamflow have the potential to strand and kill young fish and macroinvertebrates, and may cause adverse effects on amphibians including FYLF. Because each of the powerhouses discharge into reservoirs or diversion pools, peaking operation of the South Feather Power Project does not cause flows or water levels in riverine reaches to fluctuate. However, rapid flow changes in riverine reaches would occur occasionally during spills and when high flow releases are made from project dams for geomorphic purposes, to meet downstream consumptive needs, or to support whitewater recreation. Cal Fish & Game recommends that ramping rates be limited to a maximum of 0.5 foot per hour to minimize fish stranding. Because whitewater flow releases would occur only once per year in each reach and the release of geomorphic flows into Lost Creek would occur only once every 4 years, the cost associated with implementing this ramp rate in the Little Grass Valley dam, Slate Creek diversion dam, South Fork diversion dam, Lost Creek dam, and Forbestown diversion dam reaches is negligible, and we conclude that the benefits to fish populations are worth its cost.

Because implementing ramping constraints at Slate Creek could limit the effectiveness of sediment pass-through activities, we recommend that an exception to this ramping rate be allowed when these activities are conducted at the Slate Creek diversion. Also, because the rate of flow change during naturally occurring spills at project dams is not controllable, the ramp rate should be applied only to flow changes that are controllable by South Feather.

Flow Monitoring and Water Management during Extended Drought Conditions

South Feather proposes to monitor compliance with its proposed minimum flows using existing USGS flow gages in each reach. Cal Fish & Game recommended and Forest Service specified that South Feather operate, maintain, and modify (if needed) existing gages that are needed to determine the river stage and minimum streamflow in each project-affected reach. The Forest Service also filed preliminary and revised 4(e) conditions specifying the methodology that would be followed to determine the water year type that would guide the implementation of minimum flows, and to consult with stakeholders to develop an operating plan to manage flows during drought conditions. South Feather indicated in its reply comments that it did not object to the revised 4(e) measures, which were incorporated without change in the Forest Service's final 4(e) conditions.

Continued operation of the USGS gages in each of the affected reaches, including any modifications that may be required to accurately measure minimum flows or ramping rates that are included in a new license, would help to ensure that these gages remain functional and can be used to effectively monitor compliance with flow-related measures included in the license. The gages also would help to ensure that flow data continues to be available to other water users in the basin and to the general public. Provision of flow data recorded at 15-minute intervals to the agencies upon request would help to verify compliance with any instantaneous flows and ramping rates that are included in the license. We estimate that funding the continued operation of the USGS gages would have an annualized cost of \$20,000. Because continued operation of these gages is needed to verify license compliance and to ensure that the benefits of implementing minimum flows to the project-affected reaches are realized, we conclude that the benefits of this measure are worth its costs.

Yuba River Reopener

Diversion of water from Slate Creek to Sly Creek reservoir reduces the volume of water that is contributed to the Yuba River via Slate Creek. The Yuba County Water Agency recommends that the Commission reserve authority to require South Feather to make reasonable provisions for modifying project facilities or operation as necessary to mitigate or avoid cumulative effects identified in any environmental analysis of the Yuba River Project (FERC No. 2246). They indicate that this reservation would be applicable in the context of any relicensing or license amendment proceeding involving the downstream Yuba River Project.

We include analysis in this document of the cumulative effects of relicensing the South Feather Power Project on water resources, and adopt several measures that we consider to be appropriate to address the project's contribution to cumulative effects on water resources in the Yuba River basin. If additional measures are needed because of proposed changes in the operation of the Yuba River Project, it would be appropriate to consider the need to mitigate for the effects of those changes in the proceeding that would implement those changes. If it is determined in the future that a change in South Feather's operations may be needed, this can be addressed through the Commission's standard license reopener provision. For this reason, we conclude that a specific reopener provision to address cumulative effects is not needed, and we do not recommend that it be adopted.

Water Temperatures Downstream of Kelly Ridge Powerhouse

The release of warm water from the Kelly Ridge powerhouse has the potential, depending on Oroville Project operation, to incrementally increase water temperatures in the upstream portion of the Thermalito diversion pool. DWR, Cal Fish & Game, NMFS, and SWC/MWD recommend that South Feather be required to curtail or cease power generation at the Kelly Ridge powerhouse when the temperature of waters released from the powerhouse exceed specified values. The purpose of this shutdown would be to ensure that South Feather project operation does not jeopardize DWR's ability to meet its water temperature objectives established in the Oroville Settlement Agreement for the protection of adult broodstock, eggs, or juvenile salmon and steelhead below the fish barrier dam and at the Feather River Hatchery, located about 5 miles downstream from the Kelly Ridge powerhouse. The hatchery was built as mitigation for the effects of the construction of the Oroville Project on anadromous fishes.

In their comments on the draft EIS, SWC/MWD recommended that installation of temperature control curtains in Miners Ranch reservoir to direct outflows from the Miners Ranch conduit to the powerhouse intake be considered as a means to reduce the amount of warming that occurs as water passes through the reservoir. Similarly, Cal Fish & Game noted that a pipeline could be used for the same purpose. Both of these approaches would limit mixing with warmer water in the reservoir and would likely provide some reduction in the temperature and temperature variability of water that is discharged from Kelly Ridge powerhouse. Some degree of warming during passage through Miners Creek reservoir would still occur, however, and as a result these approaches would likely be less effective than shutdown of the Kelly Ridge powerhouse as a means to assist with meeting the downstream water temperature objectives.

Implementing the recommended operational constraints at Kelly Ridge or installation of temperature control curtains or a pipeline in Miners Ranch reservoir could assist DWR with efficiently meeting the temperature objectives identified in its Settlement Agreement, by reducing uncertainty concerning the thermal characteristics of water in the upper portion of the Thermalito diversion pool. In addition, shutting down Kelly Ridge powerhouse during the high temperature summer period could provide up to

31,149 acre-feet of water that would then be available to DWR for generation, consumptive water supply, or for meeting downstream environmental objectives, which could include DWR's temperature objectives, or water quality objectives further downstream, including the Bay-Delta. Clearly, such a shutdown would have a detrimental affect on South Feather's generation.

Our analysis, as presented in section 3.3.2 shows that, while generation at Kelly Ridge powerhouse during the summer months can increase water temperatures in the upper portion of the Thermalito diversion pool when Oroville's Hyatt powerhouse is not generating or near minimum generation, the small volume of the releases in comparison to the volume of the diversion pool make it unlikely that any such temperature increases would be detectable downstream at the fish barrier dam or hatchery.

In addition, whether or not downstream temperature objectives are met ultimately depends on DWR's operation of the Oroville Project and not on Kelly Ridge powerhouse releases. When DWR is generating at its Hyatt powerhouse, releases from Kelly Ridge powerhouse have a negligible effect on downstream water temperatures due to the higher volume of flows that are released from the Hyatt powerhouse, which has a typical generation flow range of 4,000 to 8,000 cfs and a minimum generating flow of 2,400 cfs. If South Feather shut down the Kelly Ridge powerhouse completely, DWR still may not meet its temperature objectives during hot weather conditions if the Hyatt powerhouse is not generating or if pumpback operations are occurring. Conversely, under the same hot weather conditions, if the Hyatt powerhouse is generating, the Kelly Ridge powerhouse could be operated at full capacity and DWR could meet its downstream temperature objectives. Compliance with the temperature objectives in the Oroville Settlement Agreement, which DWR agreed to and to which South Feather is not a party, is clearly within DWR's ability to control using Oroville Project facilities.

We estimate that the annualized cost of curtailing or ceasing operation of the Kelly Ridge powerhouse according to the temperature criteria proposed by these parties would reduce the average annual generation by about 5,462 to 15,696 MWh and reduce the annual benefit of the project by about \$397,600 to \$1,002,000 per year.³³ Based on costs reported for the construction of temperature control curtains at Whiskeytown reservoir, we estimate that these could be constructed in Miners Ranch reservoir at a cost of approximately \$1.2 million. Assuming that the curtains would need to be replaced every 15 years, this equates to an annualized cost of \$175,000. We estimate that installing a pipeline to convey flow through Miners Ranch reservoir would have an annualized cost of \$950,000. Because achievement of the targets depends on Oroville Project operation,

³³ The lower bound of the cost range is based on information provided by South Feather Water Power Authority on April 17, 2009 (e-mail from R. Jones, Devine Tarbell, to J. Mudre, FERC) on the cost of implementing DWR's proposed condition. The higher bound of the cost range was estimated by staff assuming that a 60-day annual shutdown would be required to meet Cal Fish & Game and NMFS recommendations.

and because the potential temperature benefits of any measures that could be implemented by South Feather may not be realized at the downstream fish barrier dam or fish hatchery, we do not recommend that any limitation on the quantity or temperature of water that can be discharged from the Kelly Ridge powerhouse be included in the license.

Water Temperature Monitoring

South Feather proposes to install and maintain a continuous water temperature monitor at USGS gage 11413300 (RM 9.1) downstream of the Slate Creek diversion dam and to cease diversions from Slate Creek whenever the mean daily water temperature is greater than 20°C for three consecutive days between June 1 and September 15. South Feather also proposes to install continuous temperature monitors in the downstream ends of the South Fork diversion dam reach near the Woodleaf powerhouse (RM 7.9) and in the Forbestown diversion dam reach near the Forbestown powerhouse (RM 1.8) to provide information needed to ensure that whitewater flow releases do not occur during the FYLF breeding season. South Feather also monitors water temperatures at the Miners Ranch water treatment facility on Miners Ranch reservoir.

Cal Fish & Game recommends that South Feather monitor water temperatures in the SFFR immediately above the fish passage barrier (RM 3.7) in the Forbestown diversion dam reach to demonstrate whether the recommended flows in the reach are adequate to reduce temperatures below 20°C. Cal Fish & Game recommends that South Feather also install and maintain continuous water temperature monitors at RM 8.9 on Slate Creek, at RM 28.3 on the Little Grass Valley dam reach of the SFFR, at RMs 8.1 and 9.1 on the South Fork diversion dam reach, and in the Kelly Ridge powerhouse. The monitors would be used to record water temperatures at 1-hour intervals from May 1 through September 15 annually, and the data would be provided to Cal Fish & Game and other interested agencies in a technical report within 6 months following completion of each sampling effort.

NMFS recommends that South Feather maintain a temperature monitoring station in Miners Ranch reservoir at the Kelly Ridge intake and provide temperature data at 15-minute intervals in a format that is available to the public.

Water temperature data collected from the proposed monitoring site on Slate Creek would provide information that would be needed to implement South Feather's proposed flow regime for Slate Creek, which includes shutdown when daily average water temperatures exceed 20°C for three consecutive days. We estimate that monitoring Slate Creek water temperatures would have an annualized cost of \$7,600. Although we are not able to estimate the generation that would be foregone due to cessation of diversions from Slate Creek, South Feather stated that the volume of water diverted during the summer is small, and the amount of lost generation would be minor. Ceasing diversions from Slate Creek when average water temperatures exceed 20°C would benefit trout populations in Slate Creek downstream of the diversion, and would ensure the project has no adverse effects on the beneficial use of supporting coldwater aquatic life,

and we conclude that these benefits outweigh the costs of this measure. Installing the temperature monitor at the USGS gage, as proposed by South Feather, would provide a secure location for temperature data to be collected and transmitted in real-time to inform the project operators when diversions should be discontinued and resumed. We see no substantial advantage of installing the temperature monitor at the location recommended by Cal Fish & Game, 0.2 mile downstream of the gage, where a secure mounting location and data telemetry system would be more costly and would involve placement of a small structure that would adversely affect the aesthetics of the stream environment.

Cal Fish & Game's proposal to monitor water temperature data at five additional locations, and to provide annual technical reports summarizing monitoring results would help to document any changes in water temperatures that occur under the minimum flow regimes that are implemented in a new license, and NMFS' proposal to monitor water temperatures at the Kelly Ridge powerhouse could help DWR in its decision-making process for meeting its water temperature objectives, specified in the Oroville Settlement Agreement. South Feather's provision of water temperature and flow information to DWR operators could help them meet the temperature objectives while also meeting system needs concerning the quantity and timing of hydroelectric generation and consumptive water supply.

We recommend that South Feather consult with Cal Fish & Game, NMFS, and DWR to develop a water temperature monitoring plan designed to determine the effects of the implemented flow regime on water temperatures in each reach and the temperature and quantity of water discharged from the Kelly Ridge powerhouse. Consultation with DWR would ensure that the monitoring data is collected at locations and in a manner that will be useful to DWR, including the collection frequency, data format, and months when data will be collected. We estimate the annualized cost of developing and implementing such a temperature monitoring plan to be \$8,700, and because it would help to ensure the effective use of the hydropower facilities in the basin to meet regional energy demands, we conclude that the measure is worth its cost.

Selective Withdrawal

Flows released from Little Grass Valley reservoir are drawn from deep in the reservoir, resulting in cool water temperatures in the SFFR downstream from the reservoir. Cal Fish & Game recommends that South Feather develop and implement a plan to allow water to be selectively withdrawn from the entire water column in Little Grass Valley reservoir so that the water temperature of release flows can be more closely matched to the optimum temperatures for trout.

Although water temperatures in the Little Grass Valley reservoir reach are below the optimum range identified in the literature for growth of rainbow trout, we note that rainbow trout populations prosper in habitats that include a very wide range of temperature regimes, and that fish population sampling conducted by South Feather indicates that trout populations downstream from Little Grass Valley reservoir are in very

good condition. We also note that releasing warmer water from Little Grass Valley reservoir would contribute to high water temperatures further downstream in the Forbestown diversion dam reach of the SFFR, and could adversely affect trout populations in that reach. We estimate that the annualized cost of implementing selective withdrawal at Little Grass Valley reservoir would be about \$295,200. Because the available data indicate that the low temperature of water released from Little Grass Valley reservoir is not having a substantial adverse effect on trout populations in downstream reaches, we conclude that the benefits of this measure are not worth its costs.

Fish Entrainment

Entrainment of fish into project intakes removes fish from upstream populations, and may cause injury or mortality to a portion of the fish that would otherwise be recruited to downstream populations. South Feather evaluated the potential for fish entrainment at project intakes in its license application, concluded that effects of the project on trout populations were likely to be minor, and did not propose any measures to reduce or mitigate for fish entrainment. Cal Fish & Game recommends that South Feather develop and implement a plan to screen the intakes at the South Fork diversion dam, Slate Creek diversion dam, and the Woodleaf powerhouse intake in Lost Creek reservoir with fish screens acceptable to Cal Fish & Game and in accordance with its screening criteria. The Forest Service specifies, in its revised 4(e) conditions, that South Feather develop and implement a wild fish supplementation program to mitigate for lost fish resources in the SFFR, Slate Creek, and Sly Creek and Lost Creek reservoirs. The basis for determining the number of fish to be planted would be determined by reviewing age class distributions of rainbow trout in the Little Grass Valley dam and the upper Slate Creek diversion dam reaches, and estimating the numbers of fry that are needed to attain density and biomass levels observed in streams surrounding the project area.

South Feather developed and implemented a study in consultation with the agencies to assess the potential for entrainment losses to affect fish populations in the project area. The study focused on rainbow and brown trout, and included a literature review, a review of the likelihood of entrainment based on the physical characteristics of each intake, and an assessment of trout populations upstream and downstream of each intake. Although it is likely that some fish are entrained into each of the intakes and that some fish are killed during turbine passage, the results of South Feather's literature review and analysis indicate that entrainment potential at two of the three intakes may be limited. The entrainment potential at the Sly Creek reservoir power tunnel intake is probably reduced by the depth of the intake, and the potential for entrainment into the intake to the Woodleaf power tunnel in Lost Creek reservoir is limited by the relatively low water velocity at the trashrack. Although the Forbestown power tunnel intake may have a greater potential to entrain fish than the intakes in Sly Creek and Lost Creek reservoirs, the relatively high average biomass of trout in the SFFR/Lost Creek reach upstream of the Forbestown diversion indicates that entrainment is not having a substantial adverse effect on the trout population upstream of the diversion.

Construction of effective fish screening facilities at each diversion as recommended by Cal Fish & Game would minimize entrainment mortality, and would likely provide some benefit to trout populations. However, construction of an effective screening facility at Slate Creek is probably not feasible given the stream's high sediment load, which has filled in most of the diversion pool.

While we recognize the limited entrainment potential at the project intakes, implementing the wild fish supplementation program specified by the Forest Service and supported by South Feather would serve to augment fish populations in any reaches where entrainment losses may be limiting recruitment to levels that are not adequate to meet the carrying capacity of available habitat. Using population assessment data to guide the stocking program would ensure that stocking only occurs in reaches and years when trout populations have been affected. We also recommend that South Feather file annual reports on its stocking program. The report should include the population data that is used to assess stocking needs and the numbers of fish stocked at each location. We estimate that screening the project diversions as recommended by Cal Fish & Game would have an annualized cost of about \$3,041,100, while implementing the Forest Service's revised 4(e) measure would provide a comparable benefit to trout populations with an annualized cost of \$15,900. Because it would provide a comparable benefit at a much lower cost, we recommend implementing the wild trout stocking measure specified by the Forest Service.

Fish Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan a plan to monitor fish populations at eight sites in the project-affected bypassed reaches, in consultation with the Forest Service and other interested governmental agencies. Fish surveys would be conducted in two successive years and begin in the fifth full year after implementation of new license streamflows. Fish surveys would be conducted in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach, or at a frequency jointly agreed to by the agencies. If sampling is scheduled in years with high peak flows, the survey may be postponed by 2 years to avoid confounding effects of high peak flows on fish recruitment and populations. South Feather indicated in its reply comments that it fully supports all of the Forest Service revised 4(e) conditions, including the fish monitoring plan. Cal Fish & Game filed a similar plan, but it did not include a provision to defer sampling in high flow years, and it did include monitoring at all 11 sites sampled during South Feather's licensing studies.

Monitoring fish populations would assist with determining the effects of any changes in operation or other measures that are implemented in the new license, and with assessing whether any modifications or additional measures are needed. South Feather's analysis of fish population data indicates that fish populations can be substantially reduced during and following severe flood events. Postponing sampling by up to 2 years after a flood event as specified by the Forest Service would improve data consistency,

which would help to identify population effects associated with the measures or operational changes that are implemented in the new license.

In its reply comments, South Feather indicates that the smaller number of study sites specified by the Forest Service is more appropriate than the 11 sites recommended by Cal Fish & Game. South Feather reports that the sites that are not included in the Forest Service-specified plan include two sites that are dominated by warmwater fish, which are not an agency management priority, and one Lost Creek site that has been affected by local site disturbance and excessive angling pressure.

We estimate the annualized cost of the Forest Service and Cal Fish & Game fish monitoring plans at \$35,300 and \$48,500, respectively. Because fish monitoring would help to document the effectiveness of the new flow regime and whether or not it is having the intended effects on aquatic resources, we conclude that fish monitoring is worth the cost. Because deferring sampling in high flow years would provide a better assessment of the response of fish populations to the new flow regime and because of the limited benefit that would be provided by sampling at the three additional sites included under Cal Fish & Game's monitoring plan, we recommend implementing the Forest Service's fish monitoring plan.

Benthic Macroinvertebrate Monitoring

The Forest Service filed revised 4(e) conditions specifying that, within 1 year after license issuance, South Feather develop a plan, in consultation with the Forest Service and other interested governmental agencies, to monitor benthic macroinvertebrates in affected bypassed reaches. South Feather indicated in its reply comments that it fully supports all of the Forest Service revised 4(e) conditions, including the benthic macroinvertebrate monitoring plan. The plan specified by the Forest Service would involve conducting surveys in the same years as fish population monitoring (years 5, 6, 11, 12, 17, 18, 23, 24, and 29).

Cal Fish & Game recommends a benthic macroinvertebrate monitoring plan that is identical to the Forest Service plan, except that sampling would be conducted in years 1 through 4 and in years 8, 12, 16, and 24, unless an alternative monitoring schedule is approved in consultation with the agencies. In addition, Cal Fish & Game recommends that South Feather follow the most recent Cal Fish & Game protocols for sampling benthic macroinvertebrate species composition and abundance.

We estimate the annualized cost of the Forest Service and Cal Fish & Game benthic macroinvertebrate monitoring plans at \$23,500 and \$44,700, respectively, assuming that both plans would include monitoring the same number of sites that each agency recommended for fish monitoring (8 sites for the Forest Service and 11 sites for Cal Fish & Game). Similar to fish monitoring, benthic macroinvertebrate monitoring would assist with determining the effectiveness of measures implemented in the new license for enhancing trout populations, and we conclude that the benefits of implementing a benthic invertebrate monitoring plan are worth its costs. 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, which would improve understanding of the effects of implemented measures on aquatic productivity. Using the same sampling procedures over time would ensure that comparable data are collected over the period of monitoring, and would avoid any confounding effects that may result from any changes in Cal Fish & Game's sampling protocols. Because of these added benefits, we recommend adopting the plan as specified by the Forest Service.

Terrestrial Resources

Noxious Weeds

Project operation may potentially affect vegetation through the introduction and spreading of noxious weed species. Any O&M activities that disturb soil or remove existing vegetation could increase the spread of noxious weeds and would have a direct effect on vegetation. Potential indirect project effects could come from recreational users that spread noxious weed seeds or other regenerative plant materials from colonized to non-colonized areas.

South Feather proposes several measures to prevent and control the spread of noxious weeds on National Forest System lands within the project boundary. South Feather also would implement control measures where contiguous populations continue on National Forest System lands outside of the project boundary, as long as the majority of the treated area is on project lands. The measures proposed by South Feather include training staff to recognize noxious species, monitoring populations, sharing information on new populations with the Forest Service, and implementing several best management practices aimed at reducing the spread of noxious weeds.

The Forest Service's final 4(e) condition is consistent with South Feather's proposed plan but also would require South Feather to (1) address both aquatic and terrestrial invasive weeds; (2) include protocols for locating, monitoring, and controlling weed populations; (3) include a public education program and facilities for public use to reduce the spread of aquatic species; and (4) provide information on noxious weed populations in a data format compatible with the Forest Service GIS database.

Implementing South Feather's proposed invasive weed and vegetation management plan would help to control current populations and future infestations of noxious weeds on project lands. The additional measures specified by the Forest Service would provide a more comprehensive level of control, help to address the spread of noxious weeds by recreational users, and improve information-sharing on the occurrence and spread of noxious weeds. Additionally, including Q-rated and any additional C-rated species for which the County Agricultural Commissioner's Office has implemented additional control measures into the list of species managed as noxious weeds would further minimize project effects on vegetation. We estimate that South Feather's proposed plan would have an annualized cost of \$7,600, and that the expanded plan

specified by the Forest Service would have an annualized cost of \$9,800. Because it would improve the control of noxious weeds at a reasonable cost, we recommend adopting the plan as specified by the Forest Service.

Foothill Yellow-legged Frog

South Feather proposes several measures to minimize effects on FYLF including implementing minimum flows that take into consideration FYLF habitat needs and avoiding high pulse flows during critical time periods. South Feather proposes to avoid the release of controlled high flows during the FYLF breeding season, which it defines as starting on April 15 or when water temperatures reach 13°C (whichever is later) and extending until October 31.

South Feather filed an alternative 4(e) condition that would include both full reach and representative reach surveys to determine whether FYLF populations change as a result of changes in project operations. The full reach surveys would be conducted in the first year after relicensing and then every 10 years, and would include all reasonably accessible FYLF habitat in the SFFR/Lost Creek, Forbestown, and Slate Creek reaches. Representative surveys would be conducted at one site within each of the three reaches once every 10 years starting on the fifth year after relicensing.

The survey methods described in South Feather's alternative 4(e) condition would be similar to those used for the re-licensing studies. The surveys would consist of visual encounter surveys for counts of egg masses, tadpole groups, and young-of-year frogs. The full reach surveys would document the overall distribution of FYLF in each reach and detect shifts in the spatial distribution of FYLF in relation to project effects.

Based on the results of these surveys, South Feather would evaluate project effects on FYLF. If adverse project-related effects are evident, South Feather would recommend studies targeted on ramping rates, water temperatures, population viability, or other appropriate studies to determine the mechanisms of these adverse effects. South Feather would then use the results of these targeted studies to identify appropriate mitigation measures.

Cal Fish & Game recommends that South Feather develop a FYLF monitoring plan that would include annual monitoring surveys of FYLF adult, tadpole, and egg mass numbers in the SFFR/Lost Creek reach, Forbestown diversion dam reach, and the Slate Creek diversion dam reach. for the first 10 years after relicensing, followed with similar surveys every 5 years for the remainder of the license.

In its final 4(e) conditions, the Forest Service expanded the scope of its amphibian monitoring plan to include all six project reaches. The specified sampling would include full reach surveys reaches in year 1 and every ten years thereafter, supplemented with representative surveys in years 2-6 and once every 4 years thereafter. In addition to these visual encounter surveys, Forest Service prescribes that South Feather collect data to support population viability analysis, temperature influence on development rates, and habitat monitoring.

The Forest Service also specifies and Cal Fish & Game recommends that South Feather conduct video surveys to identify areas of vegetation channel encroachment in the fourth year after license issuance to be repeated every 10 years. South Feather would conduct the surveys by helicopter along the South Fork diversion dam and Forbestown diversion dam reaches and identify up to three segments within the South Fork diversion dam reach and up to five segments in the Forbestown reach where vegetation is encroaching into the channel. South Feather would then treat these reaches with vegetation removal measures, and evaluate the effectiveness of the treatments every 5 years to determine if conditions would warrant another treatment.

The increased flows specified by the Forest Service and proposed by South Feather are designed to improve trout habitat and provide for whitewater recreation. On the other hand, these flows also have the potential to affect FYLF by reducing water temperature and changing channel morphology. Proposed flow increases would alter the existing hydrograph in stream channels downstream from project facilities. Low flows reduce available habitat and can increase mortality of egg masses and tadpoles stranded in dry areas, while high flows and rapid changes in flow can wash egg masses, tadpoles, and adults downstream to unsuitable habitat.

The flows proposed by South Feather in its license application and in its alternative 4(e) condition are not as high as the Forest Service specifications, and therefore would have less potential to disrupt FYLF habitat and breeding patterns. South Feather's proposal to avoid high flow releases during FYLF breeding periods would reduce the potential displacement of egg masses, tadpoles, and adults to unsuitable habitat. Following the Forest Service-specified methodology to map suitable habitat and identify appropriate ramping rates for each water year type would further reduce the potential for displacement during flow increases and the potential for stranding during flow decreases.

While these protection measures are expected to limit effects on FYLF, continued monitoring would help to ensure they are effective and that new project operations do not detrimentally affect this species. We note that in the draft EIS, we did not recommend adopting all of the amphibian monitoring provisions included in the Forest Service's preliminary 4(e) Condition No. 19, part 2 in the licenses, finding that developing a population model, monitoring habitat, and determining effects of temperature on FYLF development were not needed to determine project effects and were not worth the estimated costs of these measures. In its final 4(e) condition, Forest Service explicitly defines the data collection methods South Feather would use to support the evaluation of project effects on population dynamics, habitat abundance, and development rates. The specified methodologies would be conducted concurrently with other survey efforts, would not require South Feather to develop a population model, and would not require extensive, controlled laboratory studies.

In addition, the data collection specified by the Forest Service to support population viability models, physiological studies related to water temperature, and

monitoring of changes in geomorphology are necessary to determine the presence of project-related effects. We consider Forest Service's prescribed approach to be cost effective, while providing accurate data needed to ensure the project does not have adverse effects on FYLF. Additionally, South Feather's riparian encroachment study indicates that riparian vegetation is present within the active channel in some locations, but is limited in extent. The studies indicate the timing and intensity of high flows over the time frame of the current project license have largely controlled vegetation encroachment through channel scour. As such, we conclude that implementing treatments to remove riparian vegetation as specified by the Forest Service would be premature. We conclude, however, that helicopter surveys over the South Fork diversion dam and Forbestown diversion dam reaches, as recommended by Cal Fish & Game and specified by the Forest Service, would assist with identifying areas of potential riparian encroachment and with guiding ground-level assessment of effects of encroachment on FYLF habitat, and should be incorporated into the FYLF survey protocol. If monitoring results indicate that encroachment is affecting FYLF, then treatment to remove riparian vegetation may be considered at that time. These measures would maintain or enhance the physical and biological characteristics of riparian areas to ensure their continued ecological functions; which is an overarching goal of the Plumas National Forest Management Plan.

We estimate that this approach would have an annualized cost of \$108,700 (\$93,700 for visual encounter surveys and \$15,000 for additional data collection that would occasionally occur simultaneously with these surveys). Our recommended approach would assist with determining the effectiveness and possible refinement (if needed) of measures implemented to protect FYLF, and would address multiple components of FYLF life history and habitat requirements. Therefore, we conclude that these benefits warrant the costs of this measure.

Controlling the rate of flow and stage changes during critical time periods would limit the potential for mortality of early lifestages of FYLF. South Feather has proposed to stop the release of high pulse flows during periods of FYLF breeding activity. In addition, we recommend that South Feather implement the methodology specified by the Forest Service to identify appropriate ramping rates to protect FYLF. The Forest Service methodology would identify velocity and stage-discharge relationships, and map available habitat at FYLF study sites for different water year types to determine appropriate ramping rates between low and high flows. We estimate that implementing the Forest Service's approach would have an annualized cost of \$10,200, and conclude that the benefits of this measure are worth this modest additional cost.

Recreation Resources

Replace and Rehabilitate Existing Recreation Facilities

South Feather proposes to develop and implement conceptual facility master plans for Little Grass Valley and Sly Creek reservoir recreation areas comprising an overall

conceptual plan that illustrates the layouts, locations, and relationships between existing facilities and proposed improvements. In addition, South Feather proposes to develop and implement individual site development plans and proposes site rehabilitation measures for each existing recreation facility within the existing project boundary, as discussed in section 3.3.5, *Recreation Resources*.

South Feather's proposal would allow the Forest Service and other stakeholders to have input in the development of these plans and would ensure the proposed measures would be implemented in a manner consistent with the Forest Service's management goals and other resource management plans at the project. Although coordination among the licensee, governmental agencies, and interested stakeholders is encouraged in developing and implementing the proposed recreation measures, the licensee is ultimately responsible for the construction, operation, and maintenance of the project's recreation facilities.

In addition to the facility master plans and individual site plans described above, South Feather's proposed capital improvements, including constructing a recreation access trail below Little Grass Valley dam and minor maintenance measures, such as replacing fire rings and improving parking, would improve existing facilities and increase public access at the project.

We estimate the annualized cost associated with implementing the facility master plans, the individual site rehabilitation measures, the minor maintenance measures, and the access trail (capital improvement) at \$78,000. Given the benefits identified above, we conclude that these benefits are worth the costs. We also recommend that the plans for the renovation or construction of new facilities include best management practices to minimize effects on sensitive resources and the potential for water quality degradation of adjacent water bodies.

South Feather's proposed development of facility master plans and individual site plans are consistent with the Forest Service's specified conditions, except they do not propose the additional Forest Service measures for public interpretive facilities, and measures to develop and implement a re-vegetation plan that would be submitted within 5 years of license issuance for all developed recreation facilities within the project boundary. The Forest Service also specifies that South Feather consult with the Forest Service and other appropriate agencies to ensure that the recreation rehabilitation and enhancements are consistent with the overall goals of other resource conditions and management plans required under the FERC license.

The re-vegetation plan would help to ensure that any disturbed areas resulting from implementation of the recreation enhancements are adequately mitigated through reestablishment of vegetation as necessary. Implementation of interpretive features would help to provide the means to enhance the public's knowledge and use of the recreation resources at the project. Therefore, we recommend these measures be adopted. The Forest Service additional measures would have an additional annualized cost of \$50,000, and we conclude that the benefits exceed the costs.

The Forest Service specified several additional capital improvement measures, including constructing a potable water well and providing a horse watering system at Horse Camp campground. Currently, there is no groundwater well at the project and no water for drinking or for horses at Horse Camp campground. Although South Feather proposes to upgrade the water systems, the Forest Service's proposed improvements to construct a groundwater well and implement a horse watering supply and distribution system would further improve existing facilities by providing a reliable source for drinking water to all recreation sites, including Horse Camp campground. Therefore, we recommend adopting these measures. We find that adding these components would have a negligible increase in the cost of South Feather's proposed water system upgrades.

The Forest Service also specified measures involving an OHV facility development. The proposed OHV site amenities would be associated with a potential new facility located near the Sly Creek Campground that is under consideration, but yet to be developed. We note that OHV use at the project is low and future demand is low for this type of activity. In addition, if the OHV site amenities were constructed this could stimulate increased OHV use in the project area, with associated increases in noise levels, exhaust emissions, and soil erosion. Therefore, we do not recommend these additional OHV measures specified by the Forest Service.

O'Rourke Outdoor Adventures recommends that South Feather implement rehabilitation and enhancement measures at several boat ramps and campgrounds at Little Grass Valley reservoir, as well as road maintenance measures around the project. South Feather's proposal to enhance and rehabilitate project recreation facilities includes all of O'Rourke Outdoor Adventures recommendations, with the exception of extending the boat ramps. Combined with its recent upgrades at the boat ramps, South Feather's proposal would adequately improve existing facilities and access to the project. In addition, the proposed road maintenance measures are located either on roads that are already maintained on a regular basis or are outside of the project boundary. Therefore, we do not see the need for the additional boat ramp enhancement measures or road maintenance recommended by O'Rourke Outdoor Adventures.

Maintenance and Operation of Recreation Facilities

South Feather's proposed draft operation plan for Little Grass Valley and Sly Creek reservoir recreation facilities provides specific guidelines for the operation and daily and annual maintenance of these project facilities. Implementation of the proposed plan would provide measures to help ensure that these facilities are adequately maintained over the term of a new license. We estimate the annualized cost of implementation of the proposed operation plan at \$278,700 and conclude the benefits are worth the costs.

Monitoring Recreation Use

South Feather's proposed recreation report, to be filed concurrently with the FERC Form 80 filings every 6 years, would provide periodic review of recreation facilities at

the project. The FERC Form 80 already requires facility capacity and demand to be reported every 6 years; however, South Feather's additional recreation report would determine trends of use, condition of facilities, parking capacity, and whether or not resource damage is occurring. South Feather proposes to conduct the recreation user survey every 18 years (every third filing of the Form 80) and recreation user preferences could change significantly over an 18-year timeframe. Conducting the recreation user survey every 12 years (every other filing of the Form 80) would provide the means for periodic review in a shorter timeframe, which would allow for enhanced assessment of the adequacy of public recreation facilities and access at the project. South Feather's proposed recreation monitoring measures and associated recreation reports are consistent with the Forest Service's specified condition that South Feather file a recreation use and facilities condition report; however, the Forest Service specifies in the final 4(e) conditions that South Feather conduct the recreation user survey every 6 years, rather than the staff recommendation of every 12 years. At this time, we determine that conducting and filing the recreation user survey report every 12 years, along with the filing of the Form 80 reports every 6 years, would provide the means for adequate monitoring of recreational use at the project over the term of a new license.

Both the recreational use report and the recreation user preference report would be submitted to the Commission for review and approval, which would provide the mechanism to help ensure that recreation facilities are provided to meet project needs and purposes over the term of a new license. Therefore, we are recommending South Feather's proposed measures for monitoring and reporting recreation use, with the modification of conducting the recreation user survey every 12 years, instead of 18 years. We estimate that the annualized costs for the recreation report that would be filed every 6 years to be \$10,000 and that the annualized cost of the recreation user survey monitoring would be \$5,600, and consider the benefits of these measures to be worth the costs.

Whitewater Boating Flows

South Feather proposes to provide a supplemental recreation streamflow into the Little Grass Valley dam reach, in all water years, from September 16 of each year until the date that Little Grass Valley reservoir elevation is drafted to 5,017 feet msl. We estimate the annualized cost of this measure to be \$13,000. South Feather also proposes to provide a supplemental streamflow, in the spring of Above Normal and Wet water years, downstream of the South Fork diversion dam for recreational purposes and to install a continuous water temperature monitor near the Woodleaf powerhouse that would allow flow releases to be stopped before the start of the foothill yellow-legged frog breeding. We estimate the annualized cost of this measure to be \$54,300, including an average annual reduction in power generation of 620 MWh. Similarly, South Feather proposes a supplemental streamflow in the spring during Above Normal and Wet water years at Forbestown diversion dam reach to improve opportunities for Class IV and V whitewater boating in the spring, and it proposes to install a continuous water temperature monitor near the Forbestown powerhouse. We estimate the annualized cost

for this measure would be \$34,600, including an average annual reduction in power generation of 308 MWh.

South Feather's proposed supplemental streamflows would provide for enhanced whitewater boating opportunities in project reaches during a time of year when whitewater boating is in high demand. The provision of supplemental flows in the fall season at Little Grass Valley dam reach would provide opportunities for increased whitewater boating during a period when alternative whitewater boating opportunities within the region are scarce. We conclude that the benefits associated with these measures outweigh the costs and recommend implementation of these measures. To ensure that adverse effects on FYLF breeding are avoided, we recommend that releases in the South Feather diversion dam and Forbestown diversion dam reaches be discontinued when water temperatures rise to 12°C.

Provision of Streamflow Information

Accurate and timely stream flow information is valuable information for recreational visitors planning water-related visits to the project. South Feather's proposed provision of streamflow information to the public would provide the means for the public to gain information regarding streamflow for specific stream reaches. This would allow the public to take better advantage of opportunities for public recreational use of these stream reaches; therefore we recommend implementation of this measure. We estimate the annualized cost for this measure to be \$2,500, and conclude that the benefits outweigh the costs.

Public Safety

Public information at key locations on Little Grass Valley and Sly Creek reservoirs provides area users with information on acceptable and prohibited activities, as well as dangerous or restricted areas. South Feather took over responsibility for installing safety buoys from the local county sheriff departments in 2002, and proposes to continue to install and maintain these buoys. This measure would continue to provide recreation visitors at the reservoirs with warnings regarding boat speed, dangerous areas, and other safety information, and would help to protect the safety of the public at Little Grass Valley and Sly Creek reservoirs. We recommend implementation of this measure and conclude the benefits are worth the estimated annualized cost of \$11,600.

Cultural Resources Management

Continued operation of the South Feather Power Project without adequate protection measures could adversely affect properties that are eligible for listing on the National Register. South Feather filed an HPMP for the purpose of protecting and interpreting historic properties with its license application. The Forest Service filed a 4(e) condition specifying that South Feather file a Forest Service-approved HPMP with the Commission within 1 year of license issuance. The HPMP would take into account project effects on National Register-eligible properties located on Forest Service lands,

provide measures to mitigate effects, and provide for a monitoring program and management protocols.

We find the HPMP adequately identifies the APE, describes the cultural resources inventories that were conducted within the APE, identifies existing project-related effects that could occur on potentially significant cultural resources, and provides general management measures to address these effects. The HPMP also provides procedures for handling unanticipated discoveries and the proper treatment of human remains and sacred objects, if they are encountered. The HPMP provides protocols for emergency undertakings, periodic reporting and meetings, and appropriate review and revisions of the HPMP based upon changing conditions over the period of a new license. However, our review of the HPMP reveals that it does not provide enough site-specific measures to ensure that project-related adverse effects on historic properties resulting from operation, maintenance, recreational, or other activities would be adequately addressed over the term of the new license.

We recommend that the HPMP include the following additional measures:

- a report on archaeological surveys conducted in the six project stream reaches within the APE;³⁴
- National Register evaluations on archaeological sites that have been or are being adversely affected by project-related erosion, especially the 10 archaeological sites located at the Little Grass Valley reservoir, and including any discovered during survey of the stream reaches;
- a provision for evaluation of project features that may become eligible for listing on the National Register during the term of any new license issued for the project; and
- a detailed discussion of Lost Creek dam, regarding the structure's National Register status,³⁵ and measures to address potential adverse effects to this potentially eligible structure as a result of project operations and maintenance activities.

³⁴ In some areas within the reaches, unsafe conditions may warrant using a stratified sample survey. Such sampling techniques are standard practice. Should a stratified survey be necessary, the California SHPO and the other involved parties should be consulted on the survey design prior to implementation of fieldwork to ensure that the APE will be adequately inventoried.

³⁵ Lost Creek dam may have significance under National Register criterion A because of its association with early 20th century development of irrigation and hydroelectric power (period of significance, 1920s-1930s) in California. Additionally, it may be eligible under National Register criterion C as an example of a constant arch dam designed by Laris Jorgensen, the inventor of this style of construction.

Implementation of the HPMP, with staff's additional measures, would ensure that adverse effects on historic properties as a result of project operation, maintenance, recreational, or other project-related activities would be addressed over the term of the new license. We anticipate that any new license issued for the project would include a condition to implement a PA executed among the Commission, the SHPO, and the Advisory Council, should the Council choose to participate. South Feather, the Forest Service, and others would be invited to sign the PA as concurring parties. The PA would include a measure to implement the HPMP.

We estimate that implementation of the protective measures proposed in South Feather's HPMP would have an annualized cost of \$20,300. We estimate that the additional measures that we list above would increase the annualized cost of measures included in the HPMP by \$72,910 to \$93,210. Considering the extent of cultural heritage that is present in the project area, we consider the benefits to cultural resources to be worth the costs.

Land Use and Aesthetic Resources

Fire Prevention and Response Plan

The development of a fire prevention, response, and investigation plan as proposed by South Feather and specified by the Forest Service, as well as the fuel treatment/vegetation management plan specified by the Forest Service, would provide the means for South Feather to develop and coordinate fire management and prevention strategies with the Forest Service. The fire management and response plan also would provide the means for coordinating emergency response preparedness, reporting measures associated with fire management, and the investigation of fires on project lands. We estimate that that developing a fire prevention, response, and investigation plan would have an annualized cost of \$1,100, and that development of a fuel/vegetation management plan would have an annualized cost of \$2,100. 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 their costs.

Road Management

Some of the roads used to access project facilities for O&M purposes are Forest Service roads that are also used by the Forest Service for land management, and by the public for recreation. The road management plan specified by the Forest Service would help to improve road management throughout the project vicinity, protect natural resources, provide reasonable public access, clearly define maintenance responsibilities, assess road conditions, and enable an annual survey process. In addition, the road management plan would identify measures to ensure that safety, maintenance, and rehabilitation measures associated with project roads are addressed in a consistent manner and so as not to adversely affect environmental resources. We note that it is the Commission's practice to include in the project boundary only those roads used primarily

for project purposes. Therefore, the road management plan should clearly identify the roads either already within or proposed to be included in the project boundary that are necessary to access project facilities, including recreational facilities, and limit South Feather's responsibilities to those access roads or portions of roads that are used primarily for project purposes. We estimate that the annualized cost of developing and implementing the road management plan would be \$3,500, and we conclude that the benefits of this measure warrant the costs.

Visual Management Plan

Aesthetic resources can be affected by project facilities and operations. Recreation facilities and project facilities, such as project powerhouses and substation facilities, can dominate views, creating contrast with the natural landscape. The development and implementation of a visual resource protection plan, as specified by the Forest Service, prior to ground-disturbing activities on project lands located within the Plumas National Forest, would help to ensure such activities would not adversely affect aesthetic resources within the Plumas National Forest. We estimate an annualized cost of \$2,200 and recommend implementation of this measure.

General

Annual Consultation

The Forest Service specifies that South Feather consult with the Forest Service each year with regard to measures that are needed to ensure protection and utilization of the National Forest resources affected by the project. The date of the consultation meeting would be mutually agreed to by South Feather and the Forest Service but in general would be held 60 days prior to the beginning of the recreation season, and representatives from other interested agencies would be able to request to attend the meeting. The meeting would include: (1) the review of a status report regarding implementation of license conditions; (2) 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; (3) review of any non-routine maintenance; (4) any foreseeable changes to project facilities or features; (5) any necessary revisions or modifications to plans approved as part of this license; (6) 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 information about a species requiring protection; and (7) discussion of elements of current year maintenance plans, such as those for road maintenance.

Cal Fish & Game recommends that South Feather, in consultation with the agencies, develop and implement an adaptive management plan that would allow Cal Fish & Game and other interested agencies to recommend changes to project operation during the license term based on the results of biological monitoring. The plan would include a process for identifying whether changes to project operation including, but not

limited to, operation of fish screens, operation of a thermal control device, riparian vegetation management, ramping rates, and the amount and timing of flow releases from project features are required, and a mechanism for implementing those changes.

We estimate that implementing the Forest Service and the Cal Fish & Game measure would both have an annualized cost of \$30,000. As we discuss in section 3.3.2, *Aquatic Resources*, 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 important environmental resources are protected, and we conclude that the benefits of this consultation would be worth its costs. Opening the meeting to all interested agencies and other parties would assist with interpretation of monitoring results, ensure that the full range of effects of any changes in operation or measures are fully considered, and accomplish the goals of Cal Fish & Game's adaptive recommended adaptive management plan. Any changes to license conditions that are warranted based on monitoring results could be implemented via the Commission's standard license amendment or reopener processes.

5.3 UNAVOIDABLE ADVERSE EFFECTS

The continued operation of the project would result in some minor unavoidable adverse effects on geologic, soil, and geomorphic resources. These could include some minor continued erosion associated with project operation and renovation of recreational facilities and interruption of sediment transport at project reservoirs. Most of these effects would be reduced by proposed resource enhancement measures, including: (1) preparation and implementation of an erosion and sediment control plan, (2) passage of LWD at Lower Grass Valley and Sly Creek dams, (3) provision of geomorphic flows in the Lost Creek below Sly Creek dam, and (4) sediment pass-through activities at Slate Creek diversion dam.

Under the proposed action, the continued operation of the project would continue to adversely affect some archaeological sites. The execution of a PA and implementation of the final HPMP with staff's additional measures would ensure proper protection and management of significant cultural resources within the project's APE and also would provide satisfactory resolution of any project-related adverse effects.

We have identified no other unavoidable adverse effects on resources influenced by project operation.

5.4 SUMMARY OF SECTION 10(J) RECOMMENDATIONS AND 4(E) CONDITIONS

5.4.1 Recommendations of Fish and Wildlife Agencies

Section 10(j) of the FPA requires the Commission to include license conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and 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 the agency. If the Commission still does not adopt a recommendation, it must explain how the recommendation is inconsistent with Part I of the FPA, or other applicable law and how the conditions imposed by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife resources.

In response to the Commission’s ready for environmental analysis notice, issued February 14, 2008, Cal Fish & Game and NMFS filed letters providing comments and terms and conditions for the South Feather Power Project, pursuant to section 10(j). Table 5-2 summarizes the agency recommendations made under section 10(j), as well as whether the recommendations are adopted under the staff alternative.

Table 5-2. Analysis of fish and wildlife agency section 10(j) recommendations for the South Feather Power Project. (Source: Staff)

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
1. Implement Cal Fish & Game’s recommended minimum flows	Cal Fish & Game	Yes	\$2,432,300	No, adopt South Feather’s alternative 4(e) flows instead
2. Develop ramping rates to protect FYLF within 5 years after license issuance	Cal Fish & Game	Yes	\$10,200	Yes
3. Implement selective withdrawal at Little Grass Valley reservoir	Cal Fish & Game	Yes	\$295,200 ³⁶	No, trout populations not adversely affected

³⁶ Our cost estimate for this measure in the draft EIS was based on a selective withdrawal structure sized to pass minimum flows of up to 50 cfs. We revised our estimate to account for construction of a larger structure to accommodate higher flow releases of up to 200 cfs that occur during the summer period when releases are increased to meet downstream consumptive water requirements.

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
4. Screen diversions at the South Fork diversion, Slate Creek diversion, and the Woodleaf powerhouse intake	Cal Fish & Game	Yes	\$3,041,100	No, adopt Forest Service's wild fish stocking program instead
5. Take all reasonable actions to assure conformance with water temperatures specified in the Oroville Settlement Agreement	Cal Fish & Game	Yes	\$606,400	No, recommend developing plan in consultation with DWR, NMFS, and Cal Fish & Game to monitor and provide information on water temperatures, flows, and reservoir levels to assist DWR with flow management decisions
6. Maintain water levels in Little Grass Valley and Sly Creek reservoirs as high as possible to protect beneficial uses of the reservoirs, while recognizing the need for protection of ecological resources, power production, and consumptive water supply	Cal Fish & Game	No, not a specific fish and wildlife measure; measure is intended to provide boating access	\$0	Yes, the minimum flow regime adopted by staff maintains Little Grass Valley reservoir at levels equal to or higher than Cal Fish & Game's proposed flow regime
7. Develop and implement an aquatic biological monitoring plan	Cal Fish & Game	Yes	\$30,000	Yes

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
8. Monitor fish populations in 2 successive years every 5 years in all affected bypassed reaches	Cal Fish & Game	Yes	\$48,500	No, we adopt the monitoring plan specified by the Forest Service instead
9. Develop and implement a FYLF monitoring plan	Cal Fish & Game	Yes	\$66,900	Yes
10. Monitor benthic macroinvertebrates in affected bypassed reaches in years 1 through 4 and every 4 years thereafter	Cal Fish & Game	Yes	\$44,700	No, we adopt the monitoring plan specified by the Forest Service instead
11. Monitor water temperatures at seven locations and provide monitoring results in a technical report within 6 months following each monitoring season	Cal Fish & Game	Yes	\$8,700	Yes, but we recommend that the specific sites to be monitored by selected in consultation with DWR, NMFS, and Cal Fish & Game
12. Riparian vegetation monitoring and treatment	Cal Fish & Game	Yes	\$2,400	Yes, but treatment would be implemented only if warranted based on the results of FYLF monitoring
13. Develop and implement a bat management plan	Cal Fish & Game	Yes	\$1,000	Yes

Recommendation	Agency	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
14. Monitor and maintain in functioning condition bridges, culverts, and exit ramps designed to provide wildlife crossing points or escape from the above-ground portion of the Miners Ranch conduit twice annually prior to the spring and fall migration season for local deer populations	Cal Fish & Game	Yes	\$10,500	Yes
15. Implement ramping rate of 0.5 foot/hour	Cal Fish & Game	Yes	\$0	Yes
16. Monitor water temperatures at the Kelly Ridge Power Plant intake and cease operation when temperatures exceed specified targets	NMFS	Yes	\$1,002,000	No, recommend developing a plan in consultation with DWR, NMFS, and Cal Fish & Game to monitor and provide information on water temperatures, flows and reservoir levels to assist DWR with flow management decisions

The Commission staff makes a preliminary determination that six of the recommendations by Cal Fish & Game and one recommendation by NMFS may be inconsistent with the purpose and requirements of the FPA or other applicable law. We also consider one of Cal Fish & Game's recommendations to be outside of the scope of section 10(j) of the FPA.

We do not recommend adopting Cal Fish & Game's recommended minimum flow regimes for the Little Grass Valley dam, South Fork diversion dam, Slate Creek diversion dam, Lost Creek dam, and Forbestown diversion dam reaches. Our analysis in sections 3.3.2.2 and 5.2 indicates that South Feather's alternative 4(e) flows, which we adopt in the staff alternative, would provide a substantial level of enhancement of trout populations over current license conditions, and that the additional habitat gains that would be provided by Cal Fish & Game's recommended flows are relatively small in comparison to the additional amount of water that would need to be released. We also identified several potential adverse effects associated with the higher minimum flows recommended by Cal Fish & Game, including increased drawdown of Little Grass Valley reservoir and reduced suitability of water temperatures for FYLF in the South Fork diversion dam and Lost Creek dam reaches and for hardhead in the Forbestown diversion dam reach. Lastly, we estimate that implementing the minimum flows recommended by Cal Fish & Game would reduce generation by 33,636 MWh, and would cost \$873,600 more than the flows that we adopt in the staff alternative. Because of the additional reduction in energy generation, adverse temperature effects on trout and aquatic productivity in the Little Grass Valley dam and Lost Creek dam reaches, on hardhead in the Forbestown diversion dam reach, on FYLF habitat in several reaches, and on water levels in Little Grass Valley reservoir, we find that Cal Fish & Game's recommended minimum 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.

We do not recommend adopting NMFS' recommendation to cease power generation at Kelly Ridge powerhouse when the temperature at Kelly Ridge powerhouse exceeds 56°F from October 1 to May 15, 63°F from May 16 to August 31 or 58°F from September 1 to September 30, or Cal Fish & Game's recommendation that South Feather take all reasonable actions (including curtailing releases from the Kelly Ridge powerhouse) to assure conformance with water temperatures specified in the Oroville Settlement Agreement. Our analysis in section 3.3.2 suggests that Kelly Ridge powerhouse releases do not result in appreciable increases in water temperatures of Oroville Project water at the downstream compliance points.

Furthermore, these measures would not by themselves necessarily achieve the desired temperature outcome. It is clear that DWR has several options for meeting its obligations under the Settlement Agreement through changes in Oroville Project operations using its own facilities, including releasing more cold water from Lake Oroville or limiting pumpback operations. However, knowledge of the temperature and quantity of Kelly Ridge releases into the upper portion of the diversion pool could help DWR more efficiently comply with downstream temperature objectives established in the Settlement Agreement to protect anadromous fish. Accordingly, we adopt a recommendation that South Feather consult with NMFS, DWR, and Cal Fish & Game to develop a temperature monitoring plan. We do not consider it to be reasonable to require South Feather to curtail its operations when there is no guarantee that such a curtailment would result in attainment of downstream water temperature targets, since that is

dependent on Oroville Project operation. Therefore, we have determined that NMFS and Cal Fish & Game's recommendations, which we estimate would have an annualized cost of \$1,002,000, and \$606,400, respectively, may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

We do not recommend adopting Cal Fish & Game's recommendation to implement selective withdrawal to control the temperature of water that is released from Little Grass Valley reservoir to more closely match the optimum temperatures for trout. Although our analysis in section 3.3.2 suggests that water temperatures below Little Grass Valley reservoir are below the optimum range identified in the literature for growth of rainbow trout, we noted that rainbow trout populations prosper in habitats with a very wide range of temperature regimes, and that fish population sampling conducted by South Feather indicates that trout populations downstream from Little Grass Valley reservoir are in good condition. Releasing warmer water from Little Grass Valley reservoir also would contribute to high water temperatures further downstream in the Forbestown diversion dam reach, which could adversely affect trout populations in that reach. Lastly, we estimate that implementing selective withdrawal at Little Grass Valley reservoir would cost approximately \$295,200 per year. Based on this information, we find that Cal Fish & Game's recommendation to implement selective withdrawal may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

We do not recommend adopting Cal Fish & Game's recommendation to install fish screens at the intakes at the South Fork diversion dam, Slate Creek diversion dam, and the Woodleaf powerhouse intake in Lost Creek reservoir. Our analysis in section 3.3.2 suggests that the number of fish entrained at the Sly Creek reservoir power tunnel intake is probably low due to the depth of the intake, and that the potential for entrainment into the intake to the Woodleaf power tunnel in Lost Creek reservoir is limited by the relatively low water velocity at the trashrack. Although the Forbestown power tunnel intake may have a greater potential to entrain fish than the intakes in Sly Creek and Lost Creek reservoirs, we concluded that the relatively high average biomass of trout in the SFFR/Lost Creek reach upstream of the Forbestown diversion indicates that entrainment is not having a substantial adverse effect on the trout population upstream of the diversion. We also conclude that construction of an effective screening facility at Slate Creek is probably not feasible given the stream's high sediment load, which has filled in most of the diversion pool. Lastly, the annualized cost of implementing Cal Fish & Game's recommendation to screen the project intakes would cost approximately \$3,041,100, about 200 times more than the estimated annual cost of \$15,900 to implement the Forest Service's revised 4(e) specification for a wild fish supplementation plan, which we conclude would provide a similar benefit. Based on this information, we find that Cal Fish & Game's recommendation to install fish screens at project intakes may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

We do not recommend adopting Cal Fish & Game's recommendation to conduct fish population monitoring at 11 sites in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 in each survey reach. Based on our analysis in section 3.3.2, we adopt the monitoring plan specified by the Forest Service instead, which would monitor 8 sites and defer sampling by up to 2 years after major flood events. Deferring sampling after a flood would provide better data on long-term population trends by avoiding sampling when populations may be depressed following severe high flow events. In its reply comments, South Feather indicated that the smaller number of study sites specified by the Forest Service is more appropriate than the 11 sites recommended by Cal Fish & Game, which included two sites dominated by warmwater fish, which are not an agency management priority, and one Lost Creek site that has been affected by local site disturbance and excessive angling pressure. Lastly, implementation of Cal Fish & Game's recommendation would cost approximately \$48,500, or \$13,200 more than the annualized cost of the monitoring plan specified by the Forest Service. Based on this information, we find that Cal Fish & Game's recommended fish monitoring 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.

We do not recommend adopting Cal Fish & Game's recommendation to conduct benthic macroinvertebrate monitoring, using its latest sampling protocols, at all affected reaches in years in years 1 through 4 and in years 8, 12, 16, and 24. Based on our analysis in section 3.3.2, we adopt the monitoring plan specified by the Forest Service instead, which would conduct monitoring in the same years and locations where fish population monitoring is conducted, and provide better information on the relationship between the abundance of benthic macroinvertebrates and the health of fish populations. In addition, using the same sampling protocol in all years would provide comparable data among years. Lastly, implementation of Cal Fish & Game's recommendation would cost approximately \$44,700, or \$21,200 more than the annualized cost of the monitoring plan specified by the Forest Service. Based on this information, we find that Cal Fish & Game's recommended benthic macroinvertebrate monitoring 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.

5.4.2 Forest Service 4(e) Conditions

In section 2.2.5.3, *Section 4(e) Federal Land Management Conditions*, we note that section 4(e) of the FPA, 16 U.S.C. §797(e), 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 may be included in a license issued by the Commission, regardless of whether we include the condition in our staff alternative.

In section 2.2.5.3 we identify seven Forest Service 4(e) conditions that we consider to be administrative or legal in nature and not specific environmental measures. We therefore do not analyze these seven conditions in our EIS. Table 5-3 summarizes staff conclusions with respect to the 4(e) conditions that we consider to be environmental measures. Of the twenty 4(e) conditions that we do not consider to be administrative or legal in nature, we include in the staff alternative all but two of these conditions. Our reasons for not including measures in the staff alternative are summarized in table 5-2 and are discussed in more detail in section 5.2, *Discussion of Key Issues*.

Table 5-3. Forest Service final 4(e) conditions for the South Feather Power Project.

Condition	Annualized Cost	Adopted?
1. Consult with the Forest Service on measures needed to ensure protection and utilization of the National Forest resources affected by the project. To include discussion of the status of measure implementation, the results of monitoring studies, routine and non-routine maintenance, foreseeable changes in project facilities, review of any necessary revisions or modification of plans included in the project license, and discussion of any measures that are needed to protect sensitive species or changes to existing management plans. [Condition No. 3]	\$30,000	Yes, modified to require consultation with FWS, Cal Fish & Game, the Water Board and any other interested agencies

Condition	Annualized Cost	Adopted?
<p>2. Maintain minimum streamflows in project reaches specified in tables A-1 through A-5 provided in the Forest Service filing. The minimum instantaneous 15-minute streamflow shall be at least 80 percent of the prescribed mean daily flow for those minimum streamflows less than or equal to 10 cfs and at least 90% of the prescribed mean daily flow for those minimum streamflows 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, licensee should begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release. [Condition No. 18, part 1]</p>	\$2,031,900	No, adopt South Feather's alternative 4(e) flows instead
<p>3. Determine the water year type for minimum flow compliance based on the DWR Bulletin 120 water year forecast except for the months of October through January, which should be based on the Department of Water Resources' Full Natural Flow record for the Feather River at Oroville. Provide notice to the Forest Service, Commission, and other interested governmental agencies of the final water year type determination within 30 days of making the determination.</p>	\$5,000	Yes
<p>The water year types are defined as follows: Wet = greater than or equal to 7.1 MAF; Above Normal = greater than or equal to 4.0 MAF but less than 7.1 MAF; Below Normal = greater than 2.4 MAF or equal to but less than 4.0 MAF; and Dry = less than or equal to 2.4 MAF. [Condition No. 18, part 2]</p>		

Condition	Annualized Cost	Adopted?
4. Develop an operating plan to manage drought conditions when they occur. [Condition No. 18, part 3]	\$1,600	Yes
5. Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflows. [Condition No. 18, part 4]	\$20,000	Yes
6. Develop and implement ramping rates that meet Forest Service targets for water velocity and stage changes to protect FYLF egg masses and tadpoles. [Condition No. 18, part 5]	\$10,200	Yes
7. Develop and implement a wild fish supplementation program to enhance fisheries in the SFFR, Slate Creek, and in Sly Creek and Lost Creek reservoirs. The basis for the amount of fish to be planted would be determined by reviewing age class distributions of rainbow trout in the Little Grass Valley dam and upper Slate Creek diversion dam reaches, estimating the numbers of fry needed to enhance rainbow trout production towards the density and biomass levels observed in streams surrounding the project area. [Condition No. 18, part 6]	\$15,900	Yes

Condition	Annualized Cost	Adopted?
<p>8. Develop and implement a fish population monitoring plan in affected project reaches to monitor fish species composition and relative abundance, including data on species size/age distributions and condition factors at eight of the locations previously established during the relicensing. Surveys would be conducted in two successive years and begin in the fifth full year after implementation of new license streamflows or at a frequency jointly agreed to by the agencies. [Condition No. 19, part 1]</p>	\$35,300	Yes
<p>9. Develop and implement an amphibian monitoring plan including monitoring of FYLF adult, tadpole, and egg mass numbers. In year 1, full reach surveys would be conducted in the Little Grass Valley dam, South Fork diversion dam, SFFR/Lost Creek, Forbestown diversion dam, Slate Creek diversion dam, and Lost Creek dam reaches and representative surveys would be conducted in these reaches in years 2-6, followed with representative surveys every 4 years and full reach surveys occurring every 10 years for the remainder of the license. [Condition No. 19, part 2.1]</p>	\$66,400	Yes
<p>10. Develop and implement a temperature monitoring protocol; an FYLF habitat monitoring protocol; and a protocol to determine relationships between discharge and velocity and discharge and stage at FYLF breeding sites, to be used in determining appropriate ramping rates. [Condition No. 19, part 2.2 through 2.4]</p>	\$12,360	Yes

Condition	Annualized Cost	Adopted?
11. Treat and monitor selected areas between the South Fork diversion dam and Ponderosa reservoir to reduce riparian encroachment. [Condition No. 19, part 3]	\$2,400	Yes, but treatment would be implemented only if warranted based on the results of FYLF monitoring
12. Develop and implement a benthic macroinvertebrate monitoring plan for affected bypassed reaches to be conducted in the same years as fish population monitoring, unless an alternative monitoring schedule is agreed upon with the agencies. [Condition No. 19, part 4]	\$23,500	Yes
13. Prepare a recreation facility master plan and site plans to include provisions to hold annual coordination meetings, to ensure consistency with other management plans, for re-vegetation measures for disturbed vegetation, for improving interpretive signs & kiosks, and to explore opportunities to extend paved or native trails to increase pedestrian connectivity. [Condition No. 20, part 1 and 2]	\$78,000	Yes, except for OHV parking and off-loading ramps at Sly Creek campground
14. Prepare, file and implement a fire prevention, response and investigation plan, including fuels treatment/vegetation management, prevention, emergency response preparedness, reporting, fire control/extinguishing. [Condition No. 21]	\$1,100	Yes
15. Develop and implement a fuel treatment/vegetation management plan. [Condition No. 22]	\$2,100	Yes

Condition	Annualized Cost	Adopted?
16. Develop and implement a Heritage Properties Management Plan, approved by the Forest Service, for the purpose of protecting and interpreting heritage resources. [Condition No. 23]	\$79,400	Yes
17. Annually review the current list of special status plant and wildlife species and implement a study on effects of the project on any newly added species if suitable habitat for the species is likely to occur on National Forest System lands and identify and implement resource measures where appropriate. [Condition No. 24]	\$21,600	Yes
18. Prepare a Biological Evaluation before taking actions that may affect Forest Service special status species on National Forest System lands, update and implement the Bald Eagle Management Plan, and develop and implement a bat management plan. [Condition No. 25]	\$1,500	Yes
19. Prepare and implement an invasive weed management plan to address both aquatic and terrestrial invasive weeds within the project boundary and adjacent to project features directly affecting National Forest System lands including roads, and distribution and transmission lines. [Condition No. 26]	\$9,800	Yes
20. Develop and implement a visual management plan within 60 days prior to any ground-disturbing activity on National Forest System lands. [Condition No. 27]	\$2,200	Yes

Condition	Annualized Cost	Adopted?
21. Develop and implement a road management plan. File with the Commission within 1 year of license issuance a road management plan after Forest Service approval of the plan. [Condition No. 28]	\$3,500	Yes

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, and conserving waterways affected by a project. Under this section, federal and state agencies filed numerous qualifying comprehensive plans, of which we identified 11 California and 6 federal that are applicable to the project. We have recommended numerous measures that are intended to maintain or enhance ecological functions, protect plant and wildlife resources, and provide recreational opportunities. The continued operation of the South Feather Power Project as recommended in this EIS is consistent with the 17 state and federal plans listed below that are applicable to the project.

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California Department of Fish and Game. Fish and steelhead restoration and enhancement plan. Sacramento, CA. May 20. 10 pp.

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- Plumas County. 1997. Plumas County General Plan. 2nd Edition, as amended. Plumas County Planning Department. Quincy, CA.

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