Office of
Energy
Projects

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FERC/EIS-0276

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE

Lassen Lodge Hydroelectric Project—FERC Project No. 12496-002–California

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

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FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Draft Environmental Impact Statement

Attached is the draft environmental impact statement (EIS) on the application for the proposed Lassen Lodge Project (FERC Project No. 12496), to be located on the upper South Fork Battle Creek in Tehama County, about 1.5 miles west of the town of Mineral, California. The project would occupy no federal land or Indian reservations.

This draft 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 of the applicant's proposal and alternatives for licensing the Lassen Lodge Project.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The draft EIS will be part of the record from which the Commission will make its decision. The draft EIS was sent to the U.S. Environmental Protection Agency and made available to the public on or about December 8, 2017.

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

Attachment: Draft EIS

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COVER SHEET

a.	Title:	Environmental Impact Statement for Hydropower License, Lassen Lodge Project—FERC Project No. 12496, California
b.	Subject:	Draft Environmental Impact Statement
c.	Lead Agency:	Federal Energy Regulatory Commission
d.	Abstract:	The Lassen Lodge Project would be located on upper South Fork Battle Creek and non-federal land in Tehama County, about 1.5 miles west of the town of Mineral, California. Rugraw, LLC (Rugraw), proposes to construct a diversion dam, intake structure, fish screen, pipeline, penstock, powerhouse, substation, switchyard, four multipurpose areas, transmission line, and two project access roads from California State Route 36 to the diversion dam and to the powerhouse. The 8-foot-high, 2-foot-wide, and 63-foot-long diversion dam would be located at river mile 23, approximately 0.5-mile upstream of the Old State Highway Route 36 Bridge, creating a 0.4-acre impoundment. The 50- by 51-foot powerhouse would contain a single, multi-jet, vertical Pelton-type turbine and would be closed-coupled to a synchronous generator with a capacity of 5.0 megawatt, with proposed average annual generation of 25,000 megawatt-hours. The staff's recommendation is to license the project as proposed by Rugraw with some modifications and additional measures.
e.	Contact:	Kenneth Hogan Federal Energy Regulatory Commission Office of Energy Projects 888 First Street, N.E. Washington, D.C. 20426 (202) 502-8434
f.	Transmittal:	This draft environmental impact statement on an application to construct and operate the Lassen Lodge Hydroelectric Project is being made available for public comment on or about December 8, 2017, as required by the National Environmental Policy Act of 1969[1] and the Commission's Regulations Implementing the National Environmental Policy Act (18 C.F.R., Part 380).

[1] National Environmental Policy Act of 1969, amended (Pub. L. 91-190, 42 U.S.C. 4321–4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, §4(b), September 13, 1982).

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FOREWORD

The Federal Energy Regulatory Commission (Commission), pursuant to the Federal Power Act (FPA)[2] and the U.S. Department of Energy Organization Act[3] is authorized to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric development subject to its jurisdiction, on the necessary conditions:

"That the project adopted…shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)…"[4]

The Commission may require such other conditions consistent with the FPA and as may be found necessary to provide for the various public interests to be served by the project.[5] Compliance with such conditions during the licensing period is required. The Commission's Rules of Practice and Procedure allow any person objecting to a licensee's compliance or noncompliance with such conditions to file a complaint noting the basis for such objection for the Commission's consideration.[6]

[2] 16 U.S.C. §791(a)-825r, as amended by the Electric Consumers Protection Act of 1986, Pub. L. 99-495 (1986), the Energy Policy Act of 1992, Pub. L. 102-486 (1992), and the Energy Policy Act of 2005, Pub. L. 109-58 (2005).

[3] Pub. L. 95-91, 91 Stat. 556 (1977).

[4] 16 U.S.C. § 803(a).

[5] 16 U.S.C. § 803(g).

[6] 18 C.F.R. § 385.206 (2017).

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
7DADM	7-day average of the daily maximum
ABS	Above Old Highway 36 Bridge Station
Advisory Council	Advisory Council on Historic Preservation
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
Basin Plan	*Central Valley Regional Water Quality Control Board Basin Plan*
BLM	U.S. Department of the Interior, Bureau of Land Management
BMI	benthic macroinvertebrates
BMP	best management practice
BP	before present
California DFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
Commerce	U.S. Department of Commerce
Commission	Federal Energy Regulatory Commission
CVRWQCB	California Regional Water Quality Control Board, Central Valley Region
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
DPS	distinct population segment
DSMP	debris and sediment management plan
EFH	Essential Fish Habitat
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture, Forest Service
FPA	Federal Power Act
FR	Federal Register
FWS	U.S. Department of the Interior, Fish and Wildlife Service
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
kV	kilovolt
mg/L	milligrams per liter
mm	millimeters
msl	mean sea level
MW	megawatt

MWh	megawatt-hour
NAHC	California Native American Heritage Commission
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act
NMFS	U.S. Department of Commerce, National Oceanic and Atmospheric Association, National Marine Fisheries Service
NTU	nephelometric turbidity unit
PA	Programmatic Agreement
PG&E	Pacific Gas and Electric Company
PHABSIM	physical habitat simulation
project	Lassen Lodge Hydroelectric Project, FERC Project No. 12496
Reclamation	U.S. Bureau of Reclamation
RM	river mile
ROW	right-of-way
Rugraw	Rugraw, LLC
SD1	scoping document
SD2	revised scoping document
SHPO	State Historic Preservation Officer
SMP	salmonid monitoring plan
SPI	Sierra Pacific Industries
State Route 36	California State Route 36
SWPPP	stormwater pollution prevention plan
TCP	traditional cultural properties
µmhos/cm	micromhos per centimeter
U.S.C.	United States Code
USGS	United States Geological Survey
W3T	Water Temperature Transaction Tool
Water Board	California State Water Resources Control Board
WQC	water quality certification

EXECUTIVE SUMMARY

Proposed Action

On April 21, 2014, Rugraw, LLC (Rugraw), filed an application for a license with the Federal Energy Regulatory Commission (Commission or FERC) for the construction, operation, and maintenance of the proposed 5.0-megawatt (MW) Lassen Lodge Hydroelectric Project No. 12496-002 (project). The project would be located on upper South Fork Battle Creek in Tehama County, California, about 1.5 miles west of the town of Mineral. The primary purpose of the project is hydroelectric power generation. The project would occupy no federal or Indian reservations.

Project Description and Proposed Facilities

The proposed Lassen Lodge Project would include the following new facilities: (1) an 8-foot-high, 63-foot-long, concrete diversion dam located at river mile (RM) 23 of South Fork Battle Creek; (2) a 0.4-acre reservoir at a normal pool elevation of 4,310 feet mean sea level (msl); (3) an enclosed 17-foot by 25-foot concrete intake structure with two 5-foot by 12-foot trash racks; (4) a 20-foot by 59-foot control/fish screen structure attached to the intake; (5) a 48-inch-diameter, 7,565-foot-long, low-pressure pipeline and a 36-inch-diameter, 5,230-foot-long, high-pressure penstock; (6) a 50-foot by 51-foot powerhouse containing a single Pelton-type turbine and generator with an installed capacity of 5.0 MW; (7) a buried concrete box culvert discharging back to South Fork Battle Creek; and (8) transmission facilities. The project would bypass approximately 2.4 miles of South Fork Battle Creek (bypassed reach).

To transmit power from the generator, an underground conduit would be built to a new substation located about 500 feet away. Rugraw would connect the project to the grid by constructing a 12-mile-long, 60-kilovolt (kV) transmission line and a new switchyard adjacent to Pacific Gas and Electric Company's (PG&E) existing 60-kV Volta-South transmission line. No recreation facilities are proposed.

Project Operation

Rugraw proposes to operate the Lassen Lodge Project in a run-of-river mode, maintaining the water surface elevation within +/- 0.5 inch of the normal pool elevation. Rugraw proposes to release a minimum flow of 13 cubic feet per second (cfs) to the bypassed reach. Because the minimum hydraulic capacity of the project turbine would be 5 cfs, river inflows less than 18 cfs (minimum flow plus minimum hydraulic capacity of the turbine) would not be diverted to operate the project and instead would be released downstream into the bypassed reach. Rugraw would divert flows of 18 cfs and above for generation, up to the turbine's maximum hydraulic capacity of 105 cfs. River inflows greater than 118 cfs (minimum flow plus maximum hydraulic capacity of the turbine) would be released downstream into the bypassed reach. The project would generate approximately 25,000 megawatt-hours (MWh) of electricity annually.

Proposed Environmental Measures

Rugraw proposes the following environmental measures to protect or enhance environmental resources at the project:

Project Construction

- Limit land disturbance and vegetation clearing to those areas needed for construction. Delineate the limits of construction, work areas, and multipurpose areas with flagging, fencing, and/or stakes to prevent land-disturbing activities outside of construction areas.
- Stockpile natural topsoils and replace, regrade, and revegetate disturbed areas, in accordance with California forestry regulations and best practices, with native vegetation. Restore disturbed stream and riparian habitat to preconstruction conditions and with riparian plantings and/or seeding, where applicable, with approved seed mixes.
- Develop a stormwater pollution prevention plan (SWPPP) with measures to prevent storm-induced erosion and sedimentation during ground-disturbing construction activities, including:
    - Store spoils from project construction in areas that limit erosion of spoil material and prevent runoff into aquatic habitats.
    - Install cofferdams, silt fences, or other structures to isolate in-water work areas.
- Use existing roads to the maximum possible extent, constructing new access roads only when necessary; limit access roads to a width of 12 feet whenever possible; and surface permanent roads with gravel to a depth and quantity sufficient to maintain a stable road surface and minimize erosion and dust.
- Conduct in-water work activities between July 1 and October 15 when streamflows are low to protect water quality and aquatic resources.
- Maintain upstream and downstream fish passage at the project during construction by constructing the diversion structure in phases or by providing a temporary diversion culvert to allow fish to pass the site.
- Conduct biological monitoring during construction to ensure that measures to protect biological resources are implemented appropriately.
- Provide environmental training to construction staff regarding laws, regulations, and best management practices (BMPs) to protect threatened and endangered species and special-status plant species and their habitats.

- Conduct preconstruction surveys in all areas of suitable habitat for threatened and endangered and special-status plant species where surveys have not previously been conducted, and implement specified protection measures as necessary.
- Avoid streams, wetlands, and pond habitats to the extent possible during construction, and use existing stream and wetland crossings where possible.
- Implement the Noxious Weed Management and Revegetation Plan (filed on November 30, 2015), which includes measures to ensure weeds and non-native invasive vegetation do not reestablish at onsite disposal areas during project construction, with a proposed plan revision to include provisions for riparian plantings along disturbed portions of South Fork Battle Creek to provide overhanging vegetation.
- Map, evaluate, and quantify, by vegetation type, the vegetation that would be removed as a result of project construction.
- Conduct preconstruction surveys for migratory bird nests within 100 feet of any areas that will be disturbed during the typical nesting season of April 15 to July 31 to identify nest locations and their status.
- Restrict construction activities within 100 feet of any active migratory bird nests found during the preconstruction surveys.
- Conduct preconstruction raptor nest surveys in suitable habitat within 1 mile of any areas that will be disturbed during the appropriate nesting periods (January through August) to identify nest locations and their status.
- Determine and apply an appropriate buffer for restricting construction activities around any active raptor nests found during preconstruction surveys.
- Design and construct the transmission line in compliance with the Avian Power Line Interaction Committee (APLIC) guidance to reduce impacts to avian species (APLIC, 2006; 2012).
- Avoid ground-disturbing activity on or near talus[7] slopes to protect Sierra Nevada red fox and American pika.
- Avoid construction activity within or near potential bat roosting habitat, including rock crevices, cliffs, and snags.

[7] Talus slopes consist of loose rock eroded from cliff faces or rocky outcrops upslope. Vegetation is typically sparse or absent in these areas.

- Conduct surveys for juvenile and adult foothill yellow-legged frogs immediately prior to construction when in-water work would occur and relocate juvenile and adult foothill yellow-legged frogs found within the project reach and up to 500 feet downstream, outside the project construction area.[8]
- Avoid construction activities in riparian areas during the time that egg masses of foothill yellow-legged frogs are present (typically mid-April through mid-May); postpone construction around the immediate area where egg masses of foothill yellow-legged frogs are found until the eggs have hatched; avoid collection of rocks from in-water environments and minimize disturbance to pools and shallow runs between March 1 and August 31 to protect foothill yellow-legged frogs and their habitat.
- Develop a California red-legged frog protection plan to provide for and allow for California red-legged frogs in the project area to become reestablished and to be protected from manageable threats during construction.
- Reduce visual contrast where over-story vegetation is removed by thinning and removing trees from the edge of the right-of-way (ROW) to give a natural appearance, where possible.
- Use wood poles to support the project transmission line to blend with surrounding vegetation.

Project Operation

- Operate the project in a run-of-river mode, maintaining the water surface elevation within +/- 0.5 inch of the normal pool elevation.
- Provide a ramping rate that will not exceed 0.1 foot of stage change per hour as measured by a stream gage proposed to be located within the bypassed reach between the diversion structure and the Old State Highway Route 36 Bridge.[9]

[8] Although Rugraw did not define the term "project reach," we interpret this to be South Fork Battle Creek from the upper extent of the proposed reservoir to just downstream of the proposed tailrace discharge.

[9] On August 31, 2016, Rugraw filed a letter in response to the Water Board's preliminary conditions and California DFW's preliminary section 10(j) recommendations, filed on June 24, 2016, and June 15, 2016, respectively, adopting the agencies' preliminary recommended ramping rate, thereby amending the proposed ramping rate provided in the final license application.

- Monitor water temperature at the following locations: (1) the diversion/intake structure, (2) in the bypassed reach at Old Highway 36 Bridge, (3) within the bypassed reach just upstream of the tailrace, (4) the powerhouse tailrace, (5) downstream of the powerhouse in mixed flows from the bypassed reach and powerhouse tailrace, and (6) approximately 2.1 miles downstream of the powerhouse below Ponderosa Way Bridge.
- Discontinue project operation when the average daily stream temperature exceeds 20 degrees Celsius (°C), measured in the bypassed reach upstream of Angel Falls.
- Develop a debris and sediment management plan (DSMP) to include:
    - Annually sluicing sediments from the project's reservoir when natural flow at the diversion site exceeds 400 cfs.
    - An evaluation of sediment deposits in the reservoir in years where natural flows do not reach 400 cfs to determine if sluicing is needed and, if so, sluice at flows greater than 108 cfs (minimum instream flow of 13 cfs plus turbine design flow of 95 cfs).[10]
- Maintain a minimum instream flow of 13 cfs or inflow, whichever is less, in the bypassed reach to protect aquatic resources.
- Monitor stream flow at the following locations: (1) immediately downstream of the diversion dam, (2) in the bypassed reach just above the powerhouse tailrace, and (3) at the existing station below Ponderosa Way Bridge**.**
- Construct an upstream and downstream fish passageway and fish screen structure at the project diversion dam to ensure fish are able pass the diversion dam, and design the facilities in coordination with the California Department of Fish and Wildlife (California DFW) incorporating the National Marine Fisheries Service (NMFS) Southwest Region Fish Screening Criteria for Anadromous Salmonids and NMFS Northwest Region Anadromous Salmonid Passage Facility Design.
- Develop an anadromous fish monitoring program that includes the notification of resource agencies if anadromous species are found within the bypassed reach.

[10] The text associated with this proposal was edited by Commission staff for clarity, and reflects our interpretation of Rugraw's proposal.

- If steelhead are detected upstream of Panther Grade,[11] conduct genetic tissue sampling of steelhead/rainbow trout to identify barriers to upstream steelhead passage within the bypassed reach, and implement adaptive management strategies to address the potential barriers.
- Develop project operating rules and a monitoring program for when anadromous salmonids are present in the bypassed reach.
- Monitor fish behavior at the project's tailrace and modify the tailrace in the event fish attraction is observed.
- Develop an operations model for flow and water temperature.
- Develop a California red-legged frog protection plan to provide for and allow for California red-legged frogs at the project to become reestablished and to be protected from "manageable threats" during operations.
- Implement the HPMP filed on November 30, 2015.

Public Involvement

Before filing its license application, Rugraw conducted pre-filing consultation under the Commission's traditional licensing process. 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 prior to formal filing of the application with the Commission.

As part of the National Environmental Policy Act (NEPA) scoping process, we distributed a scoping document (SD1) to stakeholders and other interested parties on October 3, 2014. Two scoping meetings were held on November 5, 2014; a day-time meeting in Sacramento, California; and an evening meeting in Red Bluff, California. Based on comments made during the scoping meetings and written comments filed with the Commission, we issued a revised scoping document (SD2) on March 26, 2015. On April 25, 2016, we issued a notice that Rugraw's application for an original license for the Lassen Lodge Project was ready for environmental analysis, and requesting comments, terms and conditions, recommendations, and prescriptions.

Alternatives Considered

This draft environmental impact statement (EIS) analyzes the effects of the proposed project's construction and operation and recommends conditions for any license that may be issued for the project. In addition to Rugraw's proposal, we consider three alternatives: (1) no-action, whereby the project would not be licensed and constructed;

[11] Panther Grade is a falls-boulder cascade at RM 18.9 that is a commonly accepted barrier to upstream fish migration in South Fork Battle Creek at flows less than 400 cfs. However, it is unclear if Panther Grade is a barrier to upstream fish passage at flows greater than 400 cfs.

(2) Rugraw's proposal with staff modifications (staff alternative); and (3) the staff alternative with all mandatory conditions.

Staff Alternative

Under the staff alternative the project would include most of Rugraw's proposed measures, with the following modifications and additions.

Project Construction

- Modify the proposal to restore disturbed areas with native vegetation using only seed mixes recommended by California DFW.
- Modify the proposed SWPPP to include measures for controlling runoff from the construction sites, preventing material from contacting or entering surface waters, and use of washed riprap, rocks, and gravel adjacent to or in watercourses during construction.
- Develop a construction plan that incorporates the specific measures proposed for construction and file the plan with the Commission for approval.
- Develop a plan for monitoring turbidity and pH, and documenting observations of oily sheens and turbidity plumes during project construction.
- Modify the proposed Noxious Weed Management and Revegetation Plan to include provisions for the preconstruction treatment of existing non-native invasive plant populations on project land, additional reseeding and monitoring if restoration success criteria are not met by the end of the 2-year monitoring period, and measures to protect rare plant species from control measures targeting noxious weeds.
- Modify the proposed measure for restricting construction activities around active raptor nests to include consultation with California DFW in determining the appropriate buffer distance.
- Conduct preconstruction inspections for slender Orcutt grass, elderberry, and vernal pool habitat in areas of proposed ground disturbance that were not previously surveyed in 2013, and adjust the transmission line to avoid any areas where these species or habitats are found.
- Design and construct the transmission line with consideration given to the APLIC guidance to reduce impacts to avian species.[12]

[12] The Commission typically does not enforce regulations and/or guidelines issued by other entities.

Project Operation

- Modify the proposed DSMP to include consultation with the Water Board and California DFW during low-flow years to determine if the sluicing of sediments should occur at inflows less than 400 cfs.
- Monitor real-time stream flow at the following locations: (1) upstream of the project impoundment; (2) just downstream of the diversion dam; and (3) in the bypassed reach just upstream of Spring #4 influence.
- Provide a ramping rate that would not exceed 0.1 foot of stage change per hour as measured at the staff recommended streamflow monitoring gage located just downstream of the diversion dam.
- Develop a streamflow monitoring plan that includes Rugraw's proposed stream flow monitoring, as modified by staff,[13] and specifies the proposed monitoring locations, monitoring equipment and methods, and provisions for annual operation and compliance reports, to document compliance with any license requirements for flow and ramping rates.
- Develop a pesticide use plan that would include BMPs to manage the risk associated with pesticide application and use to protect water quality, Endangered Species Act- and California Endangered Species Act-listed species, and/or associated habitat in or downstream of application areas.
- Develop an aquatic invasive species monitoring plan that incorporates measures to help prevent the introduction and/or spread of aquatic nuisance species (flora and fauna) into the proposed project area, including construction BMPs, to prevent the spread of aquatic nuisance species (e.g., bullfrog).
- Develop an avian protection plan that incorporates Rugraw's proposed transmission line design and considers FWS's Avian Protection Plan Guidelines to reduce the risk of avian interactions with the proposed transmission line, and implement the plan throughout the term of the license.
- Develop a bald eagle and raptor management plan that considers FWS's National Bald Eagle Management Guidelines and includes the use of species-specific distance buffers, landscape buffers, seasonal restrictions, and additional recommendations to benefit raptors.

[13] Staff is recommending monitoring (1) upstream of the project impoundment, (2) just downstream of the diversion dam, and (3) in the bypassed reach just upstream of Spring #4 influence, instead of Rugraw's proposed locations (1) immediately downstream of the diversion dam, (2) in the bypassed reach just above the powerhouse tailrace, and (3) at the existing station below Ponderosa Way Bridge.

- Develop a special-status amphibian protection plan that includes the following provisions to protect foothill yellow-legged frog, Cascade frog, and California red-legged frog: (1) conduct preconstruction surveys for all life stages during the breeding season; (2) avoid construction activities in riparian areas when egg masses are present; (3) stop work and notify FWS if California red-legged frogs are observed during preconstruction surveys or during construction; and (4) relocate larval, juvenile, and adult foothill yellow-legged and Cascade frogs prior to construction activities to an area sufficiently upstream to prevent them from re-entering the construction area.
- Revise the HPMP filed on November 30, 2015, to include: (1) copies of any post-2014 tribal correspondence and consultation related to the identification of cultural resources and development of the HPMP to document full compliance with section 106; (2) a cultural resources interpretive element, such as installation interpretive signage at key viewing areas; (3) a detailed plan for annual monitoring of cultural resources within the APE that are eligible for listing on the National Register or have not yet been evaluated; (4) provisions for periodic review and revision of the HPMP; and (5) editorial corrections as specified in section 5.1.2 of this EIS.

The staff alternative does not include the Rugraw proposals regarding: maintaining the reservoir water surface elevation within +/- 0.5 inch of the normal pool elevation, monitoring water temperature at several locations within the project area, discontinuing project operation when the average daily stream temperature exceeds 20°C, providing upstream fish passage at the diversion dam during project operation, developing an anadromous fish monitoring program, genetic sampling for steelhead, and developing an operations model for flow and water temperature. The staff alternative also does not include the following five Water Board preliminary water quality certificate conditions: (1) development of a drought plan (preliminary condition 4); (2) annual consultation on current special-status species (preliminary condition 5); (3) development of a fish population monitoring plan (preliminary condition 11); (4) development of a fish habitat assessment plan (preliminary condition 12); and (5) development of an amphibian monitoring plan (preliminary condition 13).

Environmental Impacts and Measures of the Staff Alternative

The primary issues associated with constructing and operating the project are effects of project construction, operation, and maintenance on instream flows and water quality; loss of fish, botanical, and wildlife habitat; effects on aesthetics; and protection of cultural resources. The environmental effects of the staff alternative are described in the following section.

Geology and Soil Resources

Construction of the project would include land-disturbing activities associated with building the diversion dam and associated intake and fish screening structure, the pipeline and penstock, the powerhouse, and the transmission line and its substation. These activities would include instream excavation, vegetation removal, and other soil disturbance that would create the potential for erosion and could affect water quality. Rugraw's proposed measures to minimize the limits of disturbance; stockpile, replace, regrade, and revegetate topsoils; develop and implement an SWPPP; protect aquatic habitats from erosion; and use a gravel surface for permanent roads would limit the adverse effects of erosion on terrestrial and aquatic habitats. Staff's additional recommended measures for controlling runoff, provisions for preventing material from contacting or entering surface waters, and use of washed riprap, rocks, and gravel in areas adjacent to or in watercourses during construction would further protect aquatic habitats by preventing the discharge of fines to watercourses.

Aquatic Resources

Use of a cofferdam, silt fences, in-water construction window during low-flow periods, and similar BMPs would minimize the effect of increased turbidity on aquatic organisms during project construction because these measures would isolate construction areas from South Fork Battle Creek and would protect aquatic resources by limiting the spread of disturbed sediment in the creek. Implementing staff's recommended water quality monitoring during project construction would identify when construction activities adversely affect water quality and facilitate corrective action to be taken in a timely fashion to protect aquatic resources.

The proposed DSMP, which provides for the periodic sluicing of accumulated sediment from the project reservoir for the duration of a license term, would help to maintain downstream aquatic habitat diversity by maintaining sediment and gravel transport past the dam. Staff's recommended modification to the DSMP, which includes a consultation requirement with the Water Board and California DFW, to determine the need for sediment sluicing prior to sluicing at flows less than 400 cfs, would ensure the protection of aquatic and riparian habitats.

Staff's recommended pesticide use plan would limit the risk of contaminating surface waters in the project area during road maintenance and noxious weed control, and protect water quality and associated habitats in or downstream of application areas. Staff's recommended streamflow monitoring would document compliance with the recommended run-of-river operation and the minimum instream flow and ramping rate in the bypassed reach.

Staff's recommended minimum instream bypassed reach flow of 13 cfs would protect aquatic resources in the bypassed reach. In addition, implementing our recommended ramping rate would reduce the potential for stranding mortality downstream of the diversion dam and powerhouse.

Although anadromous fish do not currently have access to the project reach, maintaining upstream and downstream fish passage during construction of the project's powerhouse, tailrace, and diversion dam would allow resident species to egress the site and not be impacted by project construction. If ongoing anadromous fish restoration efforts in South Fork Battle Creek result in anadromous fish being able to access the project area during project construction, then maintaining fish passage during the construction period also would benefit these species. Operation of a fish screen at the project intake and downstream fish passage facilities at the diversion dam would provide effective downstream fish passage at the project's diversion. Monitoring of anadromous fish presence and behavior in the tailrace would help to determine if additional measures are needed to address tailrace attraction, improve upstream passage at potential impediments in the bypassed reach, or modify project operations if restoration efforts provide anadromous species with access to the project reach in the future.

Staff's recommended aquatic invasive species monitoring during project operation would identify the presence of invasive species and help to limit the spread of aquatic invasive species.

Terrestrial Resources

Construction of the project facilities would disturb existing vegetation and remove some wildlife habitat. Birds could collide with the project's transmission line and increase risk of injury and electrocution.

Multiple measures would reduce these effects by using biological monitors, training construction staff, clearly delineating work areas, and conducting preconstruction inspections to identify and protect sensitive resources. Conducting preconstruction sensitive plant inspections in areas not previously surveyed and proposed for disturbance would minimize risk to sensitive plants.

The proposed Noxious Weed Management and Revegetation Plan, with staff's recommended modification to continue reseeding and monitoring until success criteria are met, treat existing non-native plant populations in the project boundary, and protect rare plant species from control measures, would help to promote and protect habitat quality and native vegetation structure.

Rugraw proposes to construct the transmission line in accordance with current standards to minimize risk of avian collision and electrocution and provide protection buffers around any bald eagle and other raptor nests observed during preconstruction surveys. However, the specifics of the line design and protection buffer distances are unknown. Developing an avian protection plan and a bald eagle and raptor management plan as recommended by staff would ensure that the design and measures are appropriate for the project area, and appropriate nest buffers are implemented during project construction and during any vegetation maintenance activities along the transmission that may be necessary during the duration of the license.

Three special-status amphibian species could occur in the project area. Construction activities may cause injury or mortality and affect habitat for these species. Staff's recommended special-status amphibian protection plan would ensure that all life stages of the foothill yellow-legged frog, Cascade frog, and California red-legged frog are protected during project construction and operation. The plan would include measures to avoid disturbance to riparian habitats during the breeding season, and conduct preconstruction surveys to relocate juvenile and adult foothill yellow-legged frogs and Cascade frogs outside of construction areas.

Threatened and Endangered Species

No threatened or endangered anadromous fish currently occur in the project area, although critical habitat for the threatened Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley steelhead (*O. mykiss*) has been designated in the project area. Construction and operation of the proposed project may cause short-term increases in turbidity and alter the water temperature and flow regime in the project's bypassed reach. However, with the implementation of the staff-recommended measures to protect aquatic resources and habitats discussed above, the project may affect, but is not likely to adversely affect, designated critical habitat for the threatened Central Valley spring-run Chinook salmon and Central Valley steelhead.

We conclude that licensing the Lassen Lodge Project, as proposed with staff-recommended measures, would have no effect on slender Orcutt grass (*Orcuttia tenuis*), vernal pool fairy shrimp (*Branchinecta lynchi*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus)* because Rugraw's surveys did not identify these species or suitable habitat for these species on proposed project lands. The project would also have no effect on the California red-legged frog (*Rana draytonii*) because it has not been documented on proposed project lands, and the only potentially suitable habitat on proposed project lands is located in ponds that would not be affected by the proposed project. In addition, staff's recommended special-status amphibian protection plan would ensure that all life stages of the California red-legged frog are protected during project construction and operation, and support its re-establishment in the project area. Staff's recommendation to implement bullfrog control measures as part of the aquatic invasive species monitoring plan would reduce potential predation on California red-legged frog in the project area. The threatened Northern spotted owl (*Strix occidentalis caurina*) could occur in the project area. However, proposed project lands do not contain high-quality habitat or critical habitat for this species because of historical logging and other disturbances and lack of mature forest stands, but mixed conifer patches along Battle Creek may provide marginally suitable nesting habitat on the proposed project bypassed reach. We conclude that licensing the Lassen Lodge Project, as proposed with staff-recommended measures, is not likely to adversely affect the Northern spotted owl because any potential effects on suitable habitat during construction would be discountable, and proposed and recommended measures would limit potential effects of project construction and operation on this species.

Recreational Resources

The potential for the project to affect public recreation is minimal because the project would be located entirely on private land with limited access. As such, there are no proposed or recommended recreation measures.

Land Use and Aesthetics

Construction activities would be visible to the public, and construction equipment would be present along Manton School and Hazen Roads and would affect aesthetics in the area. Measures to restrict construction to designated areas, restore existing conditions where possible, use wood poles for the transmission lines and minimize road development would minimize the effects of the project on aesthetics and on forestry, rural development, and open space.

Cultural Resources

Project-related effects on cultural resources within the area of potential effects (APE) could occur from project construction, operation and maintenance, use and maintenance of project roads, and the mitigation measures associated with other environmental resources. Rugraw's HPMP includes measures that are consistent with most of the Advisory Council on Historic Preservation and Commission's 2002 guidelines. However, revising the HPMP to include additional staff-recommended measures would ensure that historic properties are protected over the license term. To meet section 106 of the National Historic Preservation Act requirements, the Commission intends to execute a Programmatic Agreement (PA) with the California State Historic Preservation Officer for the proposed project for the protection of historic properties that would be affected by project construction and operation. The terms of the PA would require Rugraw to address all historic properties identified within the project's APE through implementation of the revised HPMP.

No-action Alternative

Under the no-action alternative the project would not be constructed.

Conclusions

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

In section 4.2 of the EIS, we estimate the likely cost of alternative power for each of the two alternatives identified above. Our analysis shows that, during the first year of operation under the proposed action alternative, project power would cost $538,640, or $21.55/MWh more than the likely alternative cost of power. Under the staff alternative, project power would cost $465,050, or $18.60/MWh more than the likely alternative cost of power. Under the staff alternative with mandatory conditions, project power would cost $477,380, or $19.10/MWh more than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (25,000 MWh annually); (2) the 5.0 MW of electric capacity would come from a renewable resource that would not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by Rugraw, and additional modifications and measures recommended 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.

ENVIRONMENTAL IMPACT STATEMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

Lassen Lodge Hydroelectric Project
FERC Project No. 12496—California

1.0 INTRODUCTION

1.1 APPLICATION

On April 21, 2014, Rugraw, LLC (Rugraw), filed an application for an original license for the Lassen Lodge Project (project) with the Federal Energy Regulatory Commission (Commission or FERC). The 5.0-megawatt (MW) hydropower project would be constructed on the upper South Fork Battle Creek in Tehama County, California, about 1.5 miles west of the town of Mineral (figure 1-1). The project would occupy no federal land.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the proposed Lassen Lodge Project is to provide a source of hydroelectric power. Therefore, under provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to Rugraw for the project and what conditions should be placed on 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 (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing an original license for the Lassen Lodge Project would allow Rugraw to generate electricity at the project for the term of a license, making electrical power from a renewable resource.

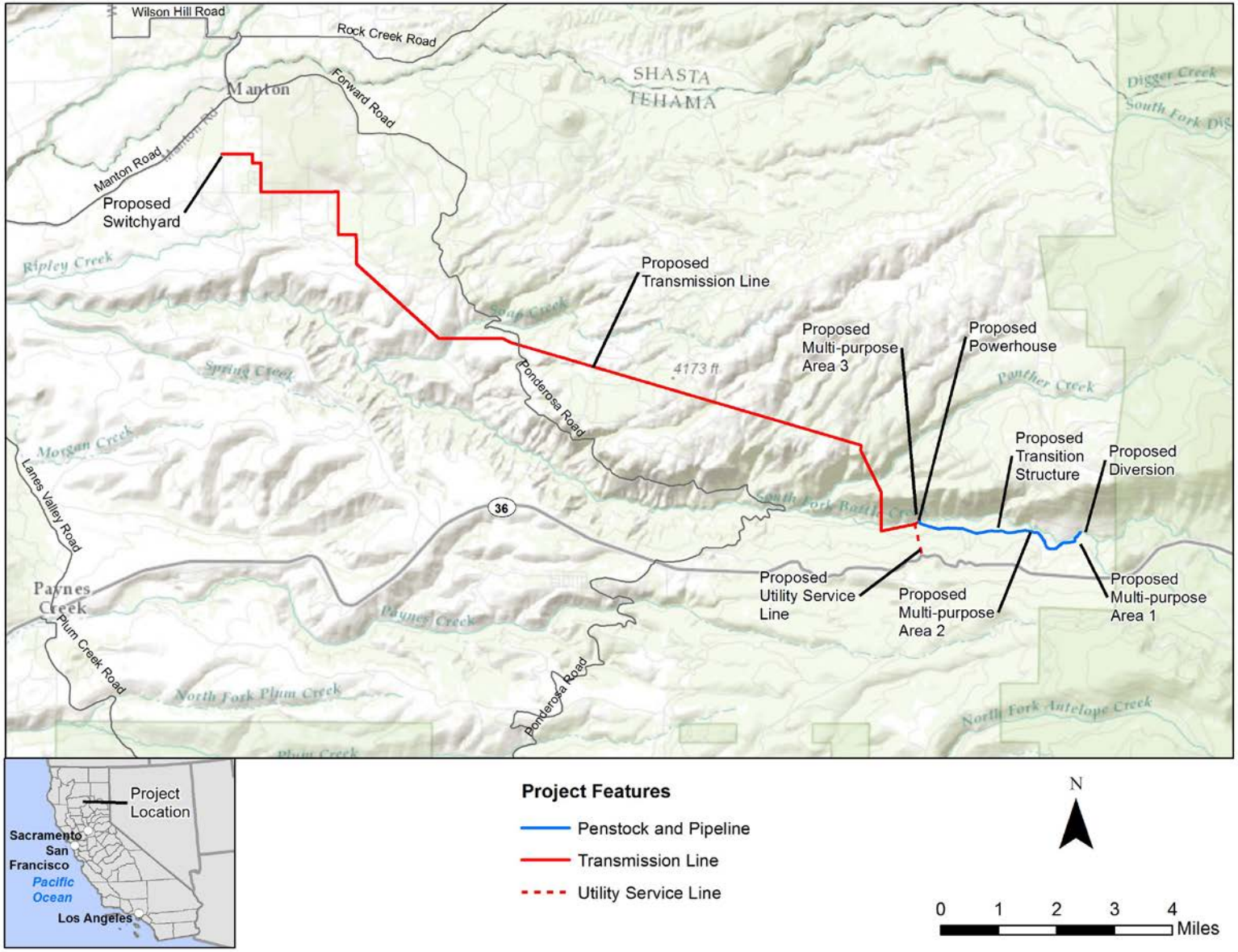


Figure 1-1. Lassen Lodge Project location and facilities layout (Source: Rugraw, 2015, as modified by staff).

This draft environmental impact statement (EIS) assesses the effects associated with construction and operation of the project and alternatives to the proposed project. It also includes recommendations to the Commission on whether to issue an original license, and if so, includes the recommended terms and conditions to become a part of any license issued.

In this EIS, we assess the environmental and economic effects of constructing and operating the project: (1) as proposed by Rugraw, (2) with our recommended measures, and (3) with any mandatory conditions prescribed by state and federal agencies. We also consider the effects of the no-action alternative, in which the project would not be licensed or constructed. Important issues addressed include effects of construction and operation on water quality; aquatic resources, including winter-, spring-, and fall-run Chinook salmon and steelhead; vegetation and wildlife; and cultural resources.

1.2.2 Need for Power

The Lassen Lodge Hydroelectric Project would provide hydroelectric generation to meet part of California's power requirements, resource diversity, and capacity needs. The project would have an installed capacity of 5.0 MW and generate approximately 25,000 megawatt-hours (MWh) per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. To assess the need for power, staff looked at the needs in the operating region in which the project is located. The Lassen Lodge Project is located in the California-Mexico subregion of the Western Electricity Coordinating Council. According to NERC's 2016 Long-Term Reliability Assessment, generating capacity is expected to drop from 49,628 to 47,210 MW from 2017 to 2026, and net internal demand is expected to drop slightly from 38,665 MW to 38,154 MW (NERC, 2016).

We conclude that power from the Lassen Lodge Project would help meet a need for power in the California-Mexico subregion in both the short and long term. Being a renewable resource, the project provides power that may displace generation from non-renewable sources. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Any license for the Lassen Lodge Project would be subject to numerous requirements under the FPA and other applicable statutes, as summarized 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 the U.S. Department of Commerce (Commerce) or the U.S. Department of the Interior (Interior). Commerce and Interior, by letters filed June 21, 2016, and June 24, 2016, respectively, request that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

1.3.1.2 Section 10(j) Recommendations

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

The California Department of Fish and Wildlife (California DFW), National Marine Fisheries Service (NMFS), and Interior timely filed, on June 16, 2016, June 21, 2016, and June 24, 2016, respectively, recommendations under section 10(j), as summarized in table 5-1, in section 5.3, *Recommendations of Fish and Wildlife Agencies*. In section 5.3, we also discuss how we address the agencies' recommendations and comply with section 10(j).

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act, a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the Clean Water Act. Rugraw initially applied to the California State Water Resources Control Board (Water Board) for section 401 water quality certification (WQC) for the Lassen Lodge Project on May 20, 2014, and subsequently each year since, has withdrawn and refiled its application. The Water Board received Rugraw's latest request on March 27, 2017, so the new deadline for certification action is March 27, 2018. However, by letter filed June 24, 2016, the Water Board provided preliminary terms and conditions in response to the notice of Ready for Environmental Analysis issued by Commission staff on April 26, 2016.

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. Four federally listed species may occur in the Lassen Lodge Project vicinity: the California red-legged frog (*Rana draytonii*), vernal pool fairy shrimp (*Branchinecta lynchi*), slender Orcutt grass (*Orcuttia tenuis*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus)* (letter from Patricia

Sanderson Port, Regional Environmental Officer, Interior, San Francisco, California, to K.D. Bose, Secretary, FERC, Washington, D.C., June 24, 2016). Although currently not found in the project area, there is the potential for the future occurrence of the listed Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), and California Central Valley steelhead (*O. mykiss*) if the Battle Creek Salmon and Steelhead Restoration Project is successful in removing downstream fish passage barriers to in South Fork Battle Creek, by approximately 2020 (letter from Steve Edmondson, Chief, FERC Branch, NMFS West Coast Region, Sacramento, California, to K.D. Bose, Secretary, FERC, Washington, D.C., June 21, 2016).[14] Our analyses of project impacts on threatened and endangered species are presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

We conclude that licensing the Lassen Lodge Project, as proposed with staff-recommended measures, would have no effect on slender Orcutt grass, vernal pool fairy shrimp, and valley elderberry longhorn beetle because Rugraw's surveys did not identify these species or suitable habitat for these species on proposed project lands. Prior to construction, Rugraw also would conduct additional inspections in all areas of proposed disturbance. If habitat for these species is detected, Rugraw would consult with the U.S. Department of the Interior, Fish and Wildlife Service (FWS) prior to construction. The project would also have no effect on the California red-legged frog because it has not been documented on proposed project lands, and the only potentially suitable habitat on proposed project lands is located in ponds that would not be affected by the proposed project. Although not mentioned in Interior's June 24, 2016, letter, the threatened Northern spotted owl (*Strix occidentalis caurina*) could occur in the project area. However, proposed project lands do not contain high-quality habitat for this species because of historical logging and other disturbances and lack of mature forest stands, but mixed conifer patches along Battle Creek may provide marginally suitable nesting habitat on the proposed project bypassed reach. Proposed project lands, however, do not contain critical habitat for this species. We conclude that licensing the Lassen Lodge Project, as proposed with staff-recommended measures, is not likely to adversely affect the Northern spotted owl because any potential effects on suitable habitat during construction would be discountable, and proposed and recommended measures would limit potential effects of construction on this species. Similarly, proposed measures to follow industry standards for design of the transmission line would minimize risk of collision and electrocution of

[14] The Battle Creek Salmon and Steelhead Restoration Project is a collaborative effort among Interior, the U.S. Bureau of Reclamation (Reclamation), PG&E, various resource agencies, and the public focused on restoring prime salmon and steelhead habitat downstream of the proposed project on Battle Creek, an area considered one of the most important anadromous fish spawning streams in the Sacramento River Valley (Jones & Stokes, 2005).

Northern spotted owl. Construction and operation of the proposed project may cause short-term increases in turbidity and alter the water temperature and flow regime in the proposed project's bypassed reach, but proposed erosion control measures during construction and implementing an instream flow during operation would protect designated critical habitat for Central Valley Chinook salmon and Central Valley steelhead. Therefore, the project may affect, but is not likely to adversely affect, this designated critical habitat.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 United States Code (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 project is not located within the state-designated Coastal Management Zone or the San Francisco Bay Conservation and Development Commission's jurisdiction. By letter dated February 15, 2017, and filed by Commission staff on February 16, 2017, the California Coastal Commission declined to assert federal consistency jurisdiction over the proposed Lassen Lodge Project. Therefore, no consistency certification is needed for the proposed action.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) 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 (TCPs), and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

To meet the requirements of section 106, the Commission intends to execute a Programmatic Agreement (PA) for the protection of historic properties from the effects of the construction and operation of the Lassen Lodge Project. The terms of the PA would ensure that the Rugraw addresses and treats all historic properties identified within the project's area of potential effects (APE) through implementation of a Historic Properties Management Plan (HPMP).

1.3.6 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with NMFS on all actions that may adversely affect Essential Fish Habitat (EFH). In the case of the Lassen Lodge Project, EFH consultation is required for Chinook salmon, because South Fork Battle Creek up to Angel Falls is

considered EFH. Because Angel Falls is located 1.7 miles upstream of the powerhouse site, 1.7 miles of the 2.4-mile-long bypassed reach would be considered EFH.

We conclude in this draft EIS that the proposed project would have only minor, short-term impacts on Chinook salmon EFH. We also conclude that staff-recommended measures would improve EFH overall over the long term. Via this draft EIS, we are providing NMFS with our EFH assessment and request that NMFS provide any EFH conservation recommendations.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 Code of Federal Regulations [C.F.R.], section 4.38) 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, ESA, NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this draft EIS, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document (SD1) was distributed to interested agencies and others on October 3, 2014. It was noticed in the *Federal Register* (FR) on October 3, 2014.[15] Two scoping meetings, both advertised in the local Red Bluff Daily News newspaper,[16] were held on November 5, 2014, where oral comments on the project were sought. The daytime meeting was held in Sacramento, California, while the evening meeting was held in Red Bluff, California. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
National Marine Fisheries Service	December 4, 2014
Pacific Gas and Electric Company	December 15, 2014
Tehama County, California	December 17, 2014

A revised scoping document (SD2) addressing these comments was issued on March 26, 2015.

[15] *Federal Register* Vol. 79, No. 198.

[16] Proof of publication filed December 3, 2014.

1.4.2 Interventions

On August 28, 2014, the Commission issued a notice that Rugraw had filed an application for an original license for the Lassen Lodge Project. This notice set October 27, 2014, as the deadline for filing protests and motions to intervene. In response to the notice, the following entities filed motions to intervene:

Intervenor	Date Filed
California State Water Resources Control Board*	September 9, 2014
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, West Coast Region	September 12, 2014
California Department of Fish and Wildlife	October 16, 2014
U.S. Department of the Interior, Office of the Solicitor*	October 23, 2014
American Whitewater	October 27, 2014
California Sportfishing Protection Alliance	October 27, 2014

* submitted notice of intervention

1.4.3 Comments on the Application

A notice requesting comments, preliminary terms and conditions, and recommendations was issued on April 26, 2016. The following entities commented:

Commenting Agency and Other Entity	Date Filed
California Department of Fish and Wildlife	June 16, 2016
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, West Coast Region	June 21, 2016
California State Water Resources Control Board	June 24, 2016
U.S. Department of the Interior	June 24, 2016

Rugraw filed reply comments on August 31, 2016.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the proposed project would not be built, and the environmental resources in the proposed project area would not be affected.

2.2 APPLICANT'S PROPOSAL

2.2.1 Project Facilities

Rugraw proposes to construct the project 1.5 miles west of Mineral, California, on South Fork Battle Creek in Tehama County. The project would consist of a diversion dam, intake structure, fish screen, pipeline, penstock, powerhouse, substation, switchyard, four multipurpose areas, transmission line, and project access roads from Route 36 to the diversion dam and from Route 36 to the powerhouse. The 8-foot-high, 2-foot-wide, and 63-foot-long diversion dam would be located at river mile (RM) 23, approximately 0.5-mile upstream of the Old State Highway Route 36 Bridge, creating a 0.4-acre impoundment at a normal operating elevation of 4,310 feet mean sea level (msl) (figure 2-1).

The proposed intake structure would be a 17-by-25-foot enclosed concrete structure located outside the normal stream wetted area, constructed partially in the south bank above the stream, and equipped with two 5-by-12-foot trash racks. Water would then pass into a 20-foot-wide, 8-foot-high, 50-foot-long control/fish screen structure that would include 27 4-by-8-foot perforated flat panel fish screens equipped with automatic travelling screen-cleaning brushes. An 18-inch-diameter juvenile fish return pipe incorporated into the downstream end of the fish screen structure would convey diverted fish downstream of the diversion dam, and flow from that pipe would be part of the minimum flow from the diversion dam. Upstream passage at the diversion dam would be provided by a conventional pool-and-weir fishway to be designed in accordance with California DFW specifications.

Water diverted for power generation would travel through a 48-inch-diameter, 7,565-foot-long, low-pressure high-density polyethylene pipeline and then into a 36-inch-diameter, 5,230-foot-long, welded steel high-pressure penstock. The 2.4-mile total length of the pipeline/penstock would be buried within a 40-foot-wide penstock right-of-way (ROW). An engineered cast-in-place concrete block transition structure would provide the transition from the 48-inch low-pressure high-density polyethylene pipeline to the 36-inch high-pressure steel penstock. Water would then enter a 50-by-51-foot powerhouse with a single multi-jet vertical Pelton-type turbine that would be closed-coupled to a synchronous generator with a capacity of 5.0 MW (figure 2-2).

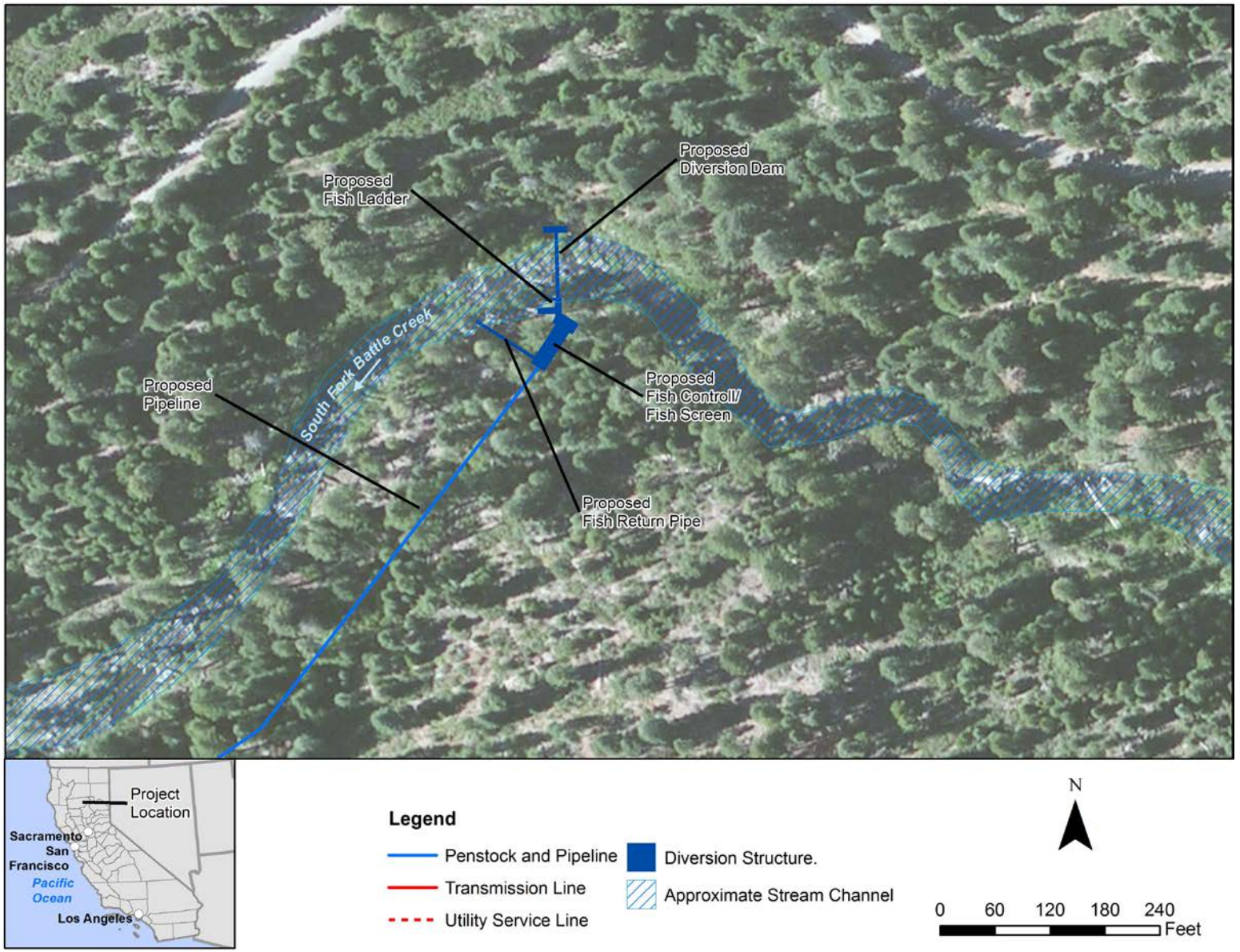


Figure 2-1. Lassen Lodge Project proposed diversion (Source: staff).

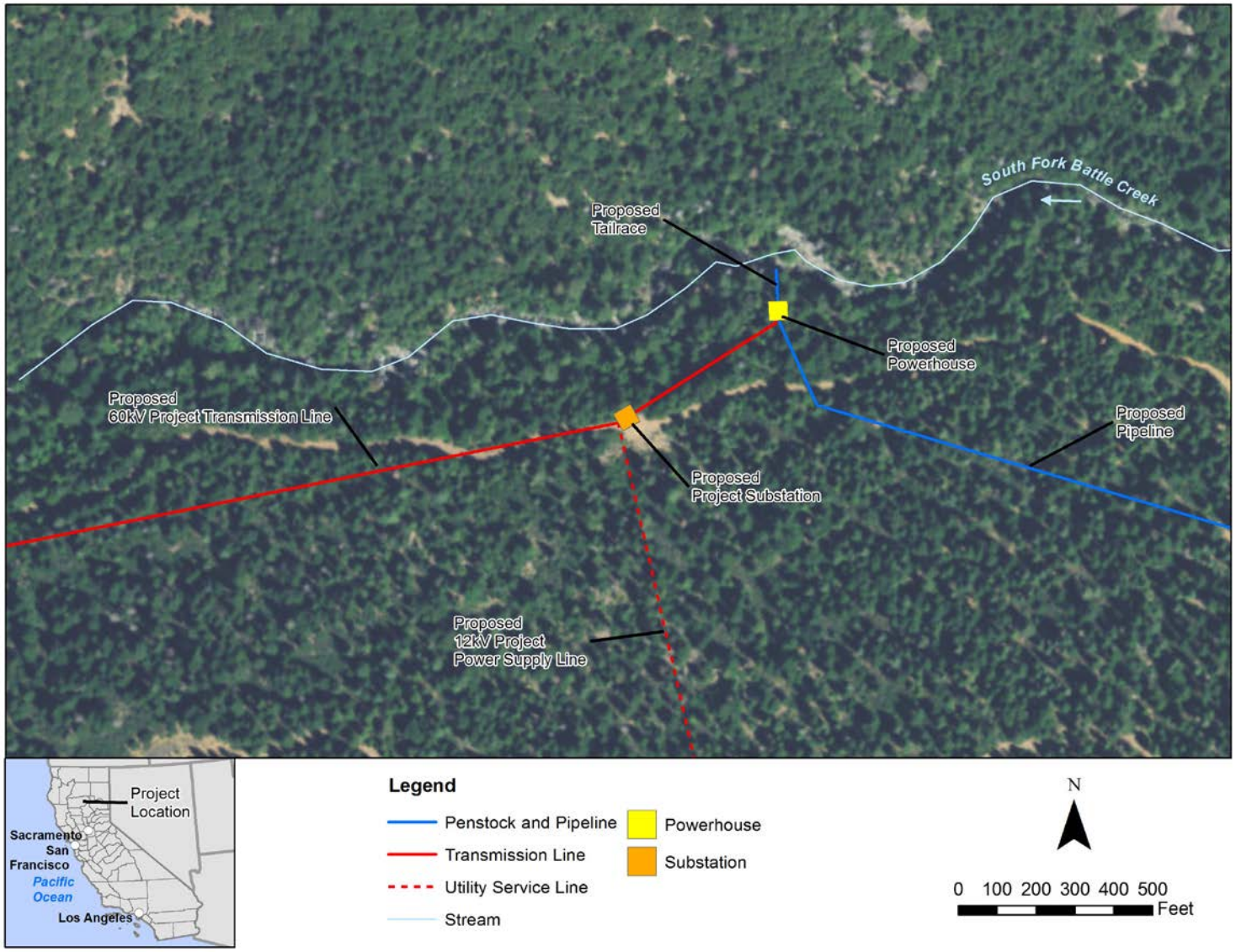


Figure 2-2. Lassen Lodge Project proposed powerhouse (Source: staff).

Water would exit the powerhouse at atmospheric pressure into a tailrace structure that starts under the powerhouse floor, and then enters an 8-by-6-by-70-foot buried concrete box culvert that returns water to the stream by cascading down 9 feet to the rock-strewn streambed over existing large boulders.

A new 12-mile-long, 60-kV transmission line would connect the powerhouse substation to a switchyard adjacent to the PG&E 60-kV Volta-South transmission line in the town of Manton, California.

A security-fenced switchyard would be located approximately 300 feet east of the point of interconnection. The switchyard, which would include a 10-by-10-foot concrete block building, would disturb an area of approximately 40-by-35-feet. An approximately 0.1-mile long aerial 12-kV line would connect to the existing PG&E line.

A new, enclosed, and security-fenced substation would be located about 500 feet west-southwest of the powerhouse. Underground conduits from the powerhouse to the substation would convey generated power at 4,160 volts to the transformer located in the fenced substation where the power will be stepped up to 60 kilovolts (kV). The substation would disturb an approximate area of 50 by 50 feet. An approximately 0.5-mile-long 12-kV aerial station service line would be constructed along a 40-foot-wide ROW from the substation location southeast to the Pacific Gas and Electric Company's (PG&E) 12-kV distribution line adjacent to Highway 36 to provide electricity and phone service to the powerhouse facility.

Rugraw also proposes four temporary[17] multipurpose areas that would be used to support project construction: (1) a construction yard near the diversion dam; (2) a construction yard near the powerhouse; (3) a multipurpose area near the Old State Highway Route 36 Bridge that would also serve as a helicopter landing site; and (4) a multipurpose area toward the west end of the proposed project boundary to support transmission line construction. These areas would vary in size from about 0.25 acre to 1 acre and be located within previously disturbed areas (e.g., log landings) on private lands.

2.2.2 Project Safety

As part of the licensing process, the Commission would review the adequacy of the proposed project facilities. Special articles would be included in any license issued, as appropriate. Commission staff would inspect the licensed project both during and after construction. Inspection during construction would concentrate on adherence to Commission-approved plans and specifications, special license articles relating to construction, and accepted engineering practices and procedures. Operational inspections would focus on the continued safety of the structures, identification of unauthorized

[17] Rugraw only stated that the multipurpose areas would be used during construction and did not identify any future use during project operations; therefore, we conclude that these areas would be used for construction and restored upon completion of construction.

modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, any license issued would require an inspection and evaluation every 5 years by an independent consultant and submittal of the consultant's safety report for Commission review.

2.2.3 Project Operation

Rugraw would operate the Lassen Lodge Project run-of-river, maintaining the water surface elevation (4,310 feet msl) of the proposed 0.4-acre-reservoir at +/-0.5 inch throughout the normal operating range. Rugraw proposes to release a minimum flow of 13 cubic feet per second (cfs) to the bypassed reach via a slot or weir gate at the diversion dam. Because the powerhouse needs a minimum of 5 cfs to operate, river inflows less than 18 cfs (13 cfs for the minimum flow plus 5 cfs required for turbine operation) would not be diverted to operate the project. Instead, flows less than 18 cfs would spill over the diversion dam. Rugraw would divert flows greater than 18 cfs for generation, up to the turbine's maximum hydraulic capacity of 105 cfs. Streamflows greater than the combined turbine capacity and minimum flow would proceed unimpeded over the project diversion dam and into the bypassed reach.

2.2.4 Environmental Measures

Rugraw proposes several measures, including the following:

Project Construction

- Limit land disturbance and vegetation clearing to those areas needed for construction. Delineate the limits of construction, work areas, and multipurpose areas with flagging, fencing, and/or stakes to prevent land-disturbing activities outside of construction areas.
- Stockpile natural topsoils and replace, regrade, and revegetate disturbed areas, in accordance with California forestry regulations and best practices, with native vegetation. Restore disturbed stream and riparian habitat to preconstruction conditions and with riparian plantings and/or seeding, where applicable, with approved seed mixes.
- Develop a stormwater pollution prevention plan (SWPPP) with measures to prevent storm-induced erosion and sedimentation during ground-disturbing construction activities, including:
    - Store spoils from project construction in areas that limit erosion of spoil material and prevent runoff into aquatic habitats.
    - Install cofferdams, silt fences, or other structures to isolate in-water work areas.
- Use existing roads to the maximum possible extent, constructing new access roads only when necessary; limit access roads to a width of 12 feet

whenever possible; and surface permanent roads with gravel to a depth and quantity sufficient to maintain a stable road surface and minimize erosion and dust.

- Conduct in-water work activities between July 1 and October 15 when streamflows are low to protect water quality and aquatic resources.
- Maintain upstream and downstream fish passage at the project during construction by constructing the diversion structure in phases or by providing a temporary diversion culvert to allow fish to pass the site.
- Conduct biological monitoring during construction to ensure that measures to protect biological resources are implemented appropriately.
- Provide environmental training to construction staff regarding laws, regulations, and best management practices (BMPs) to protect threatened and endangered species and special-status plant species and their habitats.
- Conduct preconstruction surveys in all areas of suitable habitat for threatened and endangered and special-status plant species where surveys have not previously been conducted, and implement specified protection measures as necessary.
- Avoid streams, wetlands, and pond habitats to the extent possible during construction, and use existing stream and wetland crossings where possible.
- Implement the Noxious Weed Management and Revegetation Plan (filed on November 30, 2015), which includes measures to ensure weeds and non-native invasive vegetation do not reestablish at onsite disposal areas during project construction, with a proposed plan revision to include provisions for riparian plantings along disturbed portions of South Fork Battle Creek to provide overhanging vegetation.
- Map, evaluate, and quantify, by vegetation type, the vegetation that would be removed as a result of project construction.
- Conduct preconstruction surveys for migratory bird nests within 100 feet of any areas that will be disturbed during the typical nesting season of April 15 to July 31 to identify nest locations and their status.
- Restrict construction activities within 100 feet of any active migratory bird nests found during the preconstruction surveys.
- Conduct preconstruction raptor nest surveys in suitable habitat within 1 mile of any areas that will be disturbed during the appropriate nesting periods (January through August) to identify nest locations and their status.

- Determine and apply an appropriate buffer for restricting construction activities around any active raptor nests found during preconstruction surveys.
- Design and construct the transmission line in compliance with the Avian Power Line Interaction Committee (APLIC) guidance to reduce impacts to avian species (APLIC, 2006; 2012).
- Avoid ground-disturbing activity on or near talus[18] slopes to protect Sierra Nevada red fox and American pika.
- Avoid construction activity within or near potential bat roosting habitat, including rock crevices, cliffs, and snags.
- Conduct surveys for juvenile and adult foothill yellow-legged frogs immediately prior to construction when in-water work would occur and relocate juvenile and adult foothill yellow-legged frogs found within the project reach and up to 500 feet downstream, outside the project construction area.[19]
- Avoid construction activities in riparian areas during the time that egg masses of foothill yellow-legged frogs are present (typically mid-April through mid-May); postpone construction around the immediate area where egg masses of foothill yellow-legged frogs are found until the eggs have hatched; avoid collection of rocks from in-water environments and minimize disturbance to pools and shallow runs between March 1 and August 31 to protect foothill yellow-legged frogs and their habitat.
- Develop a California red-legged frog protection plan to provide for and allow for California red-legged frogs in the project area to become reestablished and to be protected from manageable threats during construction.
- Reduce visual contrast where over-story vegetation is removed by thinning and removing trees from the edge of the ROW to give a natural appearance, where possible.
- Use wood poles to support the project transmission line to blend with surrounding vegetation.

[18] Talus slopes consist of loose rock eroded from cliff faces or rocky outcrops upslope. Vegetation is typically sparse or absent in these areas.

[19] Although Rugraw did not define the term "project reach," we interpret this to be South Fork Battle Creek from the upper extent of the proposed reservoir to just downstream of the proposed tailrace discharge.

Project Operation

- Operate the project in a run-of-river mode, maintaining the water surface elevation within +/- 0.5 inch of the normal pool elevation.
- Provide a ramping rate that will not exceed 0.1 foot of stage change per hour as measured by a stream gage proposed to be located within the bypassed reach between the diversion structure and the Old State Highway Route 36 Bridge.[20]
- Monitor water temperature at the following locations: (1) the diversion/intake structure, (2) in the bypassed reach at Old Highway 36 Bridge, (3) within the bypassed reach just upstream of the tailrace, (4) the powerhouse tailrace, (5) downstream of the powerhouse in mixed flows from the bypassed reach and powerhouse tailrace, and (6) approximately 2.1 miles downstream of the powerhouse below Ponderosa Way Bridge.
- Discontinue project operation when the average daily stream temperature exceeds 20 degrees Celsius (°C), measured in the bypassed reach upstream of Angel Falls.
- Develop a debris and sediment management plan (DSMP) to include:
    - Annually sluicing sediments from the project's reservoir when natural flow at the diversion site exceeds 400 cfs.
    - An evaluation of sediment deposits in the reservoir in years where natural flows do not reach 400 cfs to determine if sluicing is needed and, if so, sluice at flows greater than 108 cfs (minimum instream flow of 13 cfs plus turbine design flow of 95 cfs).[21]
- Maintain a minimum instream flow of 13 cfs or inflow, whichever is less, in the bypassed reach to protect aquatic resources.
- Monitor stream flow at the following locations: (1) immediately downstream of the diversion dam, (2) in the bypassed reach just above the powerhouse tailrace, and (3) at the existing station below Ponderosa Way Bridge**.**

[20] On August 31, 2016, Rugraw filed a letter in response to the Water Board's preliminary conditions and California DFW's preliminary section 10(j) recommendations, filed on June 24, 2016, and June 15, 2016, respectively, adopting the agencies' preliminary recommended ramping rate, thereby amending the proposed ramping rate provided in the final license application.

[21] The text associated with this proposal was edited by Commission staff for clarity, and reflects our interpretation of Rugraw's proposal.

- Construct an upstream and downstream fish passageway and fish screen structure at the project diversion dam to ensure fish are able pass the diversion dam, and design the facilities in coordination with the California Department of Fish and Wildlife (California DFW) incorporating the NMFS Southwest Region Fish Screening Criteria for Anadromous Salmonids and NMFS Northwest Region Anadromous Salmonid Passage Facility Design.
- Develop an anadromous fish monitoring program that includes the notification of resource agencies if anadromous species are found within the bypassed reach.
- If steelhead are detected upstream of Panther Grade,[22] conduct genetic tissue sampling of steelhead/rainbow trout to identify barriers to upstream steelhead passage within the bypassed reach, and implement adaptive management strategies to address the potential barriers.
- Develop project operating rules and a monitoring program for when anadromous salmonids are present in the bypassed reach.
- Monitor fish behavior at the project's tailrace and modify the tailrace in the event fish attraction is observed.
- Develop an operations model for flow and water temperature.
- Develop a California red-legged frog protection plan to provide for and allow for California red-legged frogs at the project to become reestablished and to be protected from "manageable threats" during operations.
- Implement the HPMP filed on November 30, 2015.

2.2.5 Modifications to Applicant's Proposal—Mandatory Conditions

The following mandatory conditions have been provided and are evaluated as part of the applicant's proposal.

Water Quality Certification Conditions

The Water Board has not yet issued the WQC. However, by letter filed June 24, 2016, the Water Board provided preliminary terms and conditions in response to the

[22] Panther Grade is a falls-boulder cascade at RM 18.9 that is a commonly accepted barrier to upstream fish migration in South Fork Battle Creek at flows less than 400 cfs. However, it is unclear if Panther Grade is a barrier to upstream fish passage at flows greater than 400 cfs.

notice of Ready for Environmental Analysis issued by Commission staff on April 26, 2016.[23]

We consider the following, project-specific, preliminary WQC conditions provided by the Water Board to be administrative in nature or insufficiently detailed; and therefore, they are not analyzed in this draft EIS: (1) reservation of authority to condition the project with minimum instream flows (preliminary condition 1); (2) recognition that project operations will likely be subject to ramping rates to be specified at a later date (preliminary condition 2); (3) obtain all of the necessary state and federal permits and any other regulatory approvals prior to construction (preliminary condition 3); (4) Water Board review and approval of proposed plans (preliminary condition 7); (5) agency consultations for all required plans (preliminary condition 15); (6) Water Board review of activities that may affect water quality (preliminary condition 16); and (7) notification of ground-disturbing activities (preliminary condition 17). In addition, the Water Board provided 16 standard, non-project-specific, conditions (preliminary conditions 24–40) that we also consider administrative in nature; therefore, they too are not analyzed in this EIS.

We consider the following preliminary WQC conditions provided by the Water Board to be sufficiently detailed environmental conditions; and therefore, they are analyzed in this draft EIS: (1) development of a drought plan (preliminary condition 4); (2) annual consultation on current special-status species (preliminary condition 5); (3) construction-related water quality monitoring (preliminary condition 6); (4) development of an aquatic invasive species monitoring plan (preliminary condition 8); (5) development of a pesticide use plan (preliminary condition 9); (6) development of a water quality monitoring plan (preliminary condition 10); (7) development of a fish population monitoring plan (preliminary condition 11); (8) development of a fish habitat assessment plan (preliminary condition 12); (9) development of an amphibian monitoring plan (preliminary condition 13); (10) development of a vegetation and invasive weed management plan (preliminary condition 14); (11) control of erosion, sedimentation, and turbidity (preliminary condition 18); (12) pre-washing of imported rock, riprap, and other imported gravels (preliminary condition 19); (13) disposition of construction-related materials and spoils (preliminary condition 20); (14) handling of cement, concrete products, wash water, etc. (preliminary condition 21); (15) equipment washing (preliminary condition 22); and (16) onsite containment and storage of chemicals (preliminary condition 23).

2.3 STAFF ALTERNATIVE

Under the staff alternative the project would include most of Rugraw's proposed measures as outlined above, with modifications to some of the measures. However, we

[23] These conditions are not mandatory until issued as final certification conditions by the Water Board.

do not recommend: maintaining the reservoir water surface elevation within +/- 0.5 inch of the normal pool elevation, monitoring water temperature at several locations within the project area, discontinuing project operation when the average daily stream temperature exceeds 20°C, providing upstream fish passage at the diversion dam during project operation, developing an anadromous fish monitoring program, genetic sampling for steelhead, and developing an operations model for flow and water temperature.[24] The staff alternative would include the following additional measures and/or modifications to Rugraw's proposed measures.

Project Construction

- Restore disturbed areas with native vegetation using only seed mixes recommended by California DFW.
- Modify the proposed SWPPP to include measures for controlling runoff from the construction sites, preventing material from contacting or entering surface waters, and use of washed riprap, rocks, and gravel adjacent to or in watercourses during construction.
- Develop a construction plan that incorporates the specific measures proposed for construction, and file the plan with the Commission for approval.
- Develop a plan for monitoring turbidity and pH and documenting observations of oily sheens and turbidity plumes during project construction.
- Modify the proposed Noxious Weed Management and Revegetation Plan to include provisions for preconstruction treatment of existing non-native

[24] Although we recommend Rugraw operate the project in a run-of-river mode, we do not recommend incorporating Rugraw's proposal to maintain the reservoir water surface elevation within +/- 0.5 inch of the normal pool elevation because this level of precision is likely beyond the capabilities of currently available monitoring and flow regulation equipment and is unnecessary for the protection of environmental resources. For reasons discussed in section 5.0, *Conclusions and Recommendations*, we find that Rugraw's proposed water temperature monitoring program, the use of a 20°C water temperature criterion to shut down the project, upstream fish passage facilities at the diversion dam, anadromous fish monitoring program, and its proposed genetic sampling for steelhead are inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA, because, based on staff's determination, the costs of the measures outweigh the expected benefits. Because Rugraw provided limited information on what the operations model may entail, we have not analyzed the model and are not recommending it as a requirement of any license issued.

invasive plant populations on project lands, additional reseeding and monitoring if restoration success criteria are not met by the end of the 2-year monitoring period, and measures to protect rare plant species from control measures targeting noxious weed species.

- Modify the proposed measure for restricting construction activities around active raptor nests to include consultation with California DFW in determining the appropriate buffer distance.

- Conduct preconstruction inspections for slender Orcutt grass, elderberry, and vernal pool habitat in areas of proposed disturbance not previously surveyed in 2013, and adjust the transmission line design to avoid any areas where these species or habitats are found.

- Design and construct the transmission line with consideration given to the APLIC guidance to reduce impacts on avian species.[25]

Project Operation

- Modify the proposed DSMP to include consultation with the Water Board and California DFW during low-flow years to determine if the sluicing of sediments should occur at inflows less than 400 cfs.
- Monitor real-time stream flow at the following locations: (1) upstream of the project impoundment; (2) just downstream of the diversion dam; and (3) in the bypassed reach just upstream of Spring #4 influence.
- Provide a ramping rate that would not exceed 0.1 foot of stage change per hour as measured at the staff recommended streamflow monitoring gage located just downstream of the diversion dam.
- Develop a streamflow monitoring plan that includes Rugraw's proposed streamflow monitoring, as modified by staff,[26] and specifies the proposed monitoring locations, monitoring equipment and methods, and provisions for annual operation and compliance reports, to document compliance with any license requirements for flow and ramping rates.

[25] The Commission typically does not enforce regulations and/or guidelines issued by other entities.

[26] Staff is recommending monitoring (1) upstream of the project impoundment, (2) just downstream of the diversion dam, and (3) in the bypassed reach just upstream of Spring #4 influence, instead of Rugraw's proposed locations (1) immediately downstream of the diversion dam, (2) in the bypassed reach just above the powerhouse tailrace, and (3) at the existing station below Ponderosa Way Bridge.

- Develop a pesticide use plan that would include BMPs to manage the risk associated with pesticide application and use to protect water quality, ESA- and California Endangered Species Act (CESA)-listed species, and/or associated habitat in or downstream of application areas.
- Develop an aquatic invasive species monitoring plan that incorporates measures to help prevent the introduction and/or spread of aquatic nuisance species (flora and fauna) into the proposed project area, including construction BMPs, to prevent the spread of aquatic nuisance species (e.g., bullfrog).
- Develop an avian protection plan that incorporates Rugraw's proposed transmission line design and considers FWS's Avian Protection Plan Guidelines to reduce the risk of avian interactions with the proposed transmission line, and implement the plan throughout the term of the license.
- Develop a bald eagle and raptor management plan that considers FWS's National Bald Eagle Management Guidelines and includes the use of species-specific distance buffers, landscape buffers, seasonal restrictions, and additional recommendations to benefit raptors.
- Develop a special-status amphibian protection plan that includes the following provisions to protect foothill yellow-legged frog, Cascade frog, and California red-legged frog: (1) conduct preconstruction surveys for all life stages during the breeding season; (2) avoid construction activities in riparian areas when egg masses are present; (3) stop work and notify FWS if California red-legged frogs are observed during preconstruction surveys or during construction; and (4) relocate larval, juvenile, and adult foothill yellow-legged and Cascade frogs prior to construction activities to an area sufficiently upstream to prevent them from re-entering the construction area.
- Revise the HPMP filed on November 30, 2015, to include: (1) copies of any post-2014 tribal correspondence and consultation related to the identification of cultural resources and development of the HPMP to document full compliance with section 106; (2) a cultural resources interpretive element, such as installation interpretive signage at key viewing areas; (3) a detailed plan for annual monitoring of cultural resources within the APE that are eligible for listing on the National Register or have not yet been evaluated; (4) provisions for periodic review and revision of the HPMP; and (5) editorial corrections as specified in section 5.1.2 of this EIS.

2.4 STAFF ALTERNATIVE WITH MANDATORY CONDITIONS

We recognize that the Commission is required to include valid WQC conditions in any license issued for the project. Although the Water Board has not yet issued certification and mandatory conditions for the project, by letter filed June 24, 2016, the Water Board provided preliminary terms and conditions in response to the Commission staff notice of Ready for Environmental Analysis issued on April 26, 2016. These preliminary terms and conditions may become mandatory conditions when the Water Board completes its action on Rugraw's application for certification, and staff has analyzed these preliminary terms and conditions as if they were mandatory. Thus, the staff alternative with mandatory conditions includes staff-recommended measures along with the mandatory conditions that we did not include in the staff alternative: (1) development of a drought plan (preliminary condition 4); (2) annual consultation on current special-status species (preliminary condition 5); (3) development of a fish population monitoring plan (preliminary condition 11); (4) development of a fish habitat assessment plan (preliminary condition 12); and (5) development of an amphibian monitoring plan and providing annual reports that present monitoring data, evaluate frog populations, and recommend actions based on population changes (preliminary condition 13).

Incorporation of these mandatory conditions into a new license would not cause us to modify or eliminate any of the environmental measures that we include in the staff alternative.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area, with historic and current conditions described first. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*.[27]

3.1 DESCRIPTION OF THE RIVER BASIN

The project would be located on the upper South Fork Battle Creek, on the western slopes of the Cascade Range about 1.5 miles west of the town of Mineral, an unincorporated community in Tehama County, California. The upper South Fork Battle Creek at the project site has a drainage area of about 33 square miles, located south and west of Lassen Volcanic National Park. The basin in the vicinity of the project is mountainous with elevations in excess of 6,000 feet, and South Fork Battle Creek flows through a deeply incised canyon. Much of the area has been logged heavily, and private land traversed by the penstock alignment has been clear-cut within the past 10 years. The area can be characterized as heavily disturbed by previous logging and road construction. South Fork Battle Creek joins North Fork Battle Creek downstream of the project site, and Battle Creek then flows 16 miles to join the Sacramento River (figure 3-1). Figure 3-2 identifies the key stream features in the area of the proposed project reach, including Ponderosa Bridge, Panther Creek, Panther Grade, and Angel Falls. Panther Creek enters South Fork Battle Creek just downstream of Panther Grade, which is a falls-boulder cascade at RM 18.9 that is a commonly accepted barrier to upstream fish migration and is the upper extent of the Battle Creek Salmon and Steelhead Restoration Project (Jones & Stokes, 2005). Although Panther Grade may be passable to fish at some flow levels, Angel Falls (RM 22.3) is a complete barrier to upstream fish migration at all flow levels.

[27] Unless otherwise indicated, our information is taken from the original and amended applications for license for this project (Rugraw, 2014; 2015).

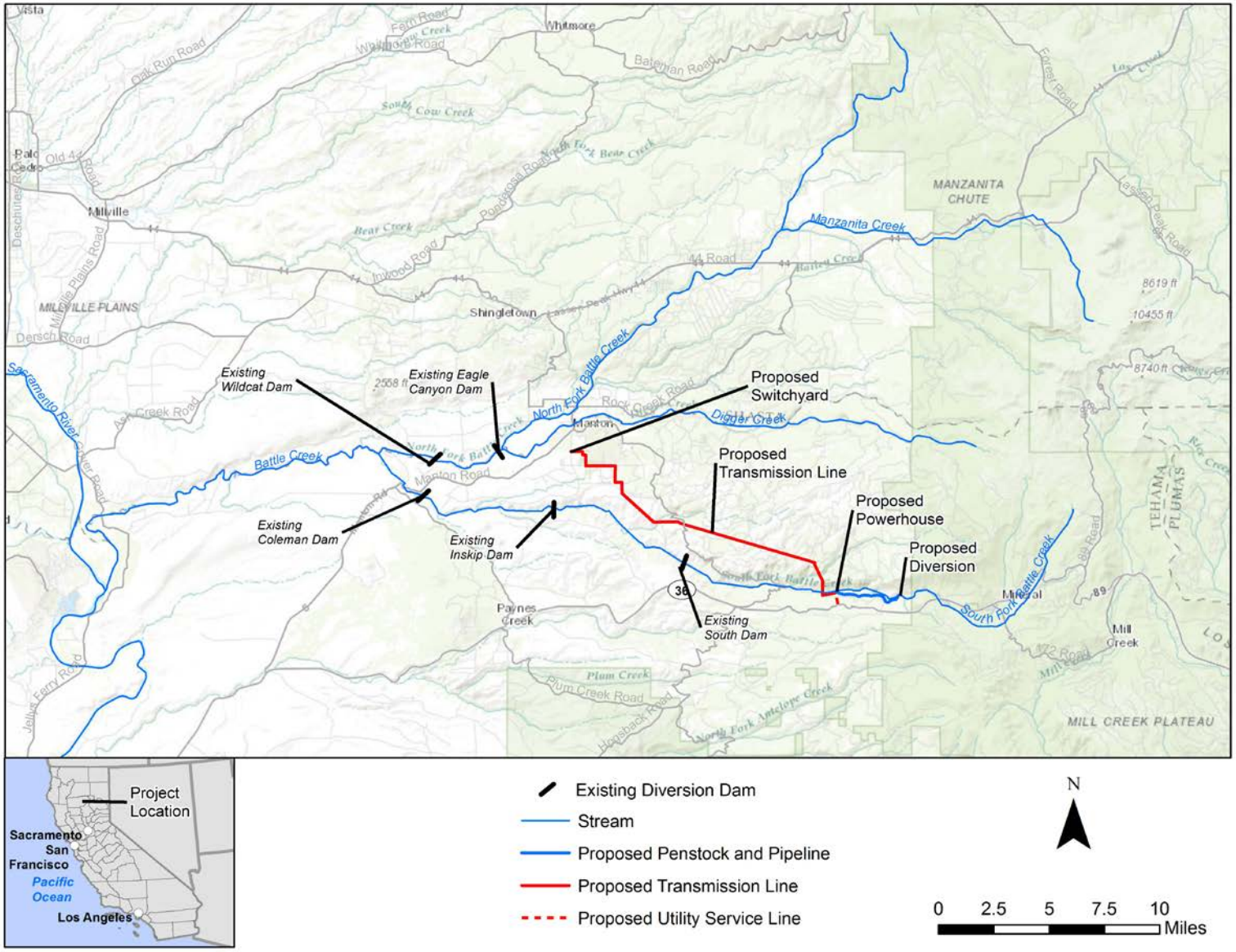


Figure 3-1. Battle Creek Basin map showing location of the proposed project (Source: staff).

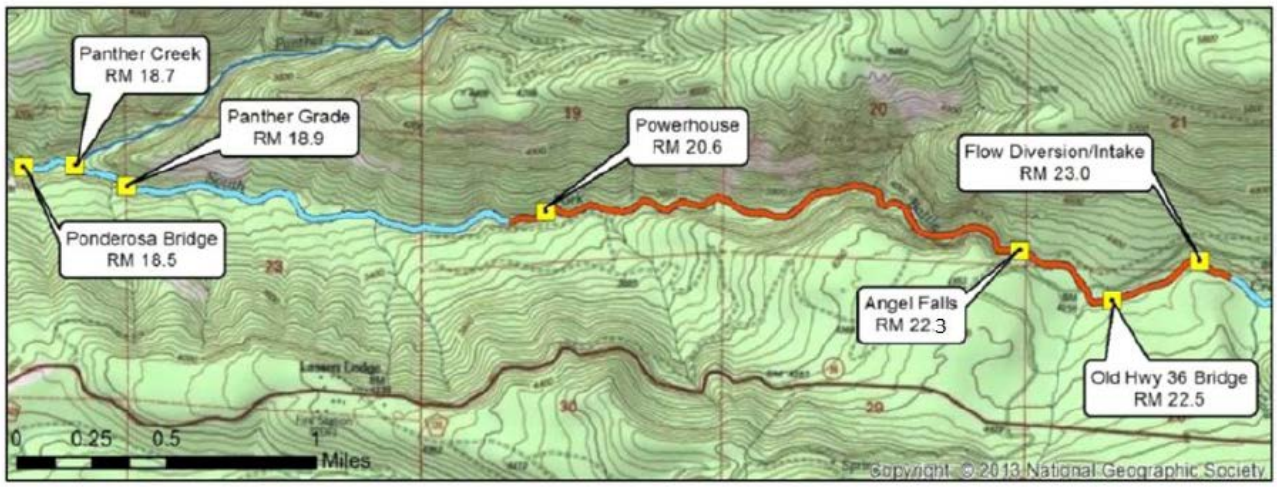


Figure 3-2. South Fork Battle Creek topographic map, showing notable stream features and the proposed project reach (Source: Cramer et al., 2015).

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 C.F.R. §1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities.

Based on our review of the license application and preliminary staff analysis, we have identified water resources (water quality and temperature) and fisheries resources (resident and anadromous fish and related habitat) as having the potential to be cumulatively affected by the proposed project in combination with other activities in the Battle Creek Basin.

The following existing actions or activities in the Battle Creek Basin may contribute to cumulative effects:

- Sierra Pacific Industries (SPI) owns the land surrounding the proposed project area and manages it for timber harvest.
- PG&E operates the Battle Creek Hydroelectric Project No. 1121 on the mainstem Battle Creek and the North and South Forks of Battle Creek, including three diversion dams on South Fork Battle Creek downstream of the proposed Lassen Lodge Project (see figure 3-1).

- The interagency Battle Creek Salmon and Steelhead Restoration Project will restore approximately 48 miles of salmonid habitat in the Battle Creek Basin and includes plans to remove or install fish passage at the three diversion dams located downstream of the proposed project on South Fork Battle Creek.

3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effect on the resources. Our geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources, and (2) contributing effects from other hydropower and non-hydropower activities within the Battle Creek Basin, specifically the removal (Coleman Diversion Dam and South Diversion Dam) and modification (Inskip Diversion Dam) of dams on the South Fork Battle Creek. Because the proposed action can affect resources differently, the geographic scope for each resource may vary.

The geographic scope for aquatic resources would be the South Fork Battle Creek from the upstream extent of the project impoundment downstream to its confluence with the North Fork Battle Creek. We chose this geographic scope because: (1) the project would affect water quality and sediment movement within the project area and areas downstream to the confluence with the North Fork Battle Creek; and (2) project operations, including flow regulation and potential effects on water temperature, could influence the ability of salmon and steelhead to use historical habitat within the project bypassed reach if salmon and steelhead are restored to South Fork Battle Creek as a result of the Battle Creek Salmon and Restoration Project.

3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis in this draft EIS includes a discussion of past, present, and future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of a new license, the temporal scope looks 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion, by necessity, is limited to the amount of available information for each resource. The quality and quantity of information, however, diminishes as we analyze resources further away in time from the present.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

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

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EIS. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geology and Soil Resources

3.3.1.1 Affected Environment

Geologic Setting

The project area is located at the southern end of the Cascade Range, which includes a chain of volcanoes that extends from British Columbia into northern California. The basement rocks of the southern end of the Cascade Range are sedimentary deposits of late Cretaceous age. These basement rocks are overlain by volcanic deposits of late Pliocene and Quaternary age. The predominant deposit in the project area is Late Pliocene ashflow tuff breccia of the Tuscan Formation.

The project area is located on the southwestern flank of the Lassen Peak volcanic system, approximately 12 miles from Lassen Peak. The most recent activity in the Mount Lassen area occurred between 1914 and 1917, which included an explosive eruption sequence that produced a 19-mile mudflow down the northeastern slope. Lassen Peak is only one of a cluster of volcanic domes that had flows of andesite, dacite, and rhyolite during the Quaternary age. The flows were followed by lahars, or hot volcanic debris avalanches, that formed into tuff breccia.

Faulting and Seismicity

There are no major faults within the project area (Clynne and Muffler, 2010; California Geological Survey, 2006). Regionally, the project is located between two zones of tectonic activity. To the west is a zone of right lateral shear within the northern Coast Ranges that runs parallel to the San Andreas fault; this zone represents a wide mobile belt of continuing deformation along the boundary between the North American and the Pacific crustal plates. To the east is a zone of generally east-west crustal extension corresponding to the Basin and Range province. The most recent faulting in the region occurred in 1975 with minor movement along the Cleveland Hill Fault south of Oroville, approximately 50 miles south of the project area, accompanied by an earthquake sequence.

Several clusters of earthquake epicenters up to approximately magnitude 4.5 on the Richter scale define the seismicity of the southern Cascade Range. Most of the earthquakes in this region probably originate through Basin and Range-style tectonic faulting, but some are associated with young volcanic centers. Earthquakes occurred in the vicinity of Mount Lassen during the eruptions of 1917. Two earthquakes of magnitude 5.0 and 5.5 on the Richter scale occurred in 1946 and one event in 1991. The Cascade Range seismicity involves generally shallow events, occurring at depths to about 7.5 miles.

Soils

Soil in the project area consists of weathering products of Tertiary and Quaternary volcanic flows and mudflow deposits. These soils contain varying concentrations of stones and gravel. The soil profile tends to be the thickest over the tuff breccia of the Tuscan Formation, reaching several feet. More recent basaltic andesite deposits weathered into reddish colored soils. Soils are more easily eroded on slopes.

Spalling and abundant rockfall slope instability are present on the steep canyon walls, especially the north wall. However, there is no evidence of deep-seated rotational or translational landsliding. Rockfalls appear to be controlled by the jointing in the flows and undercutting by weathering of rocks.

The soils at the diversion site consist of primarily alluvial river sediments with large boulders and gravels with very little fine materials such as clay or organic matter. Sediment accumulation in the streambed of the affected reach of South Fork Battle Creek is limited by high-velocity water flows.

3.3.1.2 Environmental Effects

As discussed in section 2.2.1, *Project Facilities*, construction of the project would include the diversion dam and associated intake and fish screening structure, the pipeline and penstock, the powerhouse, and the transmission line and its substation. Ancillary construction may involve preparing multi-use equipment and materials storage areas and upgrading existing roads.

Excavation of the stream bed and stream banks to construct the diversion dam and intake structure, trenching to bury the pipeline, vegetation clearing and trenching to construct the penstock and any disturbance to upland areas for access roads, transmission lines, laydown areas, and the powerhouse could cause localized erosion, sedimentation, and streambed material transport. Sediment eroded during construction of the diversion dam, intake, penstock, and powerhouse would be transported to South Fork Battle Creek via runoff. Construction of the transmission line would mostly affect tributaries draining to South Fork Battle Creek from the north. Soil eroded from upland construction sites and disturbance of the stream bed could adversely affect water quality, as well as resident aquatic species and their respective instream habitats.

Rugraw proposes to construct the project during the typical dry season in northern California. General outdoor construction would occur from April 15 through October 15, although start and end dates may be modified because of unusual weather conditions. In-water work would occur between July 1 and October 15. To further minimize soil erosion and sedimentation, and to protect the water quality of South Fork Battle Creek, Rugraw proposes to prepare and implement an SWPPP that would minimize the erosion of soils in the construction areas and limit sediment transport. The SWPPP would include, at a minimum, provisions to:

- limit surface disturbance to only those areas necessary for construction, thereby preserving existing vegetation;
- salvage and stockpile topsoil and following construction, replace, regrade and seed topsoil with native vegetation;
- use temporary fencing and protective barriers to protect vegetation not required to be removed;
- initiate construction immediately following vegetation clearing to minimize the exposure of disturbed areas to wind and water erosion;
- slope roadways and excavations away from washes and clear loose soils and sediments in areas where haul roads would cross surface washes;
- install riprap at the washes;
- build small earthen embankments within washes to slow or divert surface water;
- install silt fences in work areas near a wash to prevent sediment from entering the wash during rain storms; and
- apply water to disturbed soil areas to ensure excessive runoff does not occur and to control wind erosion and dust.

Rugraw also proposes cofferdams and other structures to isolate in-water work areas and allow for construction "in the dry." Other proposed BMPs include installation of sedimentation basins for capturing solids in stormwater runoff; placement of construction materials to avoid erosion from flowing water, and construction of permanent roads with gravel depth and quantity to maintain a stable road surface.

The Water Board provided preliminary terms and conditions for the project. Those conditions, designed to minimize erosion and sedimentation, included water quality monitoring (including turbidity) when performing in-water work (preliminary condition 6); pre-washing riprap, rocks, and gravel prior to near or in-water placement (preliminary condition 19); and erosion control measures to be put in place prior to and during construction or ground-clearing activities (preliminary conditions 18 and 20).

In its letter filed June 21, 2016, NMFS recommends (10(j) recommendation 6) that, through consultation with NMFS, Interior, California DFW, and the Water Board, Rugraw develop and implement a DSMP that describes the operation and actions that would ensure the periodic downstream transport of small and large woody debris and sediment passed the project's dam. Rugraw proposes to sluice sediment accumulated in the project's reservoir during high flows during off-operation periods. Rugraw also agrees to re-introduce small and large woody debris downstream of the diversion structure, and proposes to prepare a DSMP. However, Rugraw does not propose to monitor sediment and riparian response, which was recommended by NMFS as part of

the DSMP. The NMFS-recommended DSMP and the proposed sediment sluicing are discussed in more detail in section 3.3.2.2, *Aquatic Resources, Environmental Effects*.

Our Analysis

Construction of the proposed project would temporarily disturb areas at the diversion dam site, at the powerhouse, along the route of the penstock, and along the transmission line.

Developing an SWPPP with the erosion and sedimentation control measures proposed by Rugraw and measures recommended by the Water Board (preliminary conditions 6, 18, 19 and 20) would minimize the amount of erosion and sediment transport to South Fork Battle Creek resulting from project construction. Preliminary conditions 6, 18, and 20 are standard erosion control measures, while preliminary condition 19 would require pre-washing any rock or gravel prior to near- or in-water placement. Pre-washing of imported rock or gravel would remove fines from crusher operations and prevent those fines from entering South Fork Battle Creek and contributing to additional sedimentation.

In addition to the erosion and sedimentation control measures developed as part of the SWPPP, Rugraw proposes several construction measures for protection of environmental resources, including the timing of construction; delineation of construction areas using fencing and/or flagging; using existing roads to the maximum extent possible, and constructing any new access roads to a width of no more than 12 feet; maintaining upstream and downstream fish passage at the project during construction; avoiding streams, wetlands, and pond habitats to the extent possible during construction and using existing stream and wetland crossings where possible; and providing environmental training to construction staff regarding laws, regulations, and BMPs to protect threatened and endangered species and special-status plant species and their habitats. These are reasonable measures to implement during construction, and to ensure that these measures are implemented and coordinated, could be included in a construction plan to be filed for Commission approval prior to the start of ground-disturbing activities. This construction plan would also be closely coordinated with the SWPPP.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Use and Quantity

South Fork Battle Creek is a 28-mile-long waterway with its headwaters beginning on the western slopes of the Cascade Range near Lassen Volcanic National Park, 1.5 miles west of the town of Mineral, CA. Along with the North Fork of Battle Creek, South Fork Battle Creek is a major tributary to Battle Creek, a 17-mile-long tributary to the Sacramento River. At its confluence with Battle Creek, South Fork Battle Creek drains an area of 124 square miles. South Fork Battle Creek at the proposed project site

drains an area of about 33 square miles. Average annual precipitation is 36 inches, most of which falls from October through May.

Because of the project's high elevation, much of the precipitation that falls occurs as snow. As such, the hydrology of South Fork Battle Creek is snowmelt driven, with the highest flows occurring from March through June. Because of a lack of springs upstream of the project reach, extreme low flows naturally occur in the late summer and fall. A 7-day average low flow of zero occurs with a frequency of once every 10 years, and a 7-day average low flow of 4.4 cfs occurs with a frequency of once every 2 years. In the critically warm July through October timeframe, streamflow exceeds 18 cfs, the trigger at which flow diversions would start, only 25 percent of the time. One location on South Fork Battle Creek (Spring #4 located at RM 20.84) measured 0.3 cfs in October 2014 and was the only detectable source of year-round surface inflow between Angel Falls (located 1.7 miles upstream of the proposed powerhouse site) and the proposed powerhouse location (Cramer et al., 2015).

The lower portion of South Fork Battle Creek and Battle Creek exhibits high base flow throughout the summer and fall with a large portion of the water entering South Fork Battle Creek from cold springs emanating from the surrounding volcanic rock. The majority of these springs enter South Fork Battle Creek downstream of Panther Grade at RM 18.9.

The United States Geological Survey (USGS) conducted stream gaging on South Fork Battle Creek from 1959 to 1967 at the South Fork Battle Creek near Mineral gage, upstream of the Old Highway 36 Bridge at RM 22.5. Supplemented by long-term streamflow data from the USGS Deer Creek near Vina and Mill Creek near Los Molinos gages, the 8-year USGS continuous record was used as the basis for the development of an extended synthetic flow record specific to the project site. Table 3-1 shows a summary of USGS gage information used to develop the synthetic streamflow record for the project area. Table 3-2 provides monthly flow data for South Fork Battle Creek.

Table 3-1. Streamflow gage information for gages used in developing the synthetic flow record for South Fork Battle Creek (Source: USGS 2017a, b).

Gage Name	South Fork Battle Creek near Mineral	Mill Creek near Los Molinos	Deer Creek near Vina
Gage Number	11376400	11381500	11383500
Mean Basin Elevation (feet-msl)	5,702	3,961	4,199
Drainage Area (square miles)	33.2	131.4	208.7
Dates of Operation	October 1, 1959 to September 30, 1967	October 1, 1928 to June 20, 2017	October 1, 1911, to September 29, 1915;

Gage Name	South Fork Battle Creek near Mineral	Mill Creek near Los Molinos	Deer Creek near Vina
			April 1, 1920 to June 20, 2017
Mean Flow (cfs)	60	304	322
Maximum Flow (cfs)	608	14,400	20,100
Minimum Flow (cfs)	4	52	52

Table 3-2. Minimum, maximum, and mean monthly flow values for South Fork Battle Creek at the project site (Source: Rugraw, 2014, as modified by staff).

Month	Minimum Flow[a] (cfs)	Mean Flow[b] (cfs)	Maximum Flow[a] (cfs)
Jan	8	69	561
Feb	15	80	986
Mar	14	86	435
Apr	42	117	577
May	41	122	534
Jun	14	81	387
Jul	7	28	214
Aug	4	12	62
Sep	4	9	29
Oct	3	13	983
Nov	6	27	290
Dec	6	57	1,210

[a] Observed streamflow values from USGS South Fork Battle Creek near Mineral gage (1959–1967).

[b] Mean flow values were derived from a synthetic flow record using Mill Creek near Los Molinos flow values (1928–2017).

South Fork Battle Creek has an average annual flow of about 60 cfs at the project site. Average monthly flows range from a low of about 9 cfs in September to a high of 122 cfs in May. Based on the available flow record, recorded maximum flow in South Fork Battle Creek at the USGS South Fork Battle Creek near Mineral gage was 1,210 cfs. Recorded minimum flow at the same gage was 3 cfs.

Water in South Fork Battle Creek is not used by other water users. Domestic water supply facilities along the upper reaches of the stream, near Mineral, CA, primarily consist of groundwater wells.

Water Quality

Water Quality Standards

The South Fork Battle Creek Basin is part of the Sacramento River Basin, and the Fourth Edition of the *Central Valley Regional Water Quality Control Board Basin Plan* (Basin Plan) for the Sacramento and San Joaquin River Basins (CVRWQCB, 2016) applies to waters in the project area. The Basin Plan designates existing beneficial uses for water bodies in the basin as irrigation, stock watering, power, water contact recreation and canoeing and rafting, other non-contact water recreation, warm freshwater habitat, cold freshwater habitat, coldwater aquatic organism migration, coldwater fish spawning, warmwater fish spawning, and wildlife habitat.

Water quality standards applicable to surface waters in the project area are defined in two primary documents: the Basin Plan (CVRWQCB, 2016) and the California Toxics Rule (40 C.F.R. Part 131). Table 3-3 summarizes applicable criteria for South Fork Battle Creek. The Water Board did not include any water bodies in the project area on the 303(d) list of water-quality-limited water bodies for 2012 (Water Board, 2015), which is the most recent U.S. Environmental Protection Agency (EPA)-approved list.

Table 3-3. Water quality criteria for South Fork Battle Creek in the project area (Source: CVRWQCB, 2016).

Constituent	Water Quality Objectives
Temperature	Natural water temperatures shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration does not adversely affect beneficial uses. At no time or place shall the temperature be increased more than 5°F above the natural receiving water.
Dissolved oxygen (DO)	Monthly median of mean daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation. DO concentrations shall not be reduced below 7.0 milligrams per liter.
pH	The pH shall not be depressed below 6.5 nor raised above 8.5.

Constituent	Water Quality Objectives
Turbidity	Shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed increases of 1 nephelometric turbidity unit (NTU) where natural turbidity is 0–5 NTU, increases of 20 percent where natural turbidity is 5–50 NTU, increases of 10 NTU where natural turbidity is 50-100 NTU, and increases of 10 percent where natural turbidity is >100 NTU.
Fecal coliform	Based on a minimum of not less than five samples for any 30-day period, shall not exceed a geometric mean of 200/100 milliliters, nor shall more than 10 percent of the total number of samples taken during any 30-day period exceed 400/100 milliliters.
Oil and grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.

Water Quality

A literature review of available data and information shows that South Fork Battle Creek generally has excellent water quality and relatively stable inflows from springs about 0.2 mile upstream of the proposed powerhouse site and downstream, near Panther Grade that discharge cold, clear water into the creek (Tetra Tech, 2015a). Samples taken upstream and near the Tehama County Sanitation District No. 1 ponds at Mineral suggest that overflow from these ponds may have historically caused elevated fecal coliform concentrations in the creek. No other point sources for pollutants upstream of the proposed project are known. Potential nonpoint sources include surface runoff from roads; exposed dirt surfaces; and cattle grazing pastures, which are most active during spring and summer. Based on aerial photos, it appears the riparian habitat in the large meadow located approximately 2 miles upstream of the proposed dam site was fenced in the mid- to late-1990s (Watercourse Engineering, 2015).

The Water Board sampled the creek about 14 miles downstream of the proposed project, near Manton, and found low levels of chlorides, nitrates, magnesium, potassium, dissolved solids, and hardness (Tetra Tech, 2015a).

Water quality was sampled at the proposed diversion and powerhouse sites to describe conditions in the project area during the critical low-flow late summer period. This sampling on September 4, 2013, at a stream flow of 4 to 5 cfs at the proposed diversion site, showed the creek had low alkalinity, neutral pH, and low electrical conductivity at both stations (table 3-4). Analyses for heavy metals at both sites revealed none of the 18 regulated drinking water metals (Tetra Tech, 2015a).

Table 3-4. South Fork Battle Creek surface water quality, September 4, 2013 (Source: Tetra Tech, 2015a)

Parameter	Proposed Diversion Site (RM 23.0)	Proposed Powerhouse Site (RM 20.6)
Field temperature (°C)	16.73	11.61
Field dissolved oxygen (mg/L)	7.66	6.27
Conductivity, field/lab (µmhos/cm)	69/79	63/82
pH, field/lab (standard units)	7.42/7.51	7.95/7.57
Turbidity[a]	0	0
Hardness as $CaCO_3$[a]	26	26
Total alkalinity (mg/L)	32	39
Bicarbonate as $CaCO_3$ (mg/L)	32	39
Carbonate as $CaCO_3$ (mg/L)	<5	<5
Total dissolved solids (mg/L)	62	64
Hydroxide (mg/L)	<5	<5
Chloride (mg/L)	0.56	0.89
Fluoride (mg/L)	<0.10	<0.10
Nitrate as NO_3[a]	<2.0	<2.0
Sulfate as SO_4[a]	5.1	2.3
Calcium (mg/L)	6.4	5.8
Magnesium (mg/L)	2.5	2.8
Potassium (mg/L)	1.3	1.3
Sodium (mg/L)	3.2	2.4

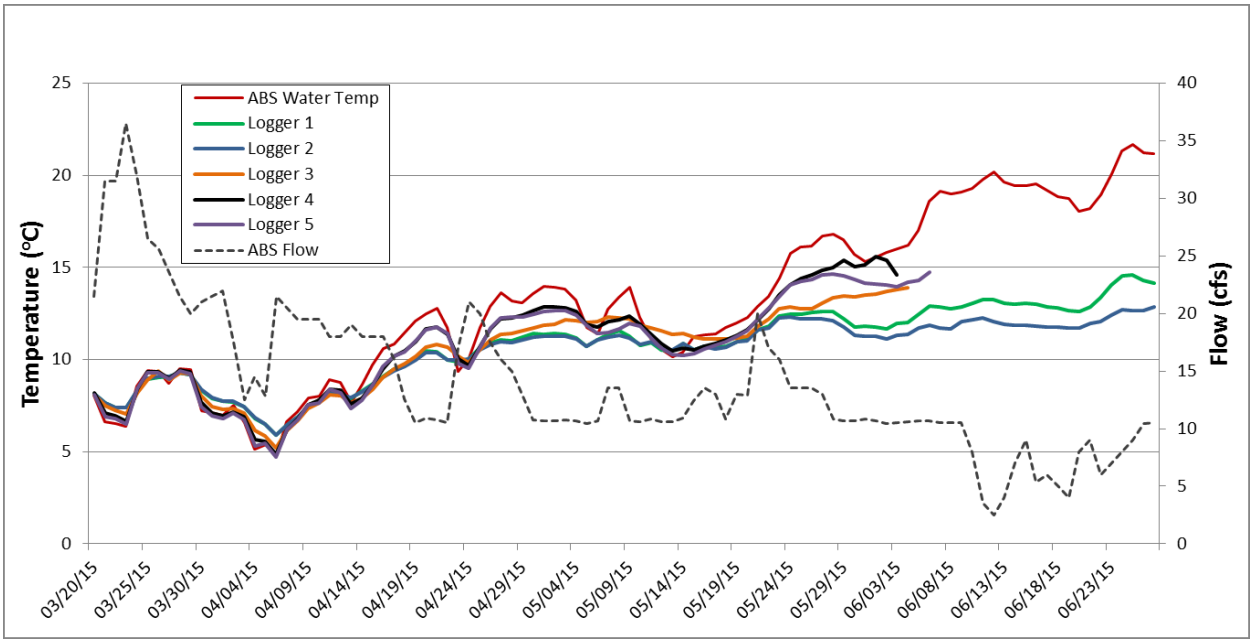
[a] Units not reported by Tetra Tech (2015a).

mg/L–milligrams per liter; µmhos/cm–micromhos per centimeter

Water Temperature

Rugraw collected water temperature data in several years for planning purposes. Data collected in South Fork Battle Creek near the proposed diversion during November 2003 through December 2006 showed daily mean temperatures that ranged from near freezing in the winter to about 18°C in mid- to late July (Tetra Tech, 2015a).

In early spring 2015, temperatures were nearly the same at all six sites monitored from the Above Old Highway 36 Bridge Station (ABS) to the powerhouse location as indicated by differences being less than 1°C. As spring and summer progressed, daily mean temperature at sites near the powerhouse remained stable at 10 to 15°C, and the warmest conditions, some of which exceeded 20°C, occurred at the ABS, upstream of Angel Falls (figure 3-3). Daily fluctuations were as large as approximately 5°C above ABS, 3°C at the proposed powerhouse site, and 1°C downstream of Panther Grade in summer of 2013 (Tetra Tech, 2015a). In late summer through early fall, temperatures at the ABS cooled substantially, while temperatures remained relatively stable at the other sites monitored.



Note: Data loggers from upstream to downstream are: ABS at RM 22.5, #5 at RM 21.7, #4 at RM 21.4, and #3 at RM 21.1, all of which were located upstream of Spring #4; and #2 at RM 20.6 and #1 at RM 20.4, both of which were located downstream of Spring #4.

Figure 3-3. Daily mean temperature and streamflow in South Fork Battle Creek, March–June 2015 (Source: Cramer et al., 2015).

These seasonal and daily trends in stream temperatures show the importance of two primary factors: (1) warming in an upstream meadow, and (2) the stabilizing effect of springs and water exchange with flows beneath the streambed (hyporheic flows). About 2 miles upstream of the project, South Fork Battle Creek goes through a large, open meadow with minimal riparian shading. The open conditions of the meadow subject the stream to substantial warming from solar radiation and little insulation from the local air temperature both in the summer and winter. These conditions are likely the

primary reason for warm summer temperatures with large daily fluctuations and the larger seasonal range of temperature at the inflow to the proposed project. Hyporheic flows and inflow from cool-water springs stabilize temperatures downstream of Angel Falls, particularly near the powerhouse site and farther downstream near Panther Grade.

Fishery Resources

Aquatic Habitat

In July 2013, Rugraw completed a detailed aquatic habitat survey in the proposed bypassed reach from RM 20.6 to 22.3 (Sellheim and Cramer, 2013). At that time, the flow was 13 cfs, and the maximum water temperature was 22°C. All 51 channel habitat units in the reach were classified by unit type (pools, riffles, rapids and cascades) and measured for gradient, wetted and active channel dimensions, substrate composition, depth, and velocity, and rated for wood complexity, potential barriers, and channel constraint types (table 3-5).

As Sellheim and Cramer (2013) describe, the proposed bypassed reach channel is confined by either bedrock or hill slopes throughout the majority of the study area. The measured stream gradient averages about 5 percent in most of the reach, but increases to about 15 percent just downstream of Angel Falls. The mean active channel width is 85 feet, and the mean wetted channel width is 23 feet. Fast-water channel units compose more than 80 percent of the surface area (figure 3-4). Large boulders are the dominant substrate type in all channel units in the study reach, often creating "pocket water" habitat. Gravel and cobble are more common in pools than in other habitat unit types; however, these substrate size classes are relatively rare. There is also a near absence of woody debris in the channel, and 16 of the 20 pools in the reach were more than 3 feet deep and appear to be capable of supporting resident trout through the low-flow season.

Although the proposed bypassed reach contains suitable salmonid spawning and rearing habitat, low natural flows during the summer limit the availability of rearing habitat, especially during dry years when flows decrease to less than 5 cfs and water temperatures climb to 24°C.

Table 3-5. Habitat feature measurements within South Fork Battle Creek from the proposed powerhouse location to Angel Falls, taken July 3 and 4, 2013, at a flow of 13 cfs (Source: Sellheim and Cramer, 2013).

	Unit Area			Average Channel Width (feet)			Substrate				
Unit Type	**Sq. Feet**	**% Total Area**	**# of Units**	**Wetted**	**Active**	**% Gradient**	**% Fines**	**% Gravel**	**% Cobble**	**% Boulder**	**% Bedrock**
Cascade	5,885.7	2.4	3	13.8	67.9	20.9	0	0.6	4.4	95	0
Pool	34,194.7	14.8	20	29.5	75.4	0	2.4	20.3	20.9	43.1	11.9
Rapid	64,251.9	26.3	11	24.9	61.7	14.2	0.5	2.2	3.2	91.4	2.7
Riffle	138,031.0	56.5	17	21.6	92.5	5.3	2	5.7	7.8	74.4	10.8

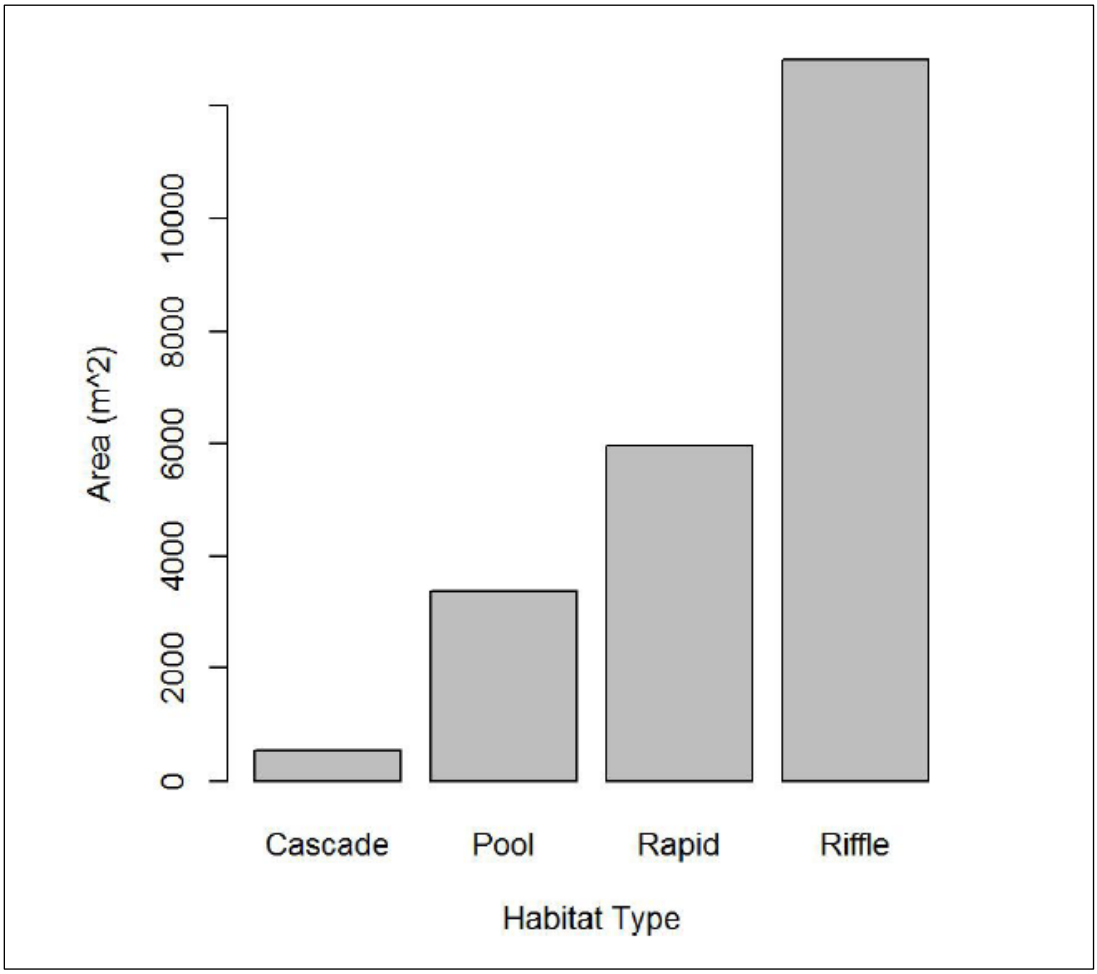


Figure 3-4. Area of each channel unit type within the survey reach of South Fork Battle Creek (Source: Sellheim and Cramer, 2013).[28]

In addition to the July 2013 habitat survey, Rugraw completed a supplemental survey in a subset of the channel units in the bypassed reach at a higher flow (31 cfs) during mid-March 2015 (Cramer et al., 2015). The survey was designed to quantify key attributes of habitat for juvenile rearing and adult spawning; evaluate potential migration barriers; estimate rearing and spawning capacity for spring- and fall-run Chinook, steelhead, and resident rainbow trout; and assess habitat change in response to flow. Rugraw also completed reconnaissance surveys downstream of the project reach (below RM 20.6) to identify changes in flow and temperature downstream of the proposed powerhouse location.

This assessment documented a sharp contrast between stream reaches upstream and downstream of Panther Grade in the suitability of the habitat for supporting

[28] One square meter (m^2) equals 10.76 square feet (ft^2).

anadromous salmonid populations. The contrast was driven by differences in flow and water temperature originating in that vicinity and by the presence of several barriers to upstream migration at and upstream of Panther Grade.[29] Upstream of Panther Grade, flow is supplied by snowmelt and rainfall, which produce peak flows in the spring, but extremely low flows in late summer to early fall (corresponding to the spawning time for spring and fall Chinook). The 2-year return flow for the 7-day low flow is only 4.4 cfs, and the majority of the project reach went completely dry in the summers of both 2014 and 2015. In contrast, a series of cold spring inflows between Panther Grade and Panther Creek (RM 18.9 to RM 18.7) were found to produce a flow of 28 cfs measured just downstream of the Ponderosa Way Bridge (RM 18.4) at the same time that flow was zero and the streambed was dry in most of the project reach. The cool and substantial spring inflows, sustained even through drought, provide favorable and reliable habitat for anadromous fish in South Fork Battle Creek downstream of Panther Grade.

Rugraw's measurements of the Panther Grade Falls (Parkinson, 2012) determined that for upstream migrating anadromous fish, it is impassible at flows of 180 cfs and less.[30] Additional measurements of jump heights and jump-pool depths were also completed in 2015 at seven potential barriers within the project reach. Each of the seven barriers was impassable to upstream migrating anadromous fish at the 31-cfs survey flow, because of inadequate jump-pool depth. The largest barrier was Powerhouse Falls, immediately downstream of the proposed powerhouse location. Fish ascending this barrier would require a 7.5-foot vertical jump, and the pool at its base is only about 1.6 feet deep, which is insufficient for a fish to make a 7.5-foot vertical jump. This falls was measured previously at 180 cfs[31] in December 2002, and also found to be impassible at that flow (Parkinson, 2012). Based on this information, Cramer et al. (2015) concluded it

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[29] Anadromous fish would only enter the project's bypassed reach if they successfully pass the downstream Coleman, Inskip, and South Diversion dams on South Fork Battle Creek, navigate through Panther Grade, and travel an additional 1.7 river miles up to and past the powerhouse tailrace. Although unoccupied, the proposed bypassed reach includes designated critical habitat for ESA-listed steelhead up to Angel Falls (RM 22.3), which is a complete barrier to upstream fish migration, and for ESA-listed spring-run Chinook salmon up to RM 21.4. Historical presence of either of these species in the proposed bypassed reach below Angel Falls is not known, because the designation was made after downstream barriers to anadromous fish passage had been in place for many years.

[30] Average monthly flows in South Fork Battle Creek range from a low of about 9 cfs in September to a high of 122 cfs in May. Flows more than 180 cfs are extremely rare during the Chinook migration period and would occur approximately once every 2 years during the steelhead migration period.

[31] 180 cfs is the highest flow that can safely be surveyed in the reach.

was highly probable that these passage barriers would prevent anadromous fish from entering the project reach.

Fish Populations

As a component of its July 2013 aquatic habitat assessment, Rugraw's biologists snorkeled about half of the pool channel units (9 out of 20 units), spread evenly throughout the study reach (figure 3-5). Rainbow trout (*Oncorhynchus mykiss*), which were common throughout the reach, were the only species observed during the survey. Juveniles 80 to 150 millimeters (mm) in fork length were the dominant size class, but larger yearlings (>150 mm) were also represented. A few fish >300 mm were observed in the deeper pools near the upper extent of the project area (i.e., Angel Falls).

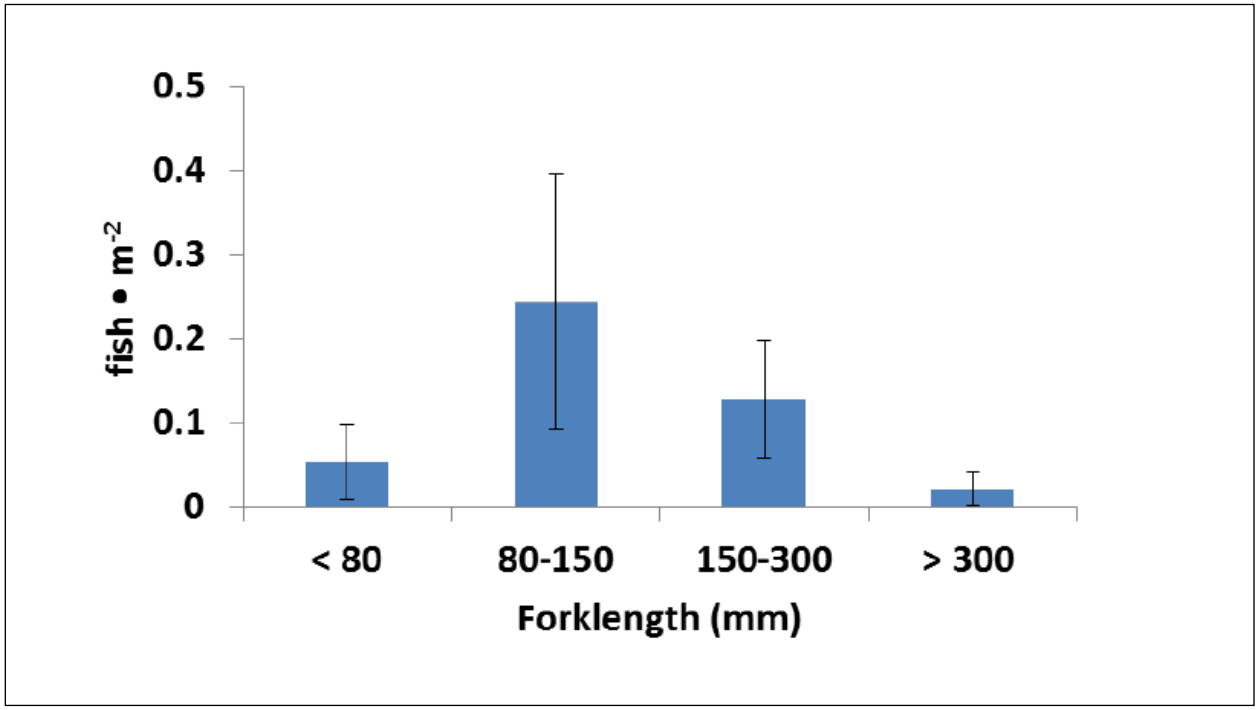

Figure 3-5. Snorkel observations of rainbow trout (*O. mykiss*) in representative pools within the study reach. Error bars indicate 2 standard errors (Source: Sellheim and Cramer, 2013).

All rainbow trout observed in the study reach in 2013 either died or moved downstream when the reach went dry in summer 2014, and only small juveniles were observed in shallow pools in the lower 0.24 mile of the reach where about 0.4 cfs of spring water entered the channel. This drying event, and evidence of previous such events in drought years, considered in combination with the finding of impassable upstream barriers within the reach over a wide range of flows, indicate that reseeding of

trout in the reach must occur by fish moving downstream from above Angel Falls. Thus, reseeding of the stream with trout occurs naturally from upstream and does not depend on the ability of trout downstream to migrate upstream over passage barriers.

The limited fish assemblage in the study reach compared to other portions of the Battle Creek watershed is another indicator of the challenges of accessing and surviving within the study reach. Quarterly electrofishing surveys by FWS just upstream of Panther Grade show that rainbow trout and riffle sculpin are the only fish species present above Panther Grade (Whitton et al., 2010). Similarly, only rainbow trout were observed within the study reach during Rugraw's 2013 snorkel surveys. These data contrast those collected from other areas in the Battle Creek watershed, where generally 8 to 10 species were captured during each sampling event in the mainstem, and 4 to 8 species were captured in the lower reaches of the North and South Forks, located downstream of the proposed project area. During the FWS survey, 12 native and 4 nonnative species were captured in the basin, but only two native species that are also present above Angel Falls were present in Rugraw's July 2013 survey.

Rainbow trout, like those captured in the proposed project's bypassed reach, are the most abundant and widespread native salmonid in western North America and likely the most widely distributed fish in California. The species can be either freshwater resident (rainbow trout) or anadromous (steelhead), and, where the two forms co-occur, the progeny of resident rainbow trout have the potential to become anadromous and the progeny of steelhead have the potential to become resident. They are also capable of spawning more than once before they die. However, most steelhead spawn only once in their life. Central Valley steelhead typically enter freshwater from August through April (Busby et al., 1996) and spawn from January through February. Spawning occurs over coarse gravel in the tail of a pool or in a riffle (Moyle, 2002). Following emergence from the gravel, young steelhead then reside in freshwater for 1 to 3 years before migrating to saltwater. Resident rainbow trout complete their entire life cycle in freshwater.

In the Sacramento-San Joaquin river system, acute and chronic episodes of elevated water temperatures are of major concern to fishery resource managers. Whereas most juvenile central valley Chinook salmon spend less than a year in freshwater, and rarely over-summer, juvenile rainbow trout and steelhead spend at least one full summer in freshwater; therefore, juvenile rainbow trout and steelhead have a greater likelihood of being exposed to chronically elevated water temperatures. According to the University of California, Division of Agriculture and Natural Resources (2017), optimal rainbow trout growth occurs at temperature ranging from 15 to 18ºC, and mortality typically results at 24 to 27ºC.

Although anadromous fish do not occur and are not expected to enter the project reach because of the substantial natural barriers to upstream migration at flows that typically occur at those times when the fish are migrating, Cramer et al. (2015) estimated the carrying capacities for various Chinook and steelhead life stages in the project reach at 13 and 31 cfs. For Chinook salmon, the estimated spawning capacity of 4 redds at 13

cfs, and 9 redds at 31 cfs would produce an estimated 872 parr and 1,962 parr, respectively. However, 13 cfs is higher than the median flow of 8 to 9 cfs during the September-October Chinook spawning season, indicating that a flow of 13 or 31 cfs would be an enhancement over baseline conditions. The estimated spawning capacity for steelhead trout was 50 redds at 13 cfs and 116 redds at 31 cfs. These redds would produce 8,150 steelhead parr at 13 cfs and 18,908 parr at 31 cfs; however, these parr estimates far exceed the steelhead rearing capacity of the reach, which is 1,407 parr at 13 cfs and 3,190 parr at 31 cfs.

3.3.2.2 Environmental Effects

Construction Effects

Erosion Control and Effects on Water Quality

Constructing the project would disturb areas near proposed project facilities and require the use and storage of potentially hazardous materials, all of which could degrade water quality. These risks are commonly mitigated through implementation of BMPs for erosion control, management of stormwater, and containment of hazardous materials. Because BMPs manage, but do not necessarily eliminate, risks of degrading water quality, monitoring water quality along with erosion control enables evaluating the effectiveness of measures taken, and provides insight into adaptive measures that could further limit water quality degradation.

As discussed in section 3.3.1.2, Rugraw proposes measures to control erosion and storm runoff. Rugraw additionally proposes to isolate in-water work areas with cofferdams, silt fences, or other structures and conduct all in-water work activities between July 1 and October 15.

The Water Board recommends that Rugraw monitor water quality, with emphasis on turbidity, when performing any in-water work, if project activities could have a discharge to surface waters, and when project-related activities result in the creation of a visible plume in surface waters (preliminary condition 6). Under preliminary condition 10, the Water Board also recommends that Rugraw develop a water quality monitoring plan, install and operate equipment at multiple water quality monitoring locations as determined by Rugraw and relevant resource agencies, and make data publicly available. The Water Board identifies potential parameters to be monitored, including, but not limited to: BMI, turbidity, flow, water surface level, pH, temperature, alkalinity, minerals, and/or conductivity. Although the Water Board does not specify a temporal period for its recommended water quality monitoring plan, it appears to be intended for construction of the project.

Our Analysis

As described in section 3.3.1.2, implementation of an erosion and sediment control plan would minimize the amount of erosion and sedimentation resulting from project

construction, and implementation of an SWPPP would minimize sediment releases and elevation of turbidity that could result from construction disturbance. Isolating in-water work areas, and limiting in-water work to the low-flow period, would minimize elevated turbidity and pH. In addition, monitoring for pH and turbidity and taking corrective actions if adverse effects are discovered, would help protect the water quality of South Fork Battle Creek from impacts from project construction activities.

Development of a water quality monitoring plan would provide a means of determining the effectiveness of mitigation measures aimed at maintaining water quality during the proposed construction period. Monitoring water quality daily before construction begins for the day, near the middle of the work day, and at the end of the work day would provide data sufficient to determine construction effects. *In situ* monitoring of turbidity and pH[32] upstream of construction sites and at the downstream end of mixing zones below construction site(s) would provide sufficient background data for detecting any construction-related turbidity and pH effects, evaluating the effectiveness of erosion and sediment control measures and the SWPPP, and identifying any concrete pouring near surface water. Reporting observations of oily sheens and turbidity plumes on surface waters would also document potential fuel and oil spills and major erosion events. These observations combined with monitoring data could be used to determine what caused these effects and facilitate initiation of appropriate responses, including clean-up actions. The water quality monitoring plan would specify the methods, quality assurance measures, and reporting schedules.

Effects on Aquatic Biota (Fish and BMI), Including Fish Passage

Construction activities could adversely affect resident fish and macroinvertebrate populations through temporary displacement and mortality associated with cofferdam construction and dewatering, excavation and dredging in the river channel, and erosion and runoff from adjacent disturbed areas. Increases in suspended sediment could reduce aquatic habitat suitability downstream of the construction area, bury fish eggs, and clog the gills of macroinvertebrates.

Rugraw proposes to develop an SWPPP that outlines measures to prevent erosion and sedimentation during construction, as discussed in section 3.3.1.2, *Geology and Soil Resources, Environmental Effects*. The SWPPP would include provisions for using cofferdams, silt fences, and other structures to isolate in-water work areas. Rugraw would also confine in-water work activities between July 1 and October 15, which is the low-flow period that would minimize adverse effects on water quality and aquatic biota. Finally, Rugraw proposes to maintain upstream and downstream fish passage during construction, either by constructing fish passage facilities first before constructing the

[32] Monitoring of pH would only be conducted to evaluate effects of fresh concrete placement within or along the stream channel or other surface waters.

remainder of the diversion/intake structure, or constructing a temporary diversion culvert if the entire diversion/intake structure is constructed as one unit in the dry.

Our Analysis

Some fishes may be displaced by cofferdam construction, increased turbidity associated with cofferdam installation, dewatering of the construction area, and excavation of the riverbed. However, Rugraw plans to complete project construction within 5.5 months. As such, any displacement would be temporary and unlikely to have long-term effects on aquatic organisms. Furthermore, limiting in-water construction to July1 through October 15 would minimize construction-related effects on aquatic organisms, because flows in South Fork Battle Creek are typically at their lowest during this period (less than 25 cfs), and most of the fish in the reach would have likely moved downstream to seek coldwater refugia. The in-water construction footprint would also be the smallest during this period, limiting potential adverse effects on immobile aquatic organisms.

Rugraw's proposed use of a cofferdam, silt fences, and similar BMPs would minimize the effect of increased turbidity on aquatic organisms because these measures would isolate construction areas from South Fork Battle Creek and limit the spread of disturbed sediment in the creek. Some minimal amount of fish stranding and mortality within the cofferdam construction areas is possible, although most fish would likely avoid the affected areas during cofferdam installation because of noise and vibrations associated with construction activities. Maintaining fish passage at the dam site would allow fish to egress the site and avoid exposure to construction activities. Some macroinvertebrate habitat would be permanently lost within the construction footprint, but, given the small amount of area and availability of similar substrate elsewhere, it is unlikely that this small loss of macroinvertebrate habitat would adversely affect this community.

Overall, Rugraw's proposed construction activities would only affect a few individual fish and macroinvertebrates and would not adversely affect local populations. Rugraw would use cofferdams and other erosion control measures to minimize sediment suspension and redistribution during construction, thereby protecting aquatic habitat.

Operational Effects on Water Quantity and Water Quality

Project operations would reduce stream flow in the 2.4-mile-long bypassed reach between the diversion dam and the powerhouse and route water diverted at the dam through a buried pipeline-penstock system to the powerhouse. The project would operate in a run-of-river mode whereby the sum of all outflows from the project would approximate the sum of all inflows to the project at any given time. By operating run-of-river, the project would not store water or divert water for any purpose other than hydropower. The project's turbine would continue releasing flows from the powerhouse under a load rejection, thereby minimizing changes in flow downstream of the project. During project operations, the project would not affect streamflow downstream of the

powerhouse, with the exception of the startup of flow diversions. During initial project startup, or after extended periods of shutdown when the pipeline/penstock has been drained, flow downstream of the powerhouse would be reduced while refilling the pipeline and penstock with water, although this would likely be relatively brief (less than one hour). Reduced streamflow in the bypassed reach could alter the temperature regime by reducing the mass of water that is acted upon by solar warming in the reach, while water diverted through the 2.4-mile-long pipeline and penstock would not experience solar warming, but could be influenced by the temperature of the pipeline/penstock.

Flow Gaging and Monitoring

Rugraw proposes, and California DFW recommends (10(j) recommendation 1), implementation of a continuous minimum flow release into the bypassed reach of 13 cfs, or inflow, whichever is less, and limiting project operation to periods with inflows of 18 cfs or more. Rugraw anticipates that project operations would typically cease in early July and resume in mid to late November. In addition, Rugraw proposes to discontinue project operation when the average daily stream temperature exceeds 20°C, as measured within the bypassed reach.

Rugraw proposes to establish and maintain three flow monitoring stations: (1) on the downstream side of the diversion structure, (2) in the bypassed reach just upstream of the powerhouse tailrace, and (3) downstream of the Ponderosa Way Bridge at approximately RM 18.5. The stations would continuously record streamflow and water temperature.

Interior and NMFS (10(j) recommendation 1) each recommend a continuous minimum instream flow of 35 cfs, or the natural inflow, if less, to provide habitat connectivity and fish passage within the bypassed reach.

Interior and NMFS (10(j) recommendation 3) also recommend implementation of a flow gage monitoring plan, to designate existing flow gages (or new gages if needed) that would be used to monitor minimum instream flows from upstream of the diversion dam to downstream of Panther Grade. The agencies' recommended locations of the flow gages are as follows: (1) upstream of the diversion dam; (2) at the intake's header box; (3) upstream of Angel Falls; (4) upstream of powerhouse Spring #4; (5) at the powerhouse discharge; (6) downstream of the powerhouse; and (7) downstream of Panther Grade. Interior and NMFS state the recommended flow gage monitoring plan is necessary to monitor compliance with license conditions.

Drought Plan

The Water Board recommends implementation of a drought plan to outline the project's operations, including flows, during a drought and/or multiple critically dry years (preliminary condition 4).

Our Analysis

Our analysis of the proposed and recommended minimum flows for the bypassed reach is discussed below under *Effects of Flow Regulation on Aquatic Habitat*. Our discussion herein focuses on the flow gaging and monitoring that would be required to determine whether the project is operating in compliance with any flow requirements of any license issued. Rugraw's proposal to monitor flow just downstream of the diversion dam, in the bypassed reach just upstream of the influence of Spring #4, and downstream of the Ponderosa Way Bridge, would not capture inflows to the project area prior to diversion through the project or enable evaluation of the proposed run-of-river operation. Maintaining a station just upstream of Spring #4, however, would enable evaluation of any flow depletion upstream of the influence of accretion from Spring #4.[33]

Interior and NMFS recommend seven monitoring stations, some that were similar in location to those proposed by Rugraw. In its August 31, 2016, response to resource agency comments, Rugraw agreed to develop a flow gage monitoring plan in consultation with appropriate resource agencies and did not dispute the number of recommended monitoring gages. However, Rugraw commented that a site downstream of Angel Falls would not be accessible for maintaining a gage in the bypassed reach, and instead proposed a gage location in the bypassed reach just upstream of the powerhouse.[34] Gage accessibility would be an important consideration, but documenting compliance with any flow requirements of any license issued would be the overriding objective of any flow gage monitoring plan. Rugraw's proposed run-of-river operation and minimum flow for the bypassed reach are the two flow requirements of any license issued that would require compliance monitoring. Several of the agency-recommended gage locations would be unnecessary to ensure compliance with these requirements. For example, because the project would not alter streamflow downstream of the powerhouse for periods longer than one hour, there would be little value in monitoring flow at the agency-recommended locations downstream of the powerhouse.

The most important points for documenting project-related flows would be the inflow to the project reservoir, the minimum flow release downstream of the diversion dam, and flow at a point just upstream of Spring #4's influence, to determine if any flow released at the dam is lost prior to the accretion from Spring #4. Run-of-river operation could then be verified by adding the known powerhouse discharge and the bypassed reach flow upstream of Spring #4's influence, and comparing that to the inflow to the project reservoir.

[33] Spring #4 is located at RM 20.8, 0.2-mile upstream of the proposed tailrace discharge.

[34] Locations for Angel Falls and the powerhouse are at RM 22.3 and RM 20.6, respectively.

Effects of Streamflow on Project Operation

The project would divert between 5 and 105 cfs for power generation, primarily during the winter and spring months when peak streamflows in the watershed occur. Rugraw proposes to design the powerhouse's Pelton turbine to continue water flow in the tailrace under a load rejection. As proposed, a minimum instream flow of 13 cfs, or natural inflow, whichever is less, would be released to the bypassed reach at all times. At natural flows up to 18 cfs, the powerhouse would be off-line, and the entire streamflow would pass over the diversion into the bypassed reach. With these operational constraints, Rugraw notes that hydropower operations would typically cease in early July and resume in mid- to late-November. Additional discussion of the minimum instream flows proposed by Rugraw and recommended by Interior and NMFS, including effects on water temperature and aquatic habitat, is included below.

To further assess the effects of streamflow on project operation, and in turn on water quality, we estimated when inflow would be sufficient for the project to operate while also releasing a minimum flow to the bypassed reach. We used synthesized flow data from October 1928 to June 2017, and estimated the percent of time the project could operate at both Rugraw's proposed 13-cfs minimum flow and the agency-recommended 35-cfs minimum flow (table 3-6). This analysis shows that there would be sufficient inflow for the project to operate under a 13-cfs instream flow[35] the majority of time from January 1 to April 15 and June 1 through mid-July; infrequently (10 to 49 percent of the time) from mid-April to May 31, mid-July through August, and mid-October to December 31; and rarely during September to mid-October (table 3-6). Under a 35-cfs instream flow, there would be sufficient inflow for the project to operate the majority of time from February 15 to May 15 and June 1 to 15; infrequently from mid-June to July 31, mid-November to mid-February, and May 16 to 31; and rarely in August through mid-November. Whenever the project would be shut down, it would have no effect on streamflows or water quality, and table 3-6 shows that shutdowns would occur a substantial portion of the year, particularly at a 35-cfs instream flow.

[35] This evaluation of 13-cfs and 35-cfs instream flows does not consider any project shutdowns to meet a temperature criterion.

Table 3-6. Percent of time the Lassen Lodge Project could operate, using synthetic flow data from October 1928—June 2017 (shading indicates when the project could operate more than 50 percent of the time) (Source: Rugraw, 2014, as modified by staff).

	Operation under 13-cfs Minimum Flow		Operation under 35-cfs Minimum Flow		
Flow Category	**% of time flows are available for generation (18 – 450 cfs)**	**% of time flows are between project capacity of 5 cfs and 105 cfs + 13 cfs (18 – 118 cfs)**	**% of time flows are available for generation (40 – 450 cfs)**	**% of time flows are between project capacity of 5 cfs and 105 cfs + 35 cfs (40 – 140 cfs)**	**% of time flows are > 450 cfs**
Jan 1 - 15	72.8	60.1	44.0	35.1	0.8
Jan 16 - 31	77.5	60.9	51.4	39.7	0.5
Feb 1 - 14	84.3	66.1	58.8	46.4	0.7
Feb 15 - 29	90.7	74.4	66.3	55.8	0.5
Mar 1 - 15	95.1	79.6	75.8	65.3	0.3
Mar 16 - 31	98.5	85.7	84.2	76.8	0.2
Apr 1 - 15	97.8	59.1	87.9	61.3	1.0
Apr 16 - 30	99.8	48.0	94.2	55.2	0.2
May 1 - 15	98.0	44.7	88.9	53.7	0.2
May 16 - 31	95.0	45.0	83.8	48.9	0.7
Jun 1 - 15	92.0	59.3	76.5	54.6	0.0
Jun 16 - 30	82.1	60.8	54.0	44.6	0.0
Jul 1 - 15	61.9	58.9	32.9	31.6	0.0
Jul 16 - 31	42.5	42.5	14.9	14.9	0.0
Aug 1 - 15	28.7	28.7	3.4	3.4	0.0
Aug 16 - 31	17.8	17.8	0.4	0.4	0.0

	Operation under 13-cfs Minimum Flow		Operation under 35-cfs Minimum Flow		
Flow Category	**% of time flows are available for generation (18 – 450 cfs)**	**% of time flows are between project capacity of 5 cfs and 105 cfs + 13 cfs (18 – 118 cfs)**	**% of time flows are available for generation (40 – 450 cfs)**	**% of time flows are between project capacity of 5 cfs and 105 cfs + 35 cfs (40 – 140 cfs)**	**% of time flows are > 450 cfs**
Sept 1 - 15	8.0	8.0	0.1	0.1	0.0
Sept 16 - 30	6.2	6.1	0.3	0.2	0.0
Oct 1 - 15	9.1	8.6	1.8	1.5	0.1
Oct 16 - 31	16.4	15.7	4.2	3.9	0.0
Nov 1 - 15	30.6	28.8	7.9	6.8	0.1
Nov 16 - 30	44.1	39.3	19.8	16.3	0.1
Dec 1 - 15	55.3	45.7	30.6	23.7	0.5
Dec 16 - 31	61.7	48.1	37.3	27.5	1.1

The development of a drought plan as recommended by the Water Board would not be required in the operating plans to guide project operation, including minimum flows, during a drought and/or multiple critically dry years. The proposed project would operate in a run-of-river mode with a proposed minimum bypassed reach flow, operate as a non-consumptive use of water for power generation (i.e., all of the diverted flow would be returned to South Fork Battle Creek), and would not store flow in a reservoir. The project as proposed would not exacerbate drought conditions in downstream stream reaches.

Water Temperature

Rugraw proposes and California DFW recommends (10(j) recommendation 4) developing a water temperature monitoring plan with six monitoring stations and a provision for project shutdown when water temperature in the bypassed reach exceeds 20ºC. Rugraw proposes water temperature monitoring stations at: (1) the diversion/intake structure; (2) Old Highway 36 Bridge; (3) within the bypassed reach, just upstream of the tailrace; (4) the powerhouse tailrace; (5) downstream of the powerhouse, in mixed flows from the bypassed reach and powerhouse tailrace; and (6) Ponderosa Way Bridge downstream of Panther Grade.

Interior and NMFS recommend (10(j) recommendation 2) that Rugraw develop a water temperature monitoring plan with seven monitoring stations between Rugraw's diversion dam pool and about 0.4 mile downstream of Panther Grade and curtail project operations when water temperature exceeds EPA's (2003) 7-day average of the daily maximum (7DADM) of 18ºC in the bypassed reach.[36] In addition, NMFS recommends limiting bypassed reach 7DADM temperatures both upstream and downstream of Angel Falls to 13ºC from November 1 to March 1 for salmonid spawning and 16ºC from March 2 to May 31 for salmonid rearing.

Interior also recommends (10(j) recommendation 2) that, if water is not available to comply with the 7DADM criteria or if water temperature above the project's influence exceeds the criteria, Rugraw restore streambed and riparian areas to provide additional shading to reduce instream water temperatures.

Our Analysis

Rugraw modeled water temperature in South Fork Battle Creek and in the powerhouse discharge using two separate models (Watercourse Engineering, 2015): the

[36] In addition to Rugraw's proposed locations at the diversion/intake structure, the powerhouse tailrace, in mixed flows from the bypassed reach and powerhouse tailrace, and Ponderosa Way Bridge, NMFS and Interior recommend monitoring locations just upstream of the diversion dam, just upstream of Angel Falls, between Angel Falls and Spring #4. They do not, however, recommend monitoring at Rugraw's proposed sites in the bypassed reach at the Old Highway 36 Bridge or just upstream of the tailrace.

Water Temperature Transaction Tool (W3T) and a tunnel temperature model. In the following discussion, we refer to changes in temperatures as water moves downstream or through the pipeline-penstock system as cooling and warming; we refer to temperature changes under alternative project operations (i.e., 13-cfs and 35-cfs minimum instream flows) as increasing and decreasing in comparison to baseline conditions, the no-action alternative, unless stated otherwise. Rugraw used W3T to simulate longitudinal temperature conditions for South Fork Battle Creek between the proposed diversion and Ponderosa Bridge (RMs 23.0 to 18.5).[37] The model used 12 subreaches: 4 for the bypassed reach and 8 for the reach between the powerhouse and Ponderosa Bridge located 2.1 miles downstream. The model was calibrated with data from 2007, 2013, and 2014; validated with 2015 data; and applied to April 29 to July 13, 2007.

The W3T model simulations show that diversion of water for the project would have minor effects on the thermal regime in the bypassed reach during the dry year modeled, 2007. Differences in simulated temperatures for an instream flow of 13 cfs compared to baseline conditions are less than ±0.2ºC for the Old Highway 36 Bridge (RM 22.5) and less than ±0.5ºC above Spring #4 (RM 20.9). Above Spring #4, the only period with an increase greater than 0.2ºC was the first week of May, which had project inflow temperatures of 5ºC to 7ºC. Temperatures in the lowermost 0.2 mile of the bypassed reach would decrease more with project operation than existing conditions in late-spring through late summer when the creek is warmer than the spring inflow.[38] At a 13-cfs instream flow, differences in simulated temperatures below the powerhouse tailrace ranged from a decrease of 1.1ºC in early May to an increase of 0.7ºC at the beginning of June. Increases greater than 0.2ºC resulted in a maximum of 17ºC below the powerhouse tailrace return and coincided with project inflow temperatures of 15ºC to 17ºC. Simulated temperatures below Ponderosa Bridge (RM 18.5) at a 13-cfs instream flow remain within ±0.5ºC of the baseline conditions, with a maximum increase of 0.2ºC.

To simulate any change in temperature for water routed through the proposed pipeline and penstock (i.e., from the intake at the diversion dam to the powerhouse's discharge), Rugraw used a tunnel temperature model.[39] This model predicts that water flowing through the pipeline-penstock would warm when inflow at the dam is less than 14ºC and cool when inflow temperature is greater than 14ºC (Watercourse Engineering, 2015). The most extreme temperature changes were simulated for the minimum

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[37] W3T is a one-dimensional steady-flow model developed by Watercourse Engineering for the National Fish and Wildlife Foundation under a Conservation Innovation Grant (Watercourse Engineering, 2013).

[38] The extent of flow reductions from project operation would depend on natural flows and any instream flow requirements of the project license.

[39] The pipe-wall temperature setting was based on Rugraw's proposal to bury both the pipeline and penstock in accordance with general engineering and construction practices to ensure proper bedding and about 3 feet of ground cover.

operating flow of 5 cfs. For an inflow temperature of 20ºC, the model simulated a cooling for the range of powerhouse operation (i.e., 5 to 95 cfs) from 0.8ºC to 0.3ºC. Consistently the model simulated a 0.1ºC cooling effect for an inflow temp of 15ºC. Whereas, the model predicts a 0.5ºC to 0.2ºC warming effect for an inflow temperature of 10ºC (figure 3-6).

Although the tunnel temperature model predicts changes in temperature for water routed through the pipeline-penstock, we note that the W3T model development assumed that temperature would not change in the pipeline and penstock. As a result, the W3T model likely over-estimates the temperatures below the powerhouse tailrace when the water temperature at the diversion dam is warmer than 14ºC (when the pipeline-penstock would provide some cooling effect), and under-estimates the water temperature when inflow is cooler than 14ºC (when the pipeline-penstock would provide some warming).

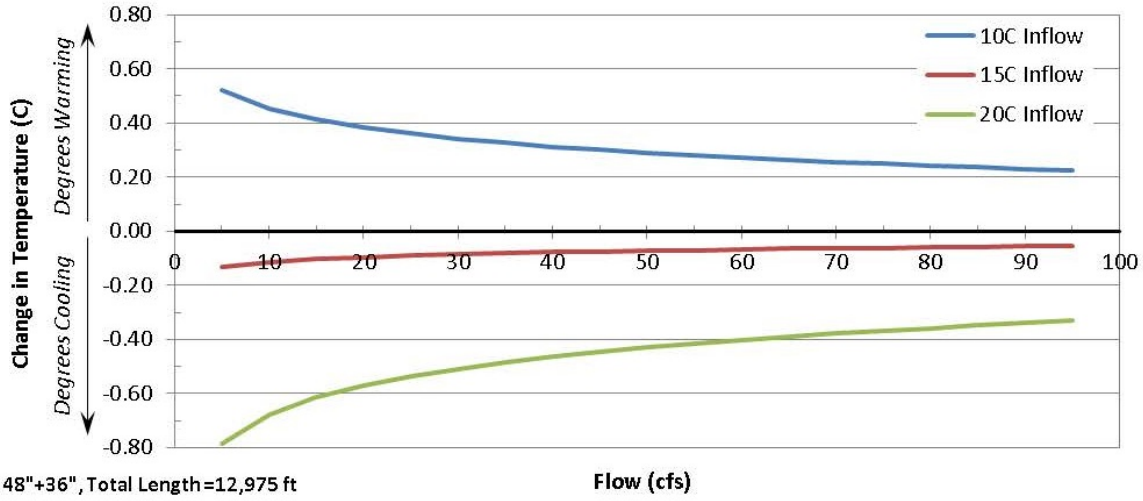

Figure 3-6. Simulated water temperature for the proposed Lassen Lodge power tunnel (Source: Watercourse Engineering, 2015).

W3T's simulated increase in temperature below the powerhouse tailrace return in June coincided with an inflow temperature of about 17ºC. The tunnel temperature model results; however, show that powerhouse discharges would be approximately 0.3ºC cooler than the inflow from the dam site used by the W3T model. Hence, the increase in temperature just below the powerhouse tailrace return would likely be less than 0.5ºC under a 13-cfs minimum instream compared to the baseline condition. Although this cooling effect of the pipeline-penstock would persist as water flows downstream, natural warming would occur between the powerhouse tailrace and the Ponderosa Bridge. Based on results of either model, however, project operation of 5 to 95 cfs would result in increases of less than 0.2ºC to 0.5 ºC compared to baseline conditions in South Fork Battle Creek downstream of the powerhouse.

The W3T model indicates that the thermal effects of project operation would be reduced as minimum instream flows in the bypassed reach increase (Watercourse Engineering, 2015). Compared to operating the project with a 13-cfs instream flow, Interior's and NMFS' recommended 35-cfs instream flow would reduce the project's effect on water temperature in the bypassed reach, including the project's reduction in the temperature of late-spring and summer flows. Under the agencies' recommended higher minimum flow, the project would cease operation sooner in the year and hence have no measurable effect on temperature during these shutdown periods.

A large open meadow upstream of the proposed diversion dam site causes water temperatures to warm in the upper South Fork Battle Creek soon after snowmelt and results in elevated temperatures at the proposed dam site. As this late spring and early summer warm water flows through the bypassed reach downstream of the dam site, it typically cools under existing conditions (Cramer and Ceder, 2013; Cramer et al., 2015). This is likely because of the narrow channel, considerable shade downstream of Angel Falls (RM 22.3), and cool-water inflow from Spring #4. In addition, modeling indicates that powerhouse discharges would be less than inflow temperatures when inflow temperatures are greater than 14ºC (see figure 3-6). As a result, project flow diversions in late spring and early summer (when inflow temperatures are likely greater than 14ºC) would result in cooler water temperatures in the bypassed reach and downstream of the project tailrace in the South Fork Battle Creek compared to baseline conditions.

Rugraw proposes and agencies recommend shutting down the project when specific water temperature criteria to protect coldwater fisheries habitat are exceeded. Figure 3-6 shows the effect of the proposed and recommended water temperature criteria on timing of potential project shutdown for the warmer months of the year when the temperature criteria may be exceeded,[40] based on water temperature data (Watercourse Engineering, 2015) for each water year type. In the 2007 modeled year, the lack of flow would result in virtually no project operation beginning on June 20 through at least October, at the proposed 13-cfs minimum instream flow (figure 3-7). Similarly, with NMFS and Interior's recommended 35-cfs minimum instream flow, the project would not operate from May 23 through at least October, and an additional 8 days in April (figure 3-7). Therefore, project operation would not affect water temperature in South Fork Battle Creek during these periods of this dry year, because the project would be shut down pursuant to the proposed and recommended minimum flow regimes.

[40] This evaluation of water temperature criteria used April through October temperature data for the project intake and Old Highway 36 Bridge for 2006 (wet year), 2004 (above normal year), 2013 (below normal year), 2007 (dry year), and 2014 (critical dry year).

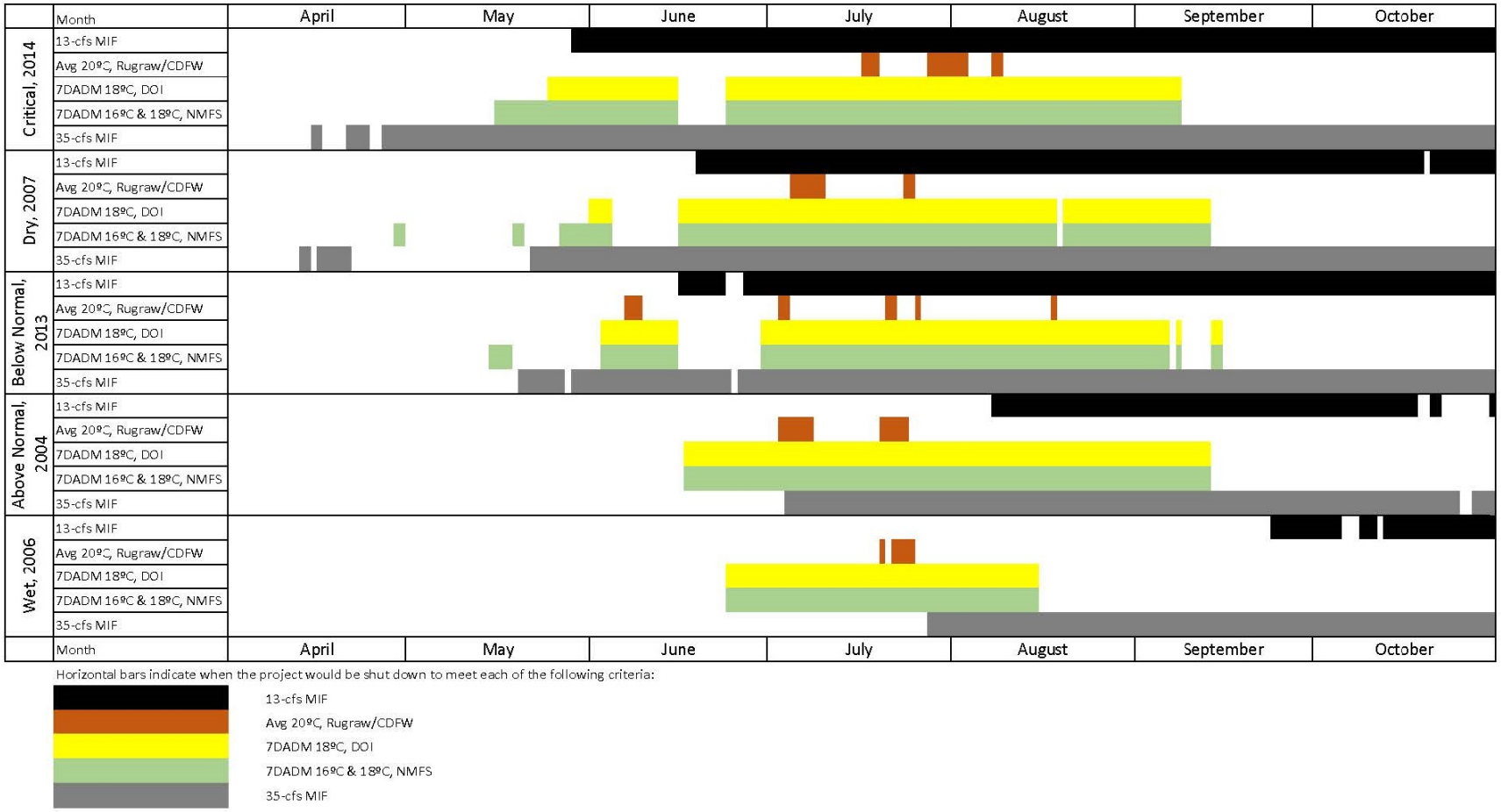

Figure 3-7. Time series for preclusion of project operation to meet proposed and recommended minimum instream flows and temperature criteria, based on historic temperatures at the proposed dam site; horizontal bars indicate when the project would be shut down (Source: Watercourse Engineering, 2015; USGS, 2017a; as modified by staff).

This analysis also shows that all of the proposed and recommended temperature criteria would be exceeded at the diversion dam (under existing conditions) at different times from April to September in all water year types. Water temperature exceedances occur on days in June through August for the 20ºC daily average temperature criterion proposed by Rugraw and recommended by California DFW, May through September for Interior's recommended 18ºC 7DADM, and April through September for NMFS recommended 16ºC and 18ºC 7DADM. The timing of many of these temperature criteria exceedances, however, coincides with periods when the project would already not operate under either the proposed 13-cfs or recommended 35-cfs minimum instream flow (see figure 3-7). However, the duration of these temperature criteria exceedances would be less in above normal and wet water years.

Various temperature criteria may trigger additional project shutdowns, outside of those occurring because of inadequate flows; however these events would be infrequent. At a 13-cfs minimum flow, the 20ºC daily average temperature criterion would cause no additional days of project shutdown in the dry and critical years, and only cause three more days of shutdown in the below normal year. Interior's 18ºC 7DADM criterion would result in 4, 7, and 10 more days of shutdown than would occur at the 13-cfs minimum instream flow in the critical, dry, and below normal years, respectively. NMFS' 16ºC and 18ºC 7DADM criteria would result in 13 to 17 more days of shutdown than would occur at the 13-cfs minimum instream flow in the critical, dry, and below normal years. Similarly, operating the project with a 35-cfs minimum instream flow requirement would result in project shutdown due to inadequate flows for nearly all days that the temperature criteria would be exceeded for the below normal and drier water years. However, operating the project with a 35-cfs minimum instream flow during the above-normal and wet water years, the project would be shut down 17 and 34 days under both the Interior and NMFS 7DADM thresholds, respectively, versus 11 and 5 days respectively for Rugraw's proposed 20ºC threshold. Operating the project with a 13-cfs minimum instream flow would result in the project being shut down the same number of days for Rugraw's proposed 20ºC threshold; however, the project would be shut down 52 to 53 days under both Interior and NMFS 7DADM thresholds. Although proposed and recommended water temperature criteria would trigger shutdown for more days in the wetter years, temperature modeling suggests that project operation would generally decrease the creek's temperatures during these periods.

Interior also recommends that, if EPA's (2003) 7DADM criteria are not met, streambed and/or riparian restoration projects should be implemented along South Fork Battle Creek to provide shading and potential cooling. Our analysis found that water temperature may occasionally exceed the 18ºC 7DADM at the diversion dam and in the bypassed reach (see figure 3-7), but this is primarily because of warm inflow to the project reach, not due to project-induced warming. Although streambed and/or riparian restoration projects may improve ambient water temperatures in the upper South Fork Battle Creek, natural and anthropogenic conditions upstream of the project that cause reduced inflows and/or elevated water temperature are beyond the project's control.

Operational Effects on Aquatic Habitat and Biota

Effects of Flow Regulation on Aquatic Habitat

The proposed run-of-river operation of the planned project would affect the seasonal instream flow pattern in the 2.4-mile-long reach of South Fork Battle Creek between the proposed diversion dam (RM 23.0) and powerhouse tailrace (RM 20.6) (bypassed reach); however, all flow would be returned to the stream 1.7 miles upstream of Panther Grade (RM 18.9) (see figure 3-2), and the flow pattern would remain unaffected downstream of the project's tailrace. Manipulation of instream flows in the bypassed reach would directly affect the capacity of that reach to support spawning, rearing, and other life stages of resident and possibly anadromous fish, and may also affect other physical and biological processes. In diverted or bypassed stream reaches that contain productive aquatic habitat, resource managers often establish instream flow regimes to maintain ecological functions, processes, and connectivity important for sustaining aquatic resources.

Rugraw proposes to maintain a minimum flow of 13 cfs in the bypassed reach, as needed to sustain functions that support fish and habitat in the stream. The minimum instream flow release would pass through a slot in the diversion dam and cascade over native boulders that would be retrieved from the instream excavations to simulate a natural boulder cascade.

In its preliminary 10(j) recommendations (recommendation 1), California DFW concurs with Rugraw's recommended 13-cfs minimum flow release for the protection of resident fish (along with the proposed temperature criteria not to exceed 20°C in the bypassed reach).[41] If anadromous salmonids are detected in the bypassed reach (through the anadromous fish monitoring program), California DFW recommends Rugraw develop in consultation with the resource agencies new flow and temperature criteria to protect anadromous salmonids.

In their preliminary 10(j) recommendations (recommendation 1), NMFS and Interior recommend that Rugraw deliver, once the project begins power generation, a year-round minimum instream flow in the bypassed reach of 35 cfs, or the natural flow (if the natural flow is less than 35 cfs), to provide for habitat connectivity and fish passage within the bypassed reach.

The Water Board reserves the right to condition the project with minimum instream flows in light of the whole record (preliminary condition 1). The whole record would include, but is not limited to, the FERC record (i.e., recommendations by resource agencies); the final National Environmental Policy Act document; and the final California Environmental Quality Act document.

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[41] As previously described, Rugraw proposes to discontinue project operation whenever the average daily stream temperature exceeds 20°C, measured within the project bypassed reach.

Our Analysis

Rugraw is proposing to operate the project in a run-of-river mode where the water surface elevation of the proposed 0.4-acre reservoir (4,310 feet mean sea level) would be maintained at +/-0.5 inch throughout the normal operating range of the project. Run-of-river operation would require Rugraw to release via the powerhouse and at the diversion dam (the minimum flow) a total flow equal to the inflow to the proposed project reservoir. Although none of the commenting agencies discussed or recommended Rugraw's proposal for run-of-river operation, such operation would protect aquatic resources upstream and downstream of the project by maintaining a constant water level and aquatic habitat in the reservoir and more constant flows and aquatic habitat downstream of the powerhouse. Changes in the amount of aquatic habitat would occur because of natural flow fluctuations, and not hydropower operations. Rugraw's proposal to maintain the water surface elevation of the reservoir to within +/-0.5 inch, however, may be beyond the capabilities of currently available monitoring and flow regulation equipment. Maintaining that level of precision in a reservoir (even a small reservoir) would be difficult, where wind and waves may cause natural fluctuations in the water surface elevation that are more than 0.5 inch.

NMFS's and Interior's 35-cfs minimum flow recommendation is based on results of a Physical Habitat Simulation (PHABSIM) study performed in the bypassed reach that predicted the usable habitat for steelhead and spring Chinook salmon juveniles and fry (Thomas R. Payne & Associates, 1995). The PHABSIM study found that a flow of 35 cfs, would provide suitable habitat for spring-run Chinook fry, spring-run Chinook juveniles, steelhead fry and steelhead juveniles equal to 97, 99, 100, and 90 percent, respectively, of the maximum possible habitat (as depicted by weighted usable area, an index of habitat) for the two species and two of their life stages. The same study showed that the minimum flow of 13 cfs would provide habitat for spring-run Chinook fry and juveniles, and steelhead fry and juveniles equal to 32, 69, 50, and 83 percent, respectively, of the maximum possible weighted usable area for the two species and two life stages.

At present, neither steelhead trout nor spring-run Chinook salmon occur in the proposed bypassed reach. Panther Grade at RM 18.9 prevents these species from entering the project reach in all but the most extreme high flow conditions, and perhaps not even then. Rugraw proposes and the resource agencies recommend regular monitoring to detect whether these species are ever successful in overcoming downstream migration barriers and the Panther Grade barrier and enter the project reach. Setting the minimum flow at 35 cfs to provide maximum habitat for a non-extant fish assemblage is not justified, particularly in light of the potential effect on power generation (see sections 4.3 and 5.2).

However, even if anadromous salmonids gain access to the project reach, the project typically would not be operating during the Chinook salmon spawning season because of naturally occurring low flows; therefore, Chinook salmon spawning would not

be affected. During steelhead spawning, the minimum instream flow would support a spawning capacity that would produce 8,150 steelhead parr at 13 cfs and 18,908 parr at 31 cfs. Both parr estimates far exceed the steelhead rearing capacity of the reach, which was estimated to be 1,407 parr at 13 cfs and 3,190 parr at 31 cfs. In addition, if steelhead are detected at the base of the powerhouse, Rugraw indicated it would evaluate passage impediments to desirable spawning areas upstream of the powerhouse, to determine the flow at which the impediments are passable. If passage impediments are found in the reach, Rugraw would initially modify project operations to provide 30 cfs in the bypassed reach for a period of 2 days, twice a month (4 days total per month) from February 1 to May 15 (the steelhead spawning period) to facilitate upstream passage. Rugraw would also provide a team of two biologists to survey and photograph potential passage impediments across a range of flows. A committee of NMFS-approved biologists would then review the photos to estimate the flow at which passage likely becomes available. If that team finds that barrier modification would be beneficial, the team may also select up to four locations where blasting or other methods may be employed by Rugraw to modify an obstacle to provide passage over a wider range of flows.

In the absence of anadromous fish, rearing capacity is also the most limiting factor for resident rainbow trout in the bypassed reach. This rearing capacity is determined by the limited volume of habitat during the low flow season, when the project would not be operating and thus would not affect the rearing capacity of rainbow trout. According to Cramer et al. (2015), the parr equivalent capacity for rainbow trout spawning is slightly less than that for steelhead, but still far greater than needed to fully seed the available rearing habitat, even for spawning at 13 cfs. Although spawning capacity would increase at flows above 13 cfs, the increased number of offspring would be forced to migrate in search of vacant rearing habitat downstream. However, this would appear to be of negligible benefit, because similar stream morphology downstream from the project indicates that spawning capacity likely exceeds rearing capacity throughout South Fork Battle Creek.

Ramping Rates

Rapid changes in streamflow associated with hydroelectric project operations have the potential to adversely affect aquatic resources. If water recedes in a project-affected reach faster than what would occur naturally (from changes in generation, emergency shutdowns, etc.), adverse effects can include stranding fish in shallow, low gradient gravel bar areas and off-channel habitat; temporary loss of fish habitat or loss of habitat access; and the dewatering of amphibians, aquatic insects, and plant life (Hunter, 1992). Rapid changes in stream flow also can affect fish behavior leading to reduced spawning success (Bauersfeld, 1978). Fry and juvenile fish less than 2 inches long are normally the most vulnerable to stranding because of their weak swimming ability; preference for shallow, low-velocity habitat such as edge-water and side channels; and a tendency to burrow into the substrate to hide. Limits governing the rate and timing of project-

induced stage changes (ramping rate restrictions) are often established at hydroelectric projects to protect aquatic organisms (Hunter, 1992; Olson, 1990).

With its response to agency preliminary conditions and recommendations, Rugraw amended its proposed ramping rate requirements to be consistent with California DFW and Water Board ramping rate recommendations of 0.1-foot per hour. Rugraw also indicates it would monitor stream stage for ramping purposes at a gage located at a narrow stream transect immediately downstream of the diversion point and fish ladder, or at another appropriate location.

Consistent with the Water Board's recommended ramping rate (preliminary condition 2), California DFW's 10(j) recommendation 2 would have Rugraw provide a controlled flow transition to avoid stranding, stressing, or displacement of native aquatic species. To accomplish this, the agencies recommend a 0.1 foot per hour (1.2 inch per hour) maximum ramping rate when returning the water conveyance facilities to service following forced or scheduled outages. California DFW also recommends that planned maintenance requiring dewatering of the conveyance facility only be scheduled during the period when the project is off line during the summer months to minimize potential effects on fish that may be present in the affected stream reaches. Per California DFW's preliminary 10(j) recommendations, the Water Board also recommends ramping rates of 0.1 foot per hour.

In their preliminary 10(j) recommendation 1, NMFS and Interior recommended Rugraw ramp flow changes at a rate no greater than a 1-inch stage per hour, based on a gage located between Angel Falls and powerhouse Spring #4.

Our Analysis

Even though the proposed project would be operated in a run-of-river mode with infrequent ramping events, any rapid changes in stream flow associated with project start-ups or shut-downs would have the potential to adversely affect aquatic resources in South Fork Battle Creek. For example, project start-ups could suddenly decrease the amount of water in the bypassed reach and strand fish and other aquatic biota. A rapid shut-down could also suddenly decrease the amount of flow immediately downstream of the powerhouse, and rapidly increase the amount of flow in the bypassed reach. In a relatively small snowmelt driven system like upper South Fork Battle Creek, streamflows would typically increase above the proposed project's minimum flow in the late fall and remain above that level until mid-summer. In late summer and fall, when the project would typically be shut down because of low flows, periodic rain events may increase the streamflow enough to support project operation for a limited number of days, resulting in additional up and downramping events. However, these ramping events would be relatively infrequent and there would be no ramping during planned maintenance activities, as these would be scheduled to occur during the summer low-flow period when the project is off-line.

Both ramping rate restrictions recommended by the resource agencies (0.1 foot per hour and 1-inch per hour) are conservative and if implemented correctly, would likely eliminate any sudden changes in flow in the bypassed reach of South Fork Battle Creek. However, given that the proposed project's bypassed reach is relative high gradient and confined (with few side channels, low gradient gravel bars, and other potential stranding areas), it is anticipated that California DFW's slightly less conservative 0.1 foot per hour restriction would be adequate to protect aquatic resources, as numerous studies in California have shown that ramping rates in the 1 to 6 inches per hour range minimize any adverse effects on aquatic biota. For example, in 2004, PacifiCorp completed a literature-based assessment of the potential impacts associated with ramping regimes in river reaches affected by the Klamath Hydroelectric Project. The study found that ramping rates ranging from 0.1-0.6 foot per hour resulted in minimal stranding and were well within the natural range of those found in unregulated river systems (PacifiCorp, 2004). PG&E also recently implemented a 6-inch per hour or less ramping rate at the Spring Gap-Stanislaus Hydroelectric Project to avoid stranding or displacement of fish and other aquatic species.

Therefore, based on this information, it is likely that a 0.1 foot per hour ramping rate would adequately protect aquatic resources in the project-affected reach of South Fork Battle Creek. In addition, Rugraw proposes to implement a real-time flow monitoring program in South Fork Battle Creek, coupled with a ramping rate monitoring and recording program, to document compliance with ramping rates required by any FERC license. A single gaging point downstream of the diversion dam would likely be adequate to monitor compliance with any required ramping rate.

Fish Habitat Assessment Plan

Maintaining or enhancing fish populations and other aquatic biota in rivers and streams requires adequate streamflow (i.e., water depth, water velocity, and habitat space); access to sufficient spawning habitat; complex rearing habitat; appropriate food sources at different life stages; and suitable water temperatures, and other water quality parameters (Bjornn and Reiser, 1991). As discussed above in *Effects of Flow Regulation on Aquatic Habitat*, any license issued for the proposed project would likely include a number of habitat measures, such as modified instream flows that would change existing aquatic habitat conditions in South Fork Battle Creek. These altered aquatic habitat conditions could affect the distribution and abundance of resident rainbow trout (the only salmonid currently known to be present in the proposed bypassed reach) and BMI, and may also eventually affect the distribution of anadromous Chinook salmon and steelhead (if they are eventually provided access to the proposed bypassed reach).

To monitor the effects of the proposed project on aquatic habitat, the Water Board recommends Rugraw develop a fish habitat assessment plan (preliminary condition 12). The fish habitat assessment plan would be prepared in consultation with Water Board staff and other relevant resource agencies and include monitoring of habitat features (such as water temperature, stream depth, flow velocities, water quality, sediment

transport, etc.) associated with resident and anadromous fish populations potentially found within the project area. Water Board preliminary condition 12 specifies that, if anadromous fish are observed within the project area at any time and the fish habitat assessment plan does not include provisions to address habitat features that pertain specifically to anadromous species, Rugraw would revise the plan to include provisions to expand the habitat monitoring to include anadromous fish habitat; and measures to facilitate anadromous fish passage through the bypassed reach.

Our Analysis

Under current conditions, high water temperatures, the availability of low flow rearing habitat, and restricted habitat connectivity are the primary limiting factors affecting the distribution and abundance of aquatic biota in the proposed bypassed reach. Construction and operation of the proposed project would alter the existing flow, water temperature, water quality, and sediment transport characteristics within the bypassed reach, which in turn could affect the distribution and abundance of resident rainbow trout and potentially Chinook salmon and steelhead, if introduced to the reach. Although long-term monitoring of aquatic habitat conditions in the project's proposed bypassed reach, as recommended by the Water Board, could allow Rugraw and the resource agencies to evaluate any changes in aquatic habitat over time and determine if required mitigative measures are effective at meeting resource objectives, we cannot envision a scenario where project construction and operation, with protection and enhancement measures that would be included in any new license, would result in a different conclusion as to the overall project effects on the resource beyond that already evaluated in this EIS. Further, general monitoring of fish habitat would not necessarily isolate any project-specific effects on the resource. Consequently, we find that any monitoring data would provide minimal benefits from a project-specific perspective.

BMI Monitoring Plan

BMI are a good indicator of the biological health of streams and are a critical component of the food web in aquatic communities.[42] Their distribution and relative abundance are affected by a variety of naturally occurring and human-induced factors, including the annual hydrologic cycle, the timing and magnitude of spring outflows, streambed substrate composition, channel gradient, bank erosion and sediment deposition, pollution, riparian habitat degradation, instream-mining, and recreation. Taxa that are especially sensitive to disturbance are considered intolerant and are typically found in streams and rivers of good water quality. Other taxa are tolerant of disturbance, heavy sedimentation and poor water quality. Many of the tolerant taxa are the first to reestablish an area after a scouring event or habitat disruption.

[42] BMI refers to benthic macroinvertebrates that are insects and other visible invertebrates in and on the streambed.

Rugraw does not propose any measures to monitor BMI in the project-affected reach of South Fork Battle Creek. However, in its response to agency preliminary conditions and recommendations, Rugraw agreed to conduct a baseline BMI survey in the proposed bypassed reach.

In their preliminary 10(j) recommendation 5, NMFS and Interior recommend Rugraw develop and file with the Commission, after consultation with the resource agencies, a BMI monitoring plan (benthic plan) describing the sampling to be conducted in the project-affected bypassed reach to assess the effects of the new flow regime and other changes stipulated by the new license on the macroinvertebrate community. Surveys would be conducted at least 1 year prior to construction and in years 1 through 4 and every 4 years thereafter through the term of the license (unless an alternative monitoring schedule is approved in consultation with the resource agencies). Interior further stipulates that if BMI total biomass, taxa richness, or Ephemeroptera, Plecoptera, and Trichoptera (EPT) index[43] decreases by more than 50 percent following construction of the project, Rugraw would prepare a riparian restoration plan targeted at increasing BMI production. NMFS recommends that if the resource agencies determine, based upon the results of BMI monitoring, that the project is having unmitigated impacts on BMIs, Rugraw should include in the technical report, its recommendations for mitigating impacts on BMI.

Our Analysis

BMI have several characteristics that make them potentially useful indicators of water quality and overall stream health. They are relatively non-mobile, and thus well suited for assessing site-specific effects. They are also abundant in most streams, and sampling is relatively easy and inexpensive. Finally, the sensitivity of aquatic insects to habitat changes makes them excellent indicators of overall environmental quality. Disadvantages of monitoring BMI include a high degree of natural variability within or between sample sites, sample seasons, and sample years. In 2001 and 2002, Ward and Kvam (2003) found that macroinvertebrates were mostly healthy throughout the Battle Creek watershed. In South Fork Battle Creek, general taxa richness was found to be mostly in the "good" to no impact condition ranges, indicating, during the sampling period, that this stretch of the stream had a healthy macroinvertebrate community.

As noted above, any license issued for the Lassen Lodge Project would likely alter aquatic habitat conditions in South Fork Battle Creek. However, it is anticipated that Rugraw's proposed mitigation measures including run-of-river operation, minimum flows, ramping rates, BMPs during construction, and sediment and woody debris passage at the dam, would adequately protect aquatic habitat and BMI in the project-affected

[43] The EPT index is named for three orders of aquatic insects that are common in the BMI community: Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). The EPT index is based on the premise that high-quality streams usually have the greatest species richness.

reach. Although continued sampling of BMI, as recommended by resource agencies, would enable trends to be evaluated over time, we cannot envision a scenario where project construction and operation, with protection and enhancement measures included in any new license, would result in a significant declining trend in BMI density and EPT taxa. Further, general monitoring of BMI would not necessarily isolate any project-specific effects on the resource. Consequently, we find that any monitoring data would provide minimal benefits from a project-specific perspective.

Salmonid Monitoring Plan

Reduced flows in the proposed project's bypassed reach, even with mitigation provided by the recommended minimum flow requirement, could result in some loss of available habitat for resident (and potentially anadromous) fish populations, including ESA-listed steelhead and spring-run Chinook salmon.

Rugraw proposes to develop a salmonid monitoring plan (SMP) with two monitoring approaches: (1) genetic sampling for steelhead and (2) snorkel surveys for steelhead and spring-run Chinook salmon. If adult steelhead are passed above the downstream Inskip dam, Rugraw proposes to monitor the 1.7-mile-long reach above Panther Grade up to the proposed project powerhouse to assess steelhead spawning success. If steelhead spawning is documented above Panther Grade, Rugraw would then conduct genetic sampling to determine the success of steelhead spawning upstream of Panther Grade and subsequently evaluate impediments to steelhead passage through the proposed bypassed reach. If steelhead are able to surmount Panther Grade and successfully spawn in 2 of 3 years (1 year space of absence), and impediments to upstream passage occur in the bypassed reach between the project's tailrace and the base of Angel Falls, Rugraw proposes to modify project operations that may improve accessibility and subsequently production of steelhead within the bypassed reach. However, if successful steelhead spawning is detected at a frequency of less than 2 out of 3 years, Rugraw asserts that this would indicate that steelhead access to the project area is opportunistic and not sufficient to sustain a population, and therefore, no action to improve steelhead production in the bypassed reach would be taken. Rugraw's proposed genetic surveys would cease after 4 consecutive years if no steelhead are observed in the reach.

Rugraw's proposed snorkel surveys would occur within the bypassed reach (when safe), and within a month of each 400 cfs + flow event for the duration of the license. The snorkel surveys would be exclusively for the identification of presence or absence of anadromous fish. Rugraw proposes to notify the resource agencies when/if anadromous species are found within the bypassed reach.[44] If anadromy is established within the bypassed reach at a later date (based on the results of these snorkel surveys and/or

[44] Adult salmon and steelhead must pass Inskip dam to reach the project area, and the fishway at Inskip is to be equipped with video counting equipment operated by California DFW or Interior.

steelhead genetic testing), Rugraw proposes to develop an adaptive management plan, in consultation with resource agencies, to mutually determine if modifications to project operations could improve production of anadromous species within the bypassed reach.

Interior and NMFS recommend (10(j) recommendation 4) that Rugraw's proposed SMP include provisions to monitor the presence of all life stages of both anadromous and resident salmonids within the bypassed reach, and provide for quarterly snorkel surveys (seasonally), through the term of license, within the entire bypassed reach. The agencies specify that the design and execution of the SMP would, in consultation with the resource agencies, use standard fisheries sampling techniques (Kohler and Hubert, 1999). Rugraw would inform resource agencies if either steelhead/rainbow trout and/or Chinook salmon are present within the reach as soon as possible, via email or telephone.

The Water Board recommends that Rugraw develop, in consultation with the Water Board and other relevant resource agencies, a fish population monitoring plan, with provisions for monitoring all fish species within and downstream of the project area (preliminary condition 11). Consistent with Rugraw's proposal, the Water Board recommends that any observation of ESA- or CESA-listed species trigger a review of the need for additional measures to manage the population; any such measures would be developed in consultation with relevant resource agencies.

Our Analysis

In rivers and streams, resident and anadromous salmonids require adequate streamflow (i.e., water depth, water velocity, and habitat space); sufficient spawning habitat (spawning gravel); sufficient rearing habitat; appropriate food sources at different life stages; and proper environmental conditions (particularly water temperature, dissolved oxygen, and turbidity) (Bjornn and Reiser, 1991). As discussed above, any license for the proposed Lassen Lodge Project would likely include a number of measures that would change aquatic habitat conditions in the bypassed reach of South Fork Battle Creek. As is the case for BMI, these altered habitat conditions could affect the distribution and abundance of resident rainbow trout, and potentially ESA-listed steelhead and spring-run Chinook salmon, should they gain access to the reach. Monitoring, if conducted, is typically based on the presence or absence of particular species, numbers of particular species, or on community parameters (such as productivity, density, and diversity), and is usually conducted over multiple years.

Long-term monitoring within the proposed bypassed reach could help Rugraw to adaptively manage the project's operations to protect and enhance salmonid resources (if project operations affect those resources), and assist fishery agencies in managing the fishery (a non-project function). Although seasonal monitoring, as NMFS recommends, would allow for the seasonal observation of steelhead and/or Chinook salmon, as well as other species present in the bypassed reach, Panther Grade is a complete barrier to upstream fish migration when flows are less than approximately 400 cfs. Thus, returning sea-run anadromous species would be unlikely to occur in some seasons or in some years when natural flows never exceed 400 cfs. In addition, under current conditions,

anadromous Chinook salmon and steelhead are unable to pass upstream of the downstream Coleman, Inskip, and South Diversion dams. Therefore, Rugraw's proposal to conduct steelhead genetic sampling and snorkel surveys upstream of Panther Grade to the base of Angel Falls for anadromous salmonids is appropriate only after adequate high flows (400+ cfs) are available to support potential passage at Panther Grade. These natural flow conditions, however, would be unrelated to project operations.

Although Rugraw's proposal to conduct genetic sampling for steelhead and snorkel surveys could provide information on the distribution of resident and anadromous salmonids in the bypassed reach, this distribution would be unrelated to project operations (it would depend on successful fish passage at downstream dams and over Panther Grade, for the anadromous species), and there appears to be no project-related basis for requiring such monitoring as a condition of any license issued. If anadromous species eventually gain access to the project reach as a result of the Battle Creek Salmon and Steelhead Restoration Project, Rugraw and the resource agencies could, at that time, develop an appropriate monitoring program to determine the distribution of salmonids within the project bypassed reach. For resident salmonids, mitigation measures already proposed by Rugraw should adequately protect the limited fish population within the bypassed reach, there is no project-specific need for the monitoring data, and thus would be no need to monitor resident populations.

Fish Passage

Physical barriers to fish migration can include natural structures such as waterfalls, cascades, and debris dams, and artificial barriers such as dams, diversions, and improperly placed culverts.

Project intakes also have the potential to entrain fish residing upstream of any project-related diversion structure. Fish that become entrained into a project intake and turbine would be removed from the local population and could be killed or injured. Small fish, especially newly emerged fry, have the greatest potential for entrainment because fry have poor swimming ability, whereas adult salmonids have a much greater swimming ability and generally can avoid entrainment, unless fish desire to migrate downstream.

Rugraw proposes to construct an upstream fish passageway and a control/fish screen structure at the project diversion works to ensure fish are able pass the diversion dam (both upstream and downstream) when the power plant is operating or shut down. Both structures would be designed in coordination with California DFW incorporating NMFS Southwest Region Fish Screening Criteria for Anadromous Salmonids and NMFS Northwest Region Anadromous Salmonid Passage Facility Design. The control/fish screen structure would include nine 4-foot by 8-foot stainless steel perforated flat panel screens and a juvenile fish return pipe to return any fish entering the fish/screen control structure into South Fork Battle Creek near the bottom of the proposed fish passageway (see below). The fish screens would be automatically cleaned by a travelling screen

cleaner as frequently as necessary to prevent flow impedance and violation of the approach velocity criteria.

Rugraw's proposed upstream fish passageway would be designed post-license issuance in consultation with California DFW following recommended fish ladder design standards. In addition, Rugraw would use temporary diversion culverts, or phased construction, to allow fish to egress the affected area during the construction of the diversion dam, intake, and control/fish screen structures.

Our Analysis

Under existing conditions, the proposed project's bypassed reach supports a population of resident rainbow trout.[45] No anadromous fish are expected to be present in the project area until passage barriers on lower South Fork Battle Creek are removed through the Battle Creek Salmon and Steelhead Restoration Project (which is scheduled for completion in 2020), although Angel Falls, located at RM 22.3 about 0.7 mile downstream of the diversion dam site, would remain a long-standing natural barrier to upstream migration at all flows. Thus, the only fish that would currently benefit from upstream passage at the diversion dam would be rainbow trout that reside in the 0.7 mile of stream between Angel Falls and the diversion dam. As we previously described, reseeding of the stream with trout occurs naturally from upstream and does not depend on the ability of trout downstream to migrate upstream over passage barriers. Should anadromous salmonids gain access to the bypassed reach in the future, they would not require passage at the diversion dam because the impassable Angel Falls would prevent fish from reaching the dam. Any upstream passage facility at the dam would likely only be used by a limited number of resident fish that would not require upstream passage to complete their life history.

Rugraw's proposed fish screen structure at the project diversion dam would prevent all life stages of fish moving downstream from entering the pipeline and penstock and experiencing injury and mortality during turbine passage. Because a Pelton turbine is proposed, any fish entering the turbine would likely experience nearly 100 percent mortality. The fish screen would be in operation whenever flows are being diverted for power generation. An estimate of when the project could operate (based on natural inflows) is presented in table 3-6. This estimate shows that there would be sufficient inflow for the project to operate under a 13-cfs instream flow[46] the majority of time (greater than 50 percent of the time) from January 1 through mid-April, and June 1 to mid-July; infrequently (10 to 49 percent of the time) from mid-April through May, mid-

[45] In some years, low flows and high water temperatures can lead to a severe reduction in rainbow trout abundance in the proposed bypassed reach, as observed during summer 2014.

[46] This evaluation does not consider any project shutdowns to meet temperature criteria.

July through August, and mid-October through December; and rarely (less than 10 percent of the time) during September to mid-October (table 3-6). Therefore, the project would likely be operating in the spring spawning period for rainbow trout and during the early-summer when fry are hatching and juveniles are rearing, as well as other periods of the year when adult fish would be present. The screens would be beneficial in preventing entrainment of several life stages of rainbow trout, particularly in a system where recruitment primarily occurs from upstream.

Sediment and Woody Debris Management

Regulated flows may alter two key components of habitat for aquatic resources: (1) the characteristics and distribution of substrate material in streams and (2) the availability of woody debris in downstream reaches. Woody debris can provide enhanced habitat for fish and other aquatic organisms, and project operation could affect the quantity and quality of aquatic habitat in the proposed project area by altering the existing availability and dispersal of woody debris. In its letter filed August 31, 2016, Rugraw proposes to re-introduce small and large woody debris retained in project facilities to be re-deposited downstream of the diversion structure as recommended by NMFS (10(j) recommendation 6). Rugraw also proposes to annually sluice sediments from the project's reservoir during annual high flows, which are defined as flows of 400 cfs or greater at the diversion site. Rugraw states that in a year when natural flows never reach 400 cfs, the sediment deposits in the reservoir behind the diversion would be evaluated to determine if sluicing of sediments would be desired. In such cases when sluicing is desired, the sluicing could be scheduled by the operator at flows less than 400 cfs. Sluicing could take place during project operations when streamflows exceed 108 cfs (minimum instream flow of 13 cfs plus maximum penstock diversion to powerhouse of 95 cfs) by opening the bottom of the sluice gates on either side of the diversion to bypass flow greater than 108 cfs.[47]

In its letter filed June 21, 2016, NMFS recommends (10(j) recommendation 6) that, through consultation with NMFS, Interior, California DFW, and the Water Board, Rugraw develop a DSMP that describes the operations and actions that would ensure the periodic downstream transport of small and large woody debris and sediment past the project's dam. NMFS also recommends that the DSMP detail the monitoring of such woody debris transport and assess the riparian habitat's response to the project's operations. In its letter filed June 24, 2016, Interior also recommends such a DSMP (10(j) recommendation 6). Rugraw, in its March 31, 2017, response to the Commission's

[47] Rugraw's March 31, 2017, letter responding to our February 24, 2017, additional information request indicates the project would have a maximum penstock diversion to the powerhouse of 95 cfs; however, we note that Rugraw's final license application indicates that the maximum hydraulic capacity of the turbine is 105 cfs. Therefore, we are seeking clarification of this proposal.

additional information request, proposes to prepare a DSMP, but it would not include downstream monitoring.

Our Analysis

Rugraw's proposal to annually sluice sediment from the project's reservoir during high flows and to potentially sluice sediment during lower flows (less than 400 cfs) would help to maintain sediment supply to the bypassed reach and would also help manage aggradation above the dam and thereby reduce the potential for clogging project facilities. Maintaining sediment supply in the bypassed reach through annual sluicing would provide gravel necessary for trout and other resident fish spawning, as well as maintain habitat diversity. However, while the proposed sluicing at higher flows would limit the effects of the sluicing event on water quality and turbidity, sluicing at lower flows may be detrimental to water quality, particularly turbidity downstream of the project's diversion.

NMFS and Interior both recommend the periodic downstream transport of small and large woody debris as part of their recommended DSMP (10(j) recommendation 6). Although woody debris is nearly absent in the bypassed reach under existing conditions (Sellheim and Cramer, 2013), a provision to transport any available woody debris downstream would provide an opportunity to reduce the proposed project's potential to intercept woody debris and thereby reduce operational effects on aquatic habitat. Both large and small woody debris can offer hydraulic and thermal refuges, nest building material, protection from predation, nutrients, and maintain habitat diversity.

NMFS's and Interior's recommendation also includes a monitoring component to measure the sediment retention upstream of the sluice gates, the debris and sediment distribution downstream of the proposed dam, and riparian response to new conditions resulting from the proposed project. Both agencies recommend monitoring of: (1) reach-wide parameters (e.g., total length and gradient, average width and depth; (2) wetted width of each riffle; (3) water velocity; (4) relative substrate composition (i.e., fines, gravel, cobble, boulder, and bedrock); (5) a pebble count; and (6) substrate consolidation and percent embeddedness. Although these data would provide information on the effectiveness of sediment and woody debris management, there is no information to indicate that the proposed sediment sluicing and passage of woody debris over the proposed small diversion dam would be unsuccessful. It is unlikely that the proposed 8-foot-high dam would substantially affect sediment and woody debris movement in South Fork Battle Creek, particularly with proposed operational measures. There would be no basis for requiring the detailed monitoring program recommended by the agencies to verify the probable minor effects of the proposed project on sediment and woody debris movement.

Pesticide Use Plan

Rugraw would likely use pesticides to control pests near project buildings, roads, and other physical structures as a component of its project facilities maintenance

program. Using pesticides to maintain project facilities presents a risk of contaminating surface waters in the project area. Contamination of project-area waters could affect aquatic biota including federally listed species. To protect aquatic habitats and ESA- and CESA-listed species, the Water Board recommends Rugraw develop a pesticide use plan (preliminary condition 9) with provisions to restrict use of pesticides as defined by the Basin Plan, and in the case of a pesticide spill, notify relevant resource agencies as soon as practical and suspend all pesticide-related activities.

Our Analysis

The development of a pesticide use plan as recommend by the Water Board would provide a comprehensive description of Rugraw's standard operating procedures for pesticide use and application, measures to protect water quality, and any other measures needed to protect ESA- or CESA-listed species, found downstream of pesticide application areas. It would also allow quick notification of the Commission and agencies that manage relevant resources if a pesticide spill occurs, which would facilitate Rugraw's evaluation of the spill and its effects in a timely manner.

Aquatic Nuisance Species

Aquatic nuisance species are nonnative aquatic plant or animal species that threaten the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependent on such waters. Once nonnative species become established in a new environment where natural predators, pests, or disease that kept them in check in their native environment are missing, they may spread rapidly and cause unanticipated negative biological and economic impacts. The longer infestations are allowed to progress, the more extensive the damage and control costs, and less efficient the control efforts. However, if populations are detected early enough, eradication may still be possible. Though prevention is the best strategy for managing invasive species, "early detection and rapid response" efforts are the most effective and cost-efficient responses to invasive species that become introduced and established. Two of the most well-known aquatic invasive species are zebra and quagga mussels. Zebra and quagga mussels have caused billions of dollars in economic and ecological damage to the Great Lakes and have spread throughout North America. Quagga mussels are present in Lake Mead (Nevada and Arizona) and Lake Havasu, California. Eurasian watermilfoil, a non-native aquatic macrophyte, is also abundant throughout the western United States. Eurasian watermilfoil spreads quickly and can adversely impact aquatic ecosystems by forming dense canopies that often shade out native vegetation. Monospecific stands of Eurasian watermilfoil adversely affect aquatic habitat and water quality, can impact power generation and irrigation, and can interfere with recreational activities.

To address the potential infestation and/or spread of invasive aquatic plant or animal species in the proposed project area, the Water Board recommends (preliminary condition 8) Rugraw develop an aquatic invasive species monitoring plan in consultation

with relevant resource agencies. The plan would identify potential sources related to or conditions associated with the proposed project that have the potential to transport or spread aquatic non-native invasive species on material and equipment; identify BMPs to reduce and/or minimize the transportation or spread of aquatic non-native invasive species; and include monitoring and corrective action steps to address potential spread of invasive species.

Our Analysis

Although Rugraw did not conduct aquatic nuisance species surveys in the proposed project area, aquatic nuisance species are abundant in California and may be introduced into the proposed project's small impoundment or bypassed reach where they could cause impairments of project function, as well as impacts to the environment. Such introductions could occur during contracted project construction and maintenance or through small-scale recreation activities in the basin. Developing an aquatic invasive species management plan, in consultation with the Water Board, could incorporate several measures to help prevent the introduction and/or spread of aquatic nuisance species into the proposed project area, including construction BMPs, to prevent the spread of aquatic nuisance species; a monitoring program to serve as an early warning system in case of the spread of invasive species; guidelines for project operation and maintenance to prevent the spread of aquatic invasive species; and control measures for dealing with the presence and movement of aquatic invasive species (e.g., bullfrog) at or near project facilities. Coupled with annual reporting, these measures would adequately monitor and help prevent the introduction or spread of aquatic invasive species within the proposed project area.

3.3.2.3 Cumulative Effects

Water Quality and Temperature

Historically, South Fork Battle Creek generally had excellent water quality that was highly influenced by inflow from cool-water springs. However, two recent events (flume failure and a large forest fire) elevated turbidity in the lower South Fork Battle Creek. On December 3, 2014, collapse of a section of the South Dam Canal flume in Devil's Gulch, located approximately 7.5 miles downstream of the proposed powerhouse resulted in an episodic torrent of water and a large amount of sediment entering the creek (FWS, 2015). Lightning started the August 2012 Ponderosa Fire that burned approximately 28,000 acres southeast of Manton, which was then salvage logged. FWS reports that lower South Fork Battle Creek has received a large influx of sediment presumably from the Ponderosa Fire and that the turbidity response to flow increased substantially in Battle Creek at RM 6.1 (FWS, 2015). The maximum turbidity during juvenile migrant fish trap sampling conducted by FWS since September 1998 was 35 nephelometric turbidity unit (NTU) for years before the Ponderosa Fire and 832 NTU

after the fire, and the ratio of turbidity to flow[48] increased from less than 1 NTU/cfs for the period of 1998 to 2013, to 5 NTU/cfs in 2015. Turbidity is expected to decrease as these areas recover and plant cover increases.

An ongoing phased restoration program is being implemented to restore salmon and steelhead populations in the Battle Creek Basin. Phase 1B, which consists of reconstructing the Inskip Powerhouse tailrace and constructing a bypass pipeline and chute system to Coleman Canal, was conducted between 2012 and 2017 (Unknown, 2017). Phase 2, which consists of installing a fish screen and ladder on Inskip Diversion Dam; constructing a South Powerhouse tailrace connector; removing South Diversion Dam and conveyance system; and removing Lower Ripley Creek Feeder, Soap Creek Feeder, and Coleman Diversion Dams, is scheduled for 2017–2021. Construction for this program is expected to result in short-term localized increases in turbidity. As described above, constructing the proposed Lassen Lodge Project could increase turbidity during construction, although these effects are expected to be short-term and localized near construction sites that are distant from the Phase 2 restoration activities. Therefore, construction of the Lassen Lodge Project would not have adverse cumulative effects on turbidity within the Battle Creek Basin, combined with other distant potential turbidity sources in the basin.

Under existing conditions, water temperature in South Fork Battle Creek may be affected by several factors including natural inflow from springs, hyporheic connections, weather, solar radiation, vegetative shading, and topographic shading; and controllable streamflow and releases from cold springs that are currently intercepted by PG&E's Battle Creek Project (FERC No. 1121). Peak summer water temperature exceeds 20°C in the upper end of the proposed bypassed reach during some years, but springs in the lower end of the proposed bypassed reach and near Panther Grade reduce summer water temperature substantially. Further downstream, PG&E's Battle Creek Project has historically warmed the creek substantially, especially from March through October (Reclamation et al., 2004).[49]

The ongoing Battle Creek salmon and steelhead restoration program will also manage water temperature in the lower South Fork Battle Creek by increasing instream flows and releasing cold spring water to the natural stream channel using an adaptive approach based on temperature in the Battle Creek Project reaches (Reclamation et al., 2004; Jones & Stokes, 2005).

As discussed above, the project is expected to cause summertime warming more frequently in the bypassed reach and be greater under a 13-cfs minimum flow proposed

[48] The ratio of turbidity to flow was used to normalize differences in rainfall and discharge between years.

[49] PG&E's Battle Creek Project starts approximately 6.5 miles downstream of the proposed Lassen Lodge powerhouse.

by Rugraw than a 35-cfs minimum flow recommended by NMFS and Interior. However, minimal summer warming may occur in South Fork Battle Creek downstream of the powerhouse discharge, and any warming is expected to be negligible below Panther Grade. Therefore, operation of the Lassen Lodge Project would not have adverse cumulative effects on water temperature in South Fork Battle Creek or lower Battle Creek.

Fishery Resources

Under existing conditions, the proposed project's bypassed reach supports a population of resident rainbow trout that has been adversely affected by drought and high water temperatures in some years. The diversion of water associated with the proposed project would affect the natural hydrology, geomorphology, and water quality in the bypassed reach downstream of the diversion dam, which in turn would affect the quality and quantity of aquatic habitat for resident trout and possibly anadromous fish if they are able to access the reach in the future. In addition to these project-related effects, non-project related timber harvest activities on SPI land, rural development, ongoing fishery restoration programs associated with the Battle Creek Salmon and Steelhead Restoration Project, and barrier removals associated with PG&E's Battle Creek Hydroelectric Project license implementation, will continue to affect aquatic habitat and fish community structure in South Fork Battle Creek.

It is anticipated that implementation of Rugraw's proposed minimum instream flow release, ramping rate requirements, and construction related BMPs would maintain aquatic habitat diversity in the proposed bypassed reach for the duration of any license issued for the project. These measures, coupled with the implementation of the SMP and adaptive management would also provide a means to adaptively manage fish populations and aquatic habitat in the project area, and adjust project operations if spring-run Chinook or steelhead are eventually found to occupy the project's bypassed reach. Therefore, operation of the Lassen Lodge Project would likely mitigate these cumulative effects on fishery resources in South Fork Battle Creek or lower Battle Creek.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Vegetation

Rugraw surveyed vegetation and other terrestrial resources within a 400-foot-wide corridor centered on the project alignment and within the multipurpose areas outside of the 400-foot-wide survey corridor in May, June, and September 2013. Vegetation types within upland portions of the project area consist primarily of grasslands, chaparral, and forested communities.

Annual grassland communities (grasslands dominated by species that reseed every year) occur mostly in the western portion of the project area. This vegetation community

is dominated by non-native annual grasses and forbs, many of which are classified as noxious weeds.

Chaparral communities occur in patches throughout the western and central portions of the project area. Chaparral vegetation types found in the project area include mixed chaparral, montane chaparral, and masticated woodland communities.

Forested communities within the project area consist primarily of Sierran mixed conifer forest, montane hardwood, blue oak woodland, and ponderosa pine communities and plantations. Sierran mixed conifer forest is the most common forested community type in the project area. The species composition and density of this vegetation type varies within the project area and has been affected by past and ongoing logging activities, fires, and other disturbances. Montane hardwood is the second most common forested community type in the project area. Montane hardwood communities are found scattered throughout the project area, with the exception of the eastern edge. Blue oak woodland communities occur in scattered patches in the western portion of the project area, with the largest stands in the northwestern corner of the project area. Ponderosa pine vegetation communities are found in scattered patches throughout the entire project area, including four small plantations. Table 3-7 shows the vegetation communities/ habitat types and their approximate area estimated during the 2013 field surveys.

Table 3-7. Vegetation communities/habitats within the proposed project lands (Source: Rugraw, 2015).

Vegetation Communities	**Acres**
Annual Grassland	64.81
Agricultural	4.36
Irrigated Hayfield	*3.88*
Old Orchard	*0.48*
Blue Oak Woodland Communities	67.21
Blue Oak-Foothill Pine-Interior Live Oak	*37.11*
Blue Oak Woodland	*30.10*
Chaparral	86.78
Masticated Woodland	*6.60*
Mixed Chaparral	*17.23*
Montane Chaparral	*62.95*
Disturbed/Developed	17.19
Disturbed	*6.00*
Himalayan Blackberry (Rubus armeniacus)	*2.08*
Residential-Developed	*2.12*

Vegetation Communities	Acres
Road	*6.99*
Montane Hardwood Communities	92.43
Montane Hardwood	*23.55*
Montane Hardwood-Conifer	*68.88*
Ponderosa Pine and Plantation	41.05
Plantation	*24.25*
Ponderosa Pine	*16.80*
Riparian and Wetland	7.29
Riparian	*3.45*
Riverine-Montane Riparian	*3.77*
Wetland	*0.07*
Rock	4.40
Sierran Mixed Conifer	340.36
Total	**725.88**

Wetlands

Rugraw assessed wetlands with the project area using the FWS National Wetlands Inventory online map source and verified the results with field surveys in May, June, and September 2013.

The project area only contains one wetland, which covers about 0.7 acre. The wetland is located at the top of an intermittent stream channel that leads into Soap Creek, a perennial stream that flows through the west-central portion of the project area near the proposed transmission line route (see figure 1-1). Vegetation in this small, emergent wetland consists of a mix of non-native and native herbaceous species. Table 3-8 shows the total area of wetlands and streams within the proposed project lands.

Table 3-8. Wetlands and other waters within the proposed project lands (Source: Rugraw, 2015).

Feature Type	Acres	Linear Feet
Wetlands		
Wetland A	0.07	NA
Total Wetlands	*0.07*	*NA*
Other Waters		
Perennial Streams	1.82[a]	4,515
Intermittent Drainages	0.62	6,727
Ephemeral Drainages	0.05	1,065
Total Other Waters	*2.49*[a]	*12,307*
Total	**2.56**[a]	**12,307**

[a] Does not include Panther Creek; Panther Creek was not delineated because of steep topography.

Noxious Weeds

Noxious and invasive weeds include those identified by the California Department of Food and Agriculture and the California Invasive Plant Council as having known ecological, environmental, or economic impacts.

Rugraw identified noxious weeds that are known to occur or may occur within the project area using the California Invasive Plant Council's Cal WeedMapper online database and verified results with field surveys in May, June, and September 2013. The database search identified 60 noxious weeds known to occur in the project area. Of these, Rugraw observed 32 species during field surveys. Field surveys revealed that noxious weeds occur throughout the majority of the proposed project lands, with the heaviest infestations in the western and west-central portions of the proposed project lands along the transmission line ROW. These surveys also found that noxious weeds appear to occur most commonly in annual grassland and disturbed or developed habitats. The most abundant and/or widespread noxious weeds observed on proposed project lands include yellow star thistle, Himalayan blackberry, medusa head, common wild oats, bull thistle, annual dogtail, cheatgrass, and rattail six weeks grass.

Special-status Plants

Special-status plants include those listed as threatened or endangered at the state level and those listed by the California Native Plant Society as rare. Species listed as threatened or endangered under the ESA are discussed in section 3.3.4, *Threatened and*

Endangered Species. Rugraw identified special-status plants that are known to occur or may occur in the project area by reviewing relevant literature, maps, and previous field survey reports, and it conducted field surveys in May, June, and September 2013.

Rugraw observed one special-status plant species, Coleman's rein orchid (*Piperia colemanii*), during the 2013 field surveys. Eight individuals were observed in one location in the central portion of the proposed project lands along the proposed transmission line route. The plants identified during the 2013 field surveys were found in burned Sierran mixed conifer habitat; however, this species also occurs in chaparral and lower montane coniferous forest habitats. It typically blooms from June through August.

Previous botanical surveys documented the presence of one additional special-status plant species, long-fruit jewelflower (*Streptanthus longisiliquus*), but this species was not found in 2013. Desktop analysis revealed that 15 additional special-status plant species have previously been reported within 10 miles of the proposed project, and 11 others have not been documented but could be present.

Wildlife

The project area contains habitat for a variety of wildlife species. Rugraw's field surveys of the proposed project lands conducted in May, June, and September 2013 documented either directly (by observation) or indirectly (by tracks, burrows, scat, call, song, or other evidence) the presence of 33 bird, 11 mammal, five reptile, and one amphibian species. This count does not include special-status or threatened or endangered wildlife species that are discussed below and in section 3.3.4. Species most commonly observed in the proposed project lands during the 2013 field surveys include sagebrush lizard, scrub jay, Steller's jay, yellow-rumped warbler, California quail, Oregon dark-eyed junco, northern flicker, acorn woodpecker, raven, turkey vulture, black-tailed jackrabbit, and mule deer.

Special-status Wildlife Species

Special-status wildlife species include those species listed as endangered or threatened under the CESA, candidates for listing under the CESA, and those listed by California DFW as fully protected, species of special concern, or those appearing on the California watch list. Special-status bird species also include those listed by FWS as birds of conservation concern and bald and golden eagles, which are federally protected under the Bald and Golden Eagle Protection Act. Species that are listed or are candidates for listing as threatened or endangered at the federal level are discussed in section 3.3.4.

Rugraw identified special-status wildlife species that are known to occur or may occur within the project area using desktop research, literature review, and field habitat assessments of proposed project lands in May, June, and September 2013. The 2013 field habitat assessments included a 1-mile buffer around the proposed project facilities. Table 3-9 shows the status, habitat requirements, and likelihood of occurrence for each species that could occur within the proposed project lands.

Table 3-9. Special-status wildlife species potentially occurring on proposed project lands (Source: Rugraw, 2015).

Species (*scientific name*)	**Status**	**Habitat Requirements**	**Potential to Occur on Proposed Project Lands**
Amphibians			
Cascades frog (*Rana cascade*)	SSC	Inhabits wet mountain areas and lays eggs in shallow stream pools, lake margins, and clear mountain ponds with silty, sandy, or gravelly substrates.	Species was not observed during 2013 surveys. Potential habitat exists along the entire project reach, with potential breeding habitat present in stream pools. Nearest mapped occurrence is about 3 miles upstream (historic). Populations near Mount Lassen identified in the 1920s may now be extinct.
Foothill yellow-legged frog (*Rana boylii*)	SSC	Habitat includes streams, rivers, and pools with cobble-sized rocky substrate. Eggs are attached to gravel or rocks in moving water near stream margins.	Species is known to occur within the project area and a probable sighting was documented in 2013 surveys at the Old State Highway Route 36 Bridge. Has also been documented downstream in South Fork Battle Creek and Soap Creek.
Birds			
American peregrine falcon (*Falco peregrinus anatum*)	CAFP, BCC, BGEPA	Occurs in mountain ranges, river valleys, and coasts, near wetlands, lakes, rivers, or other water. Nests on cliff banks, dunes, ledges, buildings, and artificial structures.	Species was not observed during 2013 surveys, but has been previously documented in the project area. Suitable nesting habitat occurs in several areas along the south-facing slope ranging approximately

Species (*scientific name*)	Status	Habitat Requirements	Potential to Occur on Proposed Project Lands
			80 to 960 feet above the creek and consisting of a series of 20- to 100-foot-tall cliffs. Nearest mapped location is 5.25 miles south of the proposed project lands, east of Paynes Creek.
Bald eagle (*Haliaeetus leucocephalus*)	CAE, CAFP, BCC	This species nests in mature trees and snags and on cliffs, rocks, and artificial structures, generally within 1 mile of water. Forages over water and other open habitats. Nesting activity occurs from January through August.	Species was not observed during 2013 surveys, but may opportunistically use the project area for foraging or roosting. Nearest known nest location is approximately 4.9 miles north of the transmission line ROW.
Calliope hummingbird (*Stellula calliope*)	BCC	Commonly feeds in montane chaparral and wet meadow habitats. Nests in woodlands or forests, often in a pine or montane riparian tree.	Species was not observed during 2013 surveys. Suitable feeding and nesting habitat occurs throughout much of the project area.
Cassin's finch (*Carpodacus cassinii*)	BCC	Nests in tall trees in open, montane coniferous forests and forages in nearby meadows or grasslands.	Species was not observed during 2013 surveys. Suitable habitat occurs throughout much of the project area.
Golden eagle (*Aquila chyrsaetos*)	CAFP, BCC, BGEPA	Nests on steep cliffs or in large trees and forages in grasslands and other open terrain habitats.	Species was not observed during 2013 surveys, but may forage in annual grasslands along the western end of the transmission line ROW. Potential nesting habitat is located on

Species (*scientific name*)	Status	Habitat Requirements	Potential to Occur on Proposed Project Lands
			south-facing cliffs just outside the proposed project lands.
Lewis's woodpecker (*Melanerpes lewis*)	BCC	Suitable habitat includes open, deciduous and conifer habitats with scattered snags and live trees for nesting and perching. Uses logged and burned areas. Prefers oaks and acorns in winter.	Species was not observed during 2013 surveys. Open, forested, logged, and burned areas within the project area provide suitable wintering habitat. The project area is outside this species' summer range.
Northern goshawk (*Accipiter gentilis*)	SSC	Prefers subalpine and upper montane forests with relatively dense canopy closure and open understories.	Species was not observed during 2013 surveys, but is has been previously documented and is known to occur within the project vicinity (near Panther Creek).
Oak titmouse (*Baeolphus inornatus*)	BCC	Preferred habitat includes oak dominated woodlands, chaparral, and riparian habitats.	Species was observed during 2013 surveys west of Soap Creek in a blue oak tree within montane chaparral habitat. Suitable habitat occurs on south-facing slopes in blue oak woodland and blue oak-foothill pine-interior live oak habitats within proposed project lands.
Olive-sided flycatcher (*Contopus cooperi*)	SSC, BCC	Prefers forested habitats with large, tall trees overlooking open terrain, for nesting, roosting, and foraging.	Species was observed during 2013 surveys in Sierran mixed conifer habitat atop cliffs above Panther Creek. Suitable habitat on proposed

Species (*scientific name*)	Status	Habitat Requirements	Potential to Occur on Proposed Project Lands
			project lands includes any tall trees overlooking open terrain.
Osprey (*Pandion haliaetus*)	WL	Suitable habitat includes large trees, snags, cliffs, or structures near riparian or open water habitats.	Species was observed during 2013 surveys flying over the west end of the project area near Manton, California. Nearest documented nesting location is approximately 3.5 miles north of the project transmission line ROW, but suitable nesting habitat occurs within the project area.
Prairie falcon (*Falco mexicanus*)	WL, BCC	Suitable nesting habitat includes cliffs and bluffs. Foraging habitat consists of grasslands and other open terrain.	Species was not observed during 2013 surveys. Potential nesting habitat occurs on south-facing cliffs in the project vicinity. Annual grasslands and fields at the western end of proposed project lands provide suitable foraging habitat.
Mammals			
American pika (*Ochotona princeps*)	CACT	Occurs in mid-montane to high alpine talus slopes near meadows, and is found in rocky areas within forests or near lakes at lower elevations.	Species was not observed during 2013 surveys, but may occur on south-facing talus slopes just outside proposed project lands. Nearest documented occurrence is approximately 1.5 miles east of proposed project lands.

Species (*scientific name*)	Status	Habitat Requirements	Potential to Occur on Proposed Project Lands
Sierra Nevada red fox (*Vulpes necator*)	CAT	Occurs in high elevation barren, conifer, and shrub habitats; montane meadows; and subalpine woodland. Potential den sites include natural cavities in talus slopes, rockslides, or boulder piles.	Species was not observed during 2013 surveys and is not expected to occur on proposed project lands with regular frequency because of a lack of suitable habitat, but potential denning sites may exist in south-facing talus slopes and rockslides just outside proposed project lands. Nearest documented occurrence is approximately 3.2 miles east of the proposed project.
Spotted bat (*Euderma maculatum*)	SSC	Roosts in crevices of cliffs, caves, and buildings. Foraging habitat includes grasslands and other open habitats near water.	Species was not observed during 2013. Suitable roosting habitat in the project area includes south-facing cliffs and the steep north-facing slope between the project bypassed reach and penstock/pipeline alignment. Suitable foraging habitat occurs throughout the project area. Nearest documented occurrence is approximately 4.5 miles southeast of the proposed project.

Notes: CAE = California Endangered, CAT = California Threatened, CACT = California Candidate Threatened, CAFP = California Fully Protected, SSC = California Species of Special Concern, WL = California Watch List, and BCC = FWS Bird of Conservation Concern (FWS, 2008); BGEPA = Bald and Golden Eagle Protection Act

3.3.3.2 Environmental Effects

Effects of Project Construction and Operation on Vegetation

Construction of the project would require vegetation clearing and ground disturbance, which would result in permanent and temporary disturbances that could alter vegetation community structure on proposed project lands through vegetation removal, soil compaction, or changes in interspecific competition associated with the introduction of invasive plants. Disturbance of vegetation communities on proposed project lands also has implications for wildlife species associated with these habitats.

Rugraw estimates that construction of the project would result in a permanent loss of 68.79 acres of vegetation and temporary disturbance of an additional 11.37 acres. Permanent disturbances to vegetation would occur primarily as a result of the construction of the diversion dam, powerhouse, switchyard, and substation. Permanent conversion of forested habitat to herbaceous or shrub habitats along the pipeline/penstock, station service line, and 12-mile-long and 40-foot-wide transmission line ROW would also be considered a permanent disturbance. Temporary disturbances to herbaceous communities would occur as a result of pipeline and penstock construction, ROW clearing, and the establishment of temporary multi-use work areas. However, these communities would be expected to recover over time. Table 3-10 summarizes total anticipated permanent and temporary disturbance to each vegetation community/habitat type on proposed project lands.

Table 3-10. Permanent and temporary impacts on vegetation on proposed project lands (Source: Rugraw, 2015).

Vegetation Community/ Habitat Type	Permanent Disturbance (acres)	Temporary Disturbance (acres)	Total Disturbance (acres)
Annual Grassland	4.69	-	4.69
Blue Oak Woodland	3.18	-	3.18
Blue Oak-Foothill Pine-Interior Live Oak	3.87	-	3.87
Disturbed	0.89	0.28	1.16
Irrigated Hayfield	0.19	-	0.19
Masticated Woodland	0.65	-	0.65
Mixed Chaparral	0.24	-	0.24
Montane Chaparral	6.46	-	6.46
Plantation	1.17	1.12	2.29

Vegetation Community/ Habitat Type	Permanent Disturbance (acres)	Temporary Disturbance (acres)	Total Disturbance (acres)
Ponderosa Pine	2.01	-	2.01
Residential-Developed	0.02	-	0.02
Riparian	0.31	-	0.31
Riverine-Montane Riparian	0.69	-	0.69
Road	3.08	-	3.08
Rock	0.57	-	0.57
Himalayan Blackberry (*Rubus armeniacus*)	0.18	-	0.18
Sierran Mixed Conifer	30.60	9.97	40.57
Wetland	0.01	-	0.01
Total	**68.79**	**11.37**	**80.16**

Effects of project operations would include ongoing vegetation maintenance within the pipeline/penstock, station service line, and transmission line ROWs.

To minimize the effects of project construction and operation on vegetation communities on proposed project lands, Rugraw proposes the following measures:

- Limit ground-disturbing activity and vegetation clearing.
- Delineate the limits of construction, work areas, and multipurpose areas with flagging, fencing, and/or stakes, and prohibit ground disturbance outside of these limits.
- Reclaim temporarily disturbed stream and riparian habitat through restoration of preconstruction conditions and riparian plantings and/or seeding, where applicable, with approved seed mixes.
- Revise the proposed Noxious Weed Management and Revegetation Plan, which includes measures to ensure weeds and non-native invasive vegetation do not reestablish at onsite disposal areas during project construction, and modify the plan to include provisions for riparian plantings along disturbed portions of South Fork Battle Creek to provide overhanging vegetation.
- Map, evaluate, and quantify, by vegetation type, vegetation that would be removed as a result of project construction.

- Restore vegetation directly removed or disturbed during project construction as appropriate and in accordance with California forestry regulations and best practices.

Rugraw has prepared a Noxious Weed and Revegetation Management Plan that outlines methods that would be used to reestablish vegetation in areas temporarily disturbed by project construction. Rugraw's plan proposes monitoring of revegetated areas for 2 years following construction, with additional seeding and planting as needed to meet a defined success criteria of 70 percent cover during the 2-year monitoring period.

Interior recommends that, if vegetation restoration success criteria as defined in the Noxious Weed and Revegetation Management Plan are not achieved by the end of Rugraw's proposed 2-year monitoring period, Rugraw should continue to reseed and monitor disturbed areas until success criteria are met.

Our Analysis

Project construction would result in the permanent removal of 68.79 acres of vegetation and temporary disturbance of an additional 11.37 acres. Clearing of vegetation in the 12-mile-long and 40-foot-wide transmission line ROW during project construction and operation would result in the permanent conversion of some forested habitats to herbaceous or shrub habitats. These disturbances would alter vegetation community structure and associated wildlife habitat on proposed project lands.

Although some permanent removal of vegetation for the construction of project facilities is unavoidable, Rugraw's proposals to limit ground disturbances and removal of vegetation, and to clearly delineate work area boundaries, would minimize temporary effects. Rugraw's proposal to map and quantify disturbances by vegetation type would provide a baseline for establishing targeted restoration goals and facilitate successful restoration of vegetation in areas of temporary disturbance.

Rugraw's implementation of a Noxious Weed and Revegetation Management Plan would ensure that temporarily disturbed areas are revegetated as soon as possible upon completion of construction activities. Rugraw's revisions to ensure restoration of overhanging riparian vegetation along disturbed portions of the South Fork Battle Creek streambanks would further minimize effects on these habitats, and would provide shade to help regulate water temperature in the stream.

Rugraw's Noxious Weed and Revegetation Management Plan proposes monitoring of revegetated areas for 2 years following construction, with additional seeding and planting as needed to meet the defined success criteria of 70 percent cover. However, the proposed plan does not include a description of any additional measures if success criteria are not met. If Rugraw implements the provisions outlined in the Noxious Weed and Revegetation Management Plan and modifies the plan to include additional reseeding and monitoring if restoration success criteria are not met by the end

of the 2-year monitoring period, as Interior recommends, this would ensure successful restoration of temporarily disturbed vegetation on proposed project lands.

Potential Spread of Noxious Weeds

Ground disturbances and removal of vegetation associated with construction of the project could create opportunities for colonization and spread of noxious and invasive weeds. Additionally, operation and maintenance activities could result in the spread of noxious weed species within proposed project lands via transport on maintenance equipment and personnel. Invasive plants and noxious weeds pose threats to native ecosystems by displacing native species and altering habitat characteristics.

To minimize the potential introduction and spread of noxious weeds during project construction and operation, Rugraw would implement the environmental measures listed above, including the implementation of a Noxious Weed and Revegetation Management Plan.

Interior recommends that, if success criteria are not met by the end of Rugraw's proposed 2-year monitoring period, Rugraw should continue its noxious weed control and monitoring program until the goal of less than 10 percent cover of noxious weeds is achieved.

Water Board preliminary condition 14 would require Rugraw to develop a vegetation and weed management plan. The plan would address aquatic and terrestrial non-native, invasive weeds and species within and adjacent to the project boundary, and would include provisions for protection of special-status plant species and an adaptive management component to reduce existing occurrences, and prevent the spread of non-native invasive aquatic weeds.

Our Analysis

The Noxious Weed and Revegetation Management Plan provides methods that Rugraw would use to prevent the spread of noxious weeds during project construction and control target noxious weeds following cessation of construction activities. The proposed plan is generally consistent with Water Board preliminary condition 14; however, the plan does not include chemical or mechanical treatment of existing noxious weed infestations, which occur on portions of proposed project lands. These populations would provide seed sources that could generate new populations in areas of project disturbance. If Rugraw modifies its plan to include treatment of existing noxious weed populations on proposed project lands, consistent with Water Board preliminary condition 14, the potential for the spread of these species to areas disturbed during construction activities would be further minimized. Specifically, noxious weed treatment techniques would need to focus on preventing existing populations from setting seed during periods of ground disturbance related to construction activities. Treatments prior to construction would reduce the likelihood that existing populations are able to establish in newly disturbed construction sites.

Water Board preliminary conditions 19-22 would require Rugraw to adopt measures that would reduce the potential for transport of noxious or invasive plants, seeds, or propagules on materials and equipment. These measures would also reduce the potential spread and effects of noxious weeds.

Revegetation of disturbed areas as soon as possible upon completion of construction activities would limit openings for potential noxious weed colonization. Rugraw's Noxious Weed and Revegetation Management Plan proposes noxious weed monitoring for 2 years following construction, with a goal of 20 percent cover of noxious weeds 1 year after the completion of construction, and less than 10 percent cover of noxious weeds at the end of the 2-year monitoring period. However, the plan does not include additional measures if success criteria are not met. If Rugraw implements the Noxious Weed and Revegetation Management Plan and modifies the plan to include continued noxious weed management and monitoring efforts until success criteria are met, as Interior recommends, the potential spread of noxious weeds during and following construction of the proposed project would be minimized.

Rugraw's proposed measures to limit ground disturbance, restore vegetation in disturbed areas, and implement a Noxious Weed and Revegetation Management Plan would minimize potential for colonization and spread of noxious and invasive weeds on proposed project lands during and after project construction.

Effects on Special-status Plants

Project construction and operation could affect special-status plants by removal or disturbance of individual plants, habitat loss or degradation, and introduction and spread of non-native invasive plants, including noxious weeds.

To minimize the potential effects of project construction and operation on Coleman's rein orchid and other special-status plants that could occur on proposed project lands, Rugraw proposes to implement the following measures in addition to those proposed and discussed above for other vegetation:

- Conduct monitoring during construction to ensure that measures to protect biological resources are implemented appropriately. Staff trained in the identification of special-status species and their habitats would be on-site to ensure surveys are conducted appropriately and that impacts to any special-status species that may be present on the proposed project lands are avoided through the proper implementation of measures such as minimization of ground-disturbing activity and vegetation clearing and proper delineation of work areas.
- Provide environmental training to construction staff regarding laws, regulations, and BMPs to protect threatened and endangered species and special-status plant species and their habitats.

- Conduct preconstruction surveys in all areas of suitable habitat for threatened and endangered and special-status plant species where surveys have not previously been conducted, and implement specified protection measures as necessary.

Water Board preliminary condition 5 would require Rugraw to consult annually with relevant resource agencies to review current lists of rare, threatened and endangered species and special-status plant and wildlife species, identify any additional species that have the potential to be adversely affected by the project, and develop or update species-specific study plans whenever new potential effects or newly listed species are identified. Rugraw would then be required to conduct studies for species identified as vulnerable to effects from project construction or operation.

Water Board preliminary condition 14 would require Rugraw to develop a vegetation and weed management plan, as described above, which must include provisions for protection of special-status plant species.

Our Analysis

Rugraw only observed one special-status plant species during its 2013 field surveys, Coleman's rein orchid. This species is not expected to be affected by project construction or operation because Rugraw has sited the proposed project facilities to avoid the location where a single population of this species was found.

Rugraw's proposal to provide training to construction staff regarding BMPs to protect threatened and endangered species and special-status plant species and their habitats, and conduct preconstruction inspections and implement protection measures where appropriate, including adjustment in the project alignment, would reduce the potential effects on special-status plant species that may be present on proposed project lands. Because of minor project alignment changes done to minimize site impacts or to avoid cultural resource sites and that occurred after the May and June 2013 field surveys, small areas of the proposed project lands were not surveyed during the appropriate flowering period to identify special-status plant species. Rugraw proposes to conduct preconstruction inspections for special-status plant species in those areas that were not surveyed in 2013. These additional inspections would further minimize the likelihood of construction effects on special-status plants.

Rugraw's proposed measures to avoid or minimize effects on vegetation and reduce the potential spread of noxious weeds would also limit potential effects on special-status plant species.

Noxious weed control methods, as proposed in Rugraw's Noxious Weed and Revegetation Management Plan, would include mechanical and chemical herbicide treatments that could affect special-status plants, if present. However, Rugraw's plan does not include provisions to protect special-status plant species during noxious weed treatment application. Modification of Rugraw's Noxious Weed and Revegetation Management Plan to include measures to avoid effects on special-status plants, in

accordance with Water Board preliminary condition 14, would ensure that these species are protected during noxious weed control activities. Specific measures could include plant surveys prior to treatment application, consultation with appropriate agencies if special-status plants are found, avoidance of special-status plants during noxious weed treatments, and possible relocation of individuals in collaboration with appropriate agencies.

Effects of Project Construction and Operation on Wildlife

Vegetation clearing, construction noise, potential introduction and/or spread of noxious weeds, and increased human activity may affect wildlife and their habitats during construction of the project.

Effects on wildlife habitat as a result of vegetation clearing for project construction and vegetation maintenance on ROWs and around other project features during project operation could include permanent and temporary habitat loss, degradation, and fragmentation. Potential introduction or spread of invasive or noxious weeds could also contribute to degradation of wildlife habitat.

Noise associated with project construction activities and equipment, including helicopters, could temporarily displace individuals and could disturb feeding or mating behaviors. The presence of work crews on proposed project lands during project construction and operation would contribute to noise and may result in additional displacement or disturbance of wildlife species.

Injury or mortality of individuals may occur from collisions with vehicles, construction equipment, or structures; and/or inadvertent crushing of inhabited dens, burrows, snags, or logs.

To minimize the effects of project construction and operations on wildlife within proposed project lands, Rugraw proposes to implement measures to minimize effects on vegetation, limit the spread of noxious weeds, minimize effects on special-status plants, and avoid effects on wetlands, as described in the sections above, as well as implement the following:

- Conduct preconstruction surveys for migratory birds within 100 feet of the project (disturbance area) prior to construction if disturbance would occur during the nesting season (typically April 15 to July 31).
- Establish a 100-foot-buffer around active nests of bird species protected under the Migratory Bird Treaty Act.
- Conduct preconstruction pedestrian or aerial nest surveys in suitable habitat within 1 mile of the project disturbed area during the appropriate nesting time periods needed to identify raptor nest locations and establish the status of nests.

- Apply an appropriate buffer to active raptor nests during project construction.
- Avoid potential bat roosting habitat, including rock crevices, cliffs, and snags.

Our Analysis

The potential for direct effects on wildlife including injury, mortality, or disturbances associated with equipment or crews would be largely restricted to the construction period and many displaced individuals would be expected to return to the area upon completion of construction activities. Effects on birds would be greatest during their nesting season. Some recurring disturbances would occur during ROW maintenance activities.

Rugraw's proposal to avoid potential bat roosting habitat would avoid direct effects on roosting bats. However, noise associated with project construction could impact roosting bats if construction occurs during the pup season (generally June 1 – August 31) and is within the general area of active roosts. These effects would be unavoidable, but temporary.

Conducting preconstruction surveys for nesting migratory birds and raptors would identify areas most susceptible to effects of noise and vegetation clearing. Implementing protection buffers in these areas, as proposed, would reduce potential for nest abandonment, accidental damage to nests, and accidental injury to nesting adults or nestlings. However, Rugraw does not describe how it would determine the appropriate buffer distance to protect nesting raptors. Different raptor species have different levels of sensitivity to noise and human presence during nesting seasons. If Rugraw prepares a raptor protection plan that identifies species-specific avoidance buffer distances, based on input from California DFW, potential effects on raptors would be minimized. Revegetation of disturbed areas and treatment of noxious weeds, as discussed above, would also reduce potential changes to habitat structure and restore wildlife habitat to existing conditions in temporarily disturbed areas. Rugraw's proposed measures, with our recommended modification to identify raptor nest buffers, would minimize these effects as described in the previous sections on vegetation.

Transmission Line Effects on Birds

Operation of a 12-mile transmission line would present a collision risk and electrocution hazard for avian species that reside within or traverse proposed project lands. The risk of avian mortality associated with above-ground transmission lines is greatest on small voltage (69-kV or less) lines such as the proposed 60-kV line because of the close spacing of conductors. Large-bodied birds such as raptors and wading birds are at greatest risk because of their long wing spans that can reach between conductors. Additionally, larger species are often less agile in flight compared to smaller species, and thus are less able to avoid collisions with lines.

To reduce the likelihood of avian injury or mortality from collisions with the transmission line and potential electrocution, Rugraw proposes to design and construct the transmission line in compliance with APLIC[50] guidance to reduce risk of electrocution and collisions to avian species. Interior agrees with Rugraw's proposal to design and construct its transmission line as described above. Additionally, Interior (10(j) recommendation 7) recommends that Rugraw prepare an avian protection plan. Interior recommends that Rugraw's avian protection plan be developed using FWS's Avian Protection Plan Guidelines.

Our Analysis

APLIC guidelines provide specific recommendations for conductor spacing and conductor arrangement to reduce risk of avian electrocutions. However, the guidelines also include a variety of nest and perch deterrents, perching poles, and nest platforms to further reduce risk of birds spending time near conductors. APLIC guidelines also provide descriptions of devices for marking lines to increase visibility and allow birds to avoid collisions. Line-marking devices are most effective when placed at stream crossings, near wetlands, near ridgelines, or at other locations along the line where avian densities are likely to be high and collision risk is greatest.

Design and construction of the transmission line with consideration to the APLIC guidance would reduce the risk of avian mortality due to electrocution or collision with the line. However, without knowing what specific measures Rugraw proposes, including types and locations of marking devises, or what, if any, measures beyond conductor separation, would be used to reduce electrocution risk, it is difficult to know whether further protection measures are warranted. Preparation of an avian protection plan, as recommended by Interior under 10(j) recommendation 7, would provide the detail needed to ensure that the risk of effects to birds associated with the transmission line are effectively minimized. If Rugraw prepares an avian protection plan that describes how APLIC guidelines were considered in the design and constructions of the project transmission line, effects of avian electrocution and collision would be reduced.

Effects on Special-status Wildlife Species

Potential effects of project construction and operation on special-status wildlife species would be similar to other wildlife species and could include loss, degradation, and fragmentation of habitat; injury or mortality because of collisions with vehicles or

[50] APLIC is a collaboration among numerous electrical utilities and research groups and FWS that was formed to identify the causes of, and develop methods and designs to minimize, avian electrocutions and collisions at power lines. APLIC has released guidelines to address avian electrocution (APLIC, 2006), collision (APLIC, 2012), and the development of national Avian Protection Plan guidelines (APLIC and FWS, 2005).

equipment; and disturbances associated with noise and the presence of work crews during project construction and maintenance activities.

To minimize the potential effects of project construction and operation on special-status wildlife species and their habitats, Rugraw proposes to implement the following measures in addition to those listed under the preceding terrestrial resource sections:

- Avoid ground-disturbing activity on or near talus slopes to protect Sierra Nevada red fox and American pika.
- Refrain from collecting rocks from in-water environments between March 1 and August 31 to avoid disturbing foothill yellow-legged frogs and their habitat.
- Conduct preconstruction surveys for juvenile and adult foothill yellow-legged frogs immediately prior to construction when in-water work would occur during the breeding season (typically mid-March to August).
- Avoid construction activities in riparian areas during the time that egg masses of foothill yellow-legged frogs are present (typically mid-April through mid-May); if egg masses of foothill yellow-legged frogs are found, postpone construction.
- Relocate juvenile and adult foothill yellow-legged frogs found within the project reach and up to 500 feet downstream, to outside the project construction area to an area immediately upstream of the project area.

Water Board preliminary condition 13 would require Rugraw to develop an amphibian monitoring plan in consultation with the appropriate agencies, to monitor and evaluate effects on the California red-legged frog, foothill yellow-legged frog, and Cascade frog.

California DFW has also recommended that Rugraw prepare a foothill yellow-legged frog monitoring plan (10(j) recommendation 2) that would include annual monitoring for all life stages between March and October, and development of appropriate measures to offset effects on this species if population effects are detected after 5 years of monitoring.

In its reply comments, Rugraw noted that it is in agreement with California DFW recommendations and Water Board preliminary conditions.

Our Analysis

Construction of the project would require vegetation clearing and associated disturbance to habitat for Sierra Nevada red fox and American pika. Proposed project operation would result in changes to the current flow regime in South Fork Battle Creek, which could result in effects on amphibian habitat.

Rugraw's proposal to conduct monitoring during construction to ensure that measures to protect biological resources are implemented appropriately, and provide training to construction staff, would reduce risk of accidental injury or mortality to sensitive species during construction. Avoiding disturbance to talus slopes would minimize potential effects on Sierra Nevada red fox and American pika, which are most likely to have dens in these areas.

Rugraw's proposed measures to conduct preconstruction surveys for foothill yellow-legged frog during the breeding season, avoid construction or other disturbances to riparian habitats during key time periods, and relocate individuals if necessary, would minimize effects on this species. Measures designed to limit project construction effects on aquatic resources and wetlands, including reducing potential for erosion and managing stormwater runoff, limiting in-water work to the July 1 to October 15 period, and avoiding construction in wetlands would also reduce effects on the foothill yellow-legged frog by protecting water quality. However, while Rugraw's proposed measures would protect egg masses, juvenile frogs, and adult frogs from construction effects, they do not address potential effects on larval frogs. Relocating larval frogs in addition to juvenile and adult frogs would further reduce effects on this species. After hatching, larval foothill yellow-legged frogs tend to move to nearby areas beneath cobble and gravel, and display frantic swimming patterns to avoid predation that could result from movement downstream from hatching location. Juveniles tend to move upstream after metamorphosis (AmphibiaWeb, 2017); therefore, relocating juvenile and adult individuals to areas upstream of the project would reduce potential for frogs migrating back into the construction zone. If the relocation spot is too close to the project, though, larval frogs could move back into the hazardous area. If Rugraw modifies its special-status amphibian monitoring and protection plan to include specific criteria for relocation of foothill yellow-legged frogs to ensure that they do not re-enter the construction zone, effects on this species at all life stages would be reduced.

Project operations could affect foothill yellow-legged frog and Cascade frog habitat if operations change the stream flow regime and conditions in breeding and rearing habitats. Effects of hydropower projects on the foothill yellow-legged frog can vary greatly based on stream geometry, vegetation and sediment type, and many other site-specific variables that can affect the way in which changes in flow regime may alter their habitat (Yarnell et al., 2011). In general, hydropower projects tend to affect foothill yellow-legged frog habitat in two ways: (1) flow pulses outside of the typical season (spring) can disrupt breeding and larval development by scouring egg masses, or displacing individuals, particularly when they occur during the summer (Forest Service, 2016); and (2) low winter flows can facilitate vegetation encroachment into the channel and pool stagnation, which also promotes the establishment of bullfrogs (Fuller et al., 2011; California DFW, 2017c).

As described in section 3.3.2.1, *Aquatic Resources*, *Water Use and Quantity*, the project would operate as a run-of-river project. Therefore, there would be no unnatural flow pulses and no effects on foothill yellow-legged frogs associated with summer pulses. Staff reviewed USGS models (Gotvald et al., 2012) to estimate the 2-year recurrence interval flow, or channel maintenance flow, for South Fork Battle Creek. This analysis indicates a flow of about 370 cfs every other year would be required to maintain current stream channel morphology, which provides habitat for foothill yellow-legged frogs. We recognize that project operations would remove some higher flow levels, including a portion of the 370 cfs bankfull flow, from the hydrograph in the bypassed reach. The project would divert a maximum of 105 cfs through the powerhouse, but would not operate at flows above 450 cfs. With an inflow of 449 cfs, 105 cfs would go through the powerhouse and 344 cfs would go through the bypassed reach. At an inflow of 450 cfs, the project would stop operating, and flows in the bypassed reach would be 450. Therefore, project operations would remove flows between 344 cfs and 449 cfs from the bypassed reach, at the higher flow levels. Staff's analysis of Rugraw's synthetic flow record indicates that, between October and April, flows over 450 cfs occurred 85 times in the 88-year synthesized record, so roughly once a year. Flows over 450 cfs ranged from 451 to 1,470 cfs, with an average of 632 cfs, with a standard deviation of 202 cfs. Because these high flows would continue to occur with similar frequency as under current conditions, the project is not expected to eliminate high winter flood pulses that would prevent vegetation encroachment or allow pool stagnation. Therefore, we do not expect the project to affect habitat for foothill yellow-legged frogs or Cascade frog.

The Water Board and California DFW recommend post-construction monitoring for foothill yellow-legged frog and Cascade frog. Rugraw agrees with these recommendations. However, the recommended measures do not indicate how monitoring would be used to identify project-related effects, what level of effects would be considered adverse, or what mitigation would be implemented. Monitoring alone would not provide protection, habitat enhancement, or mitigation, so any benefits of this measure cannot be analyzed.

Rugraw's proposals to avoid ground-disturbing activity on or near talus slopes to protect Sierra Nevada red fox and American pika, and avoid potential roosting habitat for bats, including the spotted bat, would avoid or minimize effects on these special-status mammals. However, noise associated with project construction could affect roosting spotted bats if construction occurs during the pup season (generally June 1–August 31) and is within the general area of active roosts. These effects would be unavoidable, but temporary.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Threatened and endangered species include those species listed as endangered or threatened under the ESA and those species that have been proposed for listing or are candidates for listing under the ESA. Rugraw identified such species that are known to occur or may occur within the project area using desktop research, literature review, and field habitat assessments of the project area conducted in May, June, and September 2013, as described in section 3.3.3, *Terrestrial Resources*. Staff furthered considered threatened and endangered species that may occur in the project area based on comments received from Interior.

Threatened and Endangered Plants

One federally threatened plant species, slender Orcutt grass (*Orcuttia tenuis*), could occur on proposed project lands. FWS listed slender Orcutt grass as a threatened species under the ESA on March 26, 1997 (62 FR 14338). This species occurs in the Sierra Nevada and Cascade mountain foothills and is found in vernal pool habitats, which are seasonal wetlands that fill with water during fall and winter rains and dry up during spring and summer. Blooming occurs from May through October.

Rugraw did not encounter this species and documented no vernal pool habitats during the 2013 field surveys of proposed project lands. However, FWS indicated that suitable habitat for slender Orcutt grass exists within the project vicinity and that this species is known to occur in the Dales area along Highway 36, about 20 miles west of the project site. FWS designated critical habitat for slender Orcutt grass on August 6, 2003 (68 FR 46684). Proposed project lands do not contain critical habitat for this species. The closest critical habitat for this species is about 15 miles west of the project.

Threatened and Endangered Wildlife

Six wildlife species listed as threatened, proposed threatened, or candidates for listing are known to occur, or may potentially occur, on proposed project lands. This section describes the status, habitat requirements, and likelihood of occurrence for each of these species.

California Red-legged Frog

FWS listed the California red-legged frog (*Rana draytonii*) as a threatened species under the ESA on May 23, 1996 (61 FR 25813), and it is also listed as a California species of special concern. This aquatic frog is found in ponds or along stream edges with ample emergent vegetation within humid forests, woodlands, grasslands, and coastal scrub habitats. This species requires calm or slow-moving aquatic habitats, which may be permanent or ephemeral, for breeding. Throughout its range, bullfrogs, habitat loss, degradation, and modification are the primary threats to this species.

Rugraw conducted field surveys in 2013 using FWS's *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog*. Surveyors did not observe this species, although suitable habitat exists at two locations on proposed project lands. Of the six sites surveyed, suitable habitat was identified at the Gun and Rod Club Pond and Manton School Road Pond. The Gun and Rod Club Pond is located near the west-central portion of the transmission line corridor, east of Soap Creek, and Manton School Road Pond is located near the western end of the transmission line route, near Manton Road. Both ponds are approximately 200 feet from the project centerline, and neither pond is located near the proposed diversion dam construction site or any streams that may be affected by the project. The presence of predatory fish and bullfrogs reduces the suitability of potential habitat at these sites. Similarly, marginal habitat was found at the South Fork Battle Creek powerhouse location. However, the physical characteristics of this site indicate that the presence of the California red-legged frog is unlikely. Surveyors did not observe this species in previous surveys conducted in the area in 1996 and 1998. The nearest documented occurrence is about 44 miles south of the project site. FWS designated critical habitat for the California red-legged frog on March 13, 2001 (66 FR 14626). Proposed project lands do not contain critical habitat for this species. The nearest critical habitat unit is about 45 miles south-southeast of the project site.

Northern Spotted Owl

FWS listed the northern spotted owl (*Strix occidentalis caurina*) as a threatened species under the ESA on June 26, 1990 (55 FR 26114), and it is listed as a California species of special concern. This large owl species requires mature forest stands with large trees and snags. The northern spotted owl prefers sites with both standing and fallen dead trees, and open space among the lower branches to allow flight under the canopy. Threats to this species include loss of habitat and competition with the barred owl (*Strix varia*) (FWS, 2011).

Surveyors did not observe the northern spotted owl during 2013 field surveys. Proposed project lands do not contain high-quality habitat for this species because of historical logging and other disturbances, and lack of mature forest stands. However, mixed conifer patches along Battle Creek provide marginally suitable nesting habitat. FWS designated critical habitat for the northern spotted owl on January 15, 1992 (57 FR 1796) and revised the designation on August 13, 2008 (73 FR 47326). The designation includes portions of western Washington, Oregon, and California. Proposed project lands do not contain critical habitat for this species. The nearest critical habitat unit is about 40 miles north-northwest of the project site.

Western Yellow-billed Cuckoo

FWS listed the western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus occidentalis*) as a threatened species under the ESA on October 3, 2014 (79 FR 59991). This medium-sized bird requires dense, deciduous riparian forest with large areas of contiguous closed canopy and well-developed

understories. It prefers willow and cottonwood trees for nesting. The western yellow-billed cuckoo also requires low elevation streams and rivers with unrestricted floodplains.

Surveyors did not observe the western yellow-billed cuckoo during 2013 field surveys. This species is not expected to occur on proposed project lands because of the lack of well-developed riparian habitat. The western yellow-billed cuckoo is extremely rare with an estimated 50 breeding pairs remaining in California. The decline of this species has been attributed to habitat loss. Remaining breeding pairs are believed to be limited to the Sacramento and Owens valleys. FWS proposed designation of critical habitat for western DPS of the yellow-billed cuckoo on August 15, 2014 (79 FR 48547), but this designation has not been finalized. Proposed project lands do not contain proposed critical habitat for this species.

Because there is no suitable habitat for western yellow-billed cuckoo in the project area, we have no further discussion of this species.

California Wolverine

FWS proposed the California wolverine (*Gulo luteus*) for listing under the ESA on November 15, 1994 (59 FR 58982). This species is also currently listed as threatened under CESA and is fully protected in California. This rare mammal species has been documented in a variety of forested habitats, but may also use shrub, wet meadow, and montane riparian habitats. Den sites include caves, cliffs, hollow logs, ground cavities, and under rocks. In the northern Sierra Nevada range, most documented sightings occur at 6,400 to 10,800 feet elevation.

Surveyors did not observe the California wolverine during 2013 field surveys. This species is not expected to occur on proposed project lands, because the elevation of proposed project lands is outside the range where this species is typically found. The nearest documented occurrence is approximately 3.8 miles north of the project site. FWS has not designated critical habitat for this species. Therefore, proposed project lands do not contain critical habitat for this species.

Because proposed project lands are outside the range of most reported California wolverine sightings, we have no further discussion of this species.

Valley Elderberry Longhorn Beetle

FWS listed the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) as a threatened species under the ESA on August 8, 1980 (45 FR 52803). FWS proposed this species for delisting on October 2, 2012 (77 FR 60237), but subsequently withdrew its proposal on September 17, 2014 (79 FR 55879). This beetle is exclusively associated with elderberry plants (*Sambucus* spp.), generally within riparian habitats, and requires mature plants (2 to 8 inches in diameter) for reproduction. This species and its host plant also occur in interior live oak and mixed oak woodlands, and chaparral in the Sierra foothills, where it prefers dry, rocky outcroppings of granite, where elderberry bushes are often observed growing out of cracks in the rock.

Surveyors did not observe the valley elderberry longhorn beetle or its host plan during 2013 field surveys. The nearest documented occurrence of this species is approximately 5.7 miles southwest of the project site. FWS designated critical habitat for the valley elderberry longhorn beetle at the time of its listing on August 8, 1980 (45 FR 52803). Proposed project lands do not contain critical habitat for this species. The nearest critical habitat unit is about 120 miles south of the project site.

Vernal Pool Fairy Shrimp

FWS listed the vernal pool fairy shrimp (*Branchinecta lynchi*) as a threatened species under the ESA on September 19, 1994 (59 FR 48136). This small aquatic invertebrate occurs exclusively in vernal pool habitats in northern California and Oregon. It closely resembles at least four other species of fairy shrimp that occur in similar habitats and can be difficult to distinguish (FWS, 2005).

Surveyors did not observe the vernal pool fairy shrimp during 2013 field surveys and documented no vernal pool habitat on proposed project lands. FWS designated critical habitat for the vernal pool fairy shrimp on August 6, 2003 (68 FR 46684), but proposed project lands do not contain critical habitat for this species. The nearest critical habitat unit is about 30 miles southwest of the project site.

Threatened and Endangered Fish

As described in section 3.3.4.1, the proposed project has the potential to affect ESA-listed Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and California Central Valley steelhead (should the Battle Creek Salmon and Steelhead Restoration Project be successful in removing downstream barriers to anadromy in South Fork Battle Creek); and their designated critical habitat. South Fork Battle Creek up to Angel Falls is also considered EFH for Chinook salmon.

A brief description of the federally listed species, their designated critical habitat, and Chinook salmon EFH found in the project vicinity is presented in the following sections. More detailed information describing the life history, status, and occurrence of ESA listed fish species in the Battle Creek basin is available in Rugraw's Lassen Lodge Hydroelectric Project Biological Assessment (Tetra Tech, 2015b).

Central Valley Spring-run Chinook Salmon

The Central Valley spring-run Chinook salmon ESU was listed as threatened by NMFS under the ESA on September 16, 1999 (64 FR 50394). The ESU comprises all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries. Critical habitat for Central Valley Spring-run Chinook salmon was designated on September 2, 2005 (70 FR 52488) and includes South Fork Battle Creek up to RM 21.4, which is about 0.8 mile upstream of the proposed powerhouse site and at the base of Angel Falls.

Historically, Central Valley spring-run Chinook salmon was one of the most abundant and widely distributed salmon races. The Central Valley drainage as a whole supported runs as large as 600,000 fish between the late 1880s and the 1940s (California DFW, 1998). This race once migrated into headwaters of tributaries to the Sacramento and San Joaquin Rivers. They now only exist in the mainstem and in a few tributaries to the Sacramento River. Gold mining and agricultural diversions caused the first major declines in spring-run Chinook salmon populations. Further extirpations followed construction of major water storage and flood control reservoirs on the Sacramento and San Joaquin Rivers and their major tributaries in the 1940s and 1950s (Moyle et al., 1995).

Adult Central Valley spring-run Chinook salmon enter the Sacramento River from late March to July, over-summer in coldwater habitats, and then spawn from mid-August through early October. Incubation occurs from mid-August to mid-March, with rearing and emigration occurring from mid-August through April. Adult Chinook salmon require cold, freshwater streams with suitable gravel for reproduction. For maximum survival of incubating eggs and larvae, water temperatures must be between 41°F and 55.4°F (Moyle, 2002). After emerging between November and March, Chinook salmon fry tend to seek shallow, nearshore habitat with slow water velocities and move to progressively deeper, faster water as they grow. Spring-run juveniles frequently reside in freshwater habitat for 12 to 16 months.

Factors leading to the decline of spring-run Chinook salmon populations include gold mining and agricultural diversions (Moyle et al., 1995), loss of habitat in upper elevation headwaters blocked by dams, degradation of habitat conditions (e.g., water temperature), entrainment in water diversions, and overharvest. The human-caused factor that has had the greatest effect on the abundance of spring-run Chinook salmon runs is loss of habitat, primarily in the rivers upstream of the Delta. Water diversions and reservoir operations also affect streamflow, which influences the quantity, quality, and distribution of Chinook salmon spawning and rearing habitat.

Central Valley spring-run Chinook salmon are currently unable to access the proposed Lassen Lodge project reach because of existing downstream barriers. The most upstream passage barrier is the South Diversion Dam on South Fork Battle Creek. Analyses of habitat conditions in the upper South Fork Battle Creek indicate that natural production of spring-run Chinook salmon is unlikely to be sustainable in the project reach. The velocities, depths, or areas of gravel patches are poorly suited for spawning of spring-run Chinook salmon at the prevalent flows in September when spawning peaks.

Sacramento River Winter-run Chinook Salmon

The Sacramento River winter-run Chinook salmon ESU was listed as threatened under the Federal ESA on August 4, 1989 (NMFS, 1989). NMFS subsequently upgraded the Federal listing to endangered on January 4, 1994 (NMFS, 1994). The ESU includes all naturally spawned populations of winter-run Chinook in the Sacramento River and its

tributaries, as well as populations from two artificial propagation programs, one at the Livingston Stone National Fish Hatchery and the other at Bodega Marine Laboratory (NMFS, 2005). NMFS designated critical habitat for Sacramento River winter-run Chinook salmon on June 16, 1993 (NMFS, 1993). The proposed project reach does not include critical habitat for Sacramento River winter-run Chinook.

Prior to construction of Shasta Dam, winter-run Chinook salmon spawned in the upper reaches of the Sacramento River, the McCloud River, and the lower Pit River. Spawning is now restricted to approximately 44 miles of the mainstem Sacramento River, immediately downstream of Keswick Dam (Yoshiyama et al., 1998). During the mid-1960s, more than 20 years after the construction of Shasta Dam, the winter-run Chinook population exceeded 80,000 fish (Reclamation, 1986). The population declined substantially during the 1970s and 1980s. In 1996, returning spawners numbered 1,337 fish and in 2001, returning adults were estimated to be 8,224 (California DFW, 2013).

Winter-run Chinook salmon spend 1 to 3 years in the ocean. Adults leave the ocean and migrate through the Delta into the Sacramento River from December through July with peak migration in March. Adults spawn from mid-April through August (Moyle, 2002). Egg incubation continues through October. The primary spawning habitat in the Sacramento River is above Red Bluff Diversion Dam at RM 243, although spawning has been observed downstream as far as RM 218 (NMFS, 2001). Downstream movement of juvenile winter-run Chinook salmon begins in August, soon after fry emerge.

One of the main factors in the decline of Chinook salmon is habitat loss and degradation. On the Sacramento River, Shasta Dam blocked access to historical spawning and rearing habitat. Other factors affecting abundance include the effects of reservoir operations on water temperature, harvesting and fishing pressure, entrainment in diversions, contaminants, predation by non-native species, and interaction with hatchery stock.

Cramer et al. (2015), determined that there is no capacity for winter-run Chinook salmon within the proposed project area, because natural stream temperatures during June through mid-August, when their eggs would be incubating, typically exceed levels lethal to eggs for several weeks during that period.

Central Valley Steelhead

The Central Valley steelhead DPS was listed as threatened by NMFS on May 18, 1998 (63 FR 13347). Critical habitat for the Central Valley steelhead was designated by NMFS on September 2, 2005 (70 FR 52488) and overlaps 1.7 miles of the proposed bypassed reach extending up to Angel Falls at RM 22.3. Steelhead do not have current access to the critical habitat designated in the project action area because of downstream barriers, and the historical use of this habitat by steelhead is unknown.

Unlike Chinook salmon, steelhead typically rear in freshwater for 1 to 2 years before migrating to the Pacific Ocean. Steelhead may spawn more than once and return to the Pacific Ocean between spawning. From 1967 to 1993, the estimated number of steelhead passing the Red Bluff Diversion Dam (2 miles southeast of Red Bluff, California, on the Sacramento River) ranged from a low of 470 to a high of 19,615. While estimates vary, perhaps 10 percent of these fish spawned in Battle Creek and about 28 percent were believed to have spawned at Coleman National Fish Hatchery (Reclamation, BLM, and Western Shasta Resource Conservation District, 2006). In the Central Valley, naturally producing populations only occur in the Sacramento River and its tributaries. More than 90 percent of the adult steelhead in the Central Valley are produced in hatcheries (Reynolds et al., 1990).

Central Valley steelhead adult migration occurs from July through February. Spawning occurs from December through April and, possibly in May, in most years in streams with cool, year-round, well-oxygenated water (Reclamation, BLM, and Western Shasta Resource Conservation District, 2006). Incubation generally occurs from December through April. Following emergence, fry live in small schools in shallow water along streambanks. As the steelhead grow, they establish individual feeding territories.

Juvenile steelhead typically rear for 1 to 2 years in streams before emigration, which generally occurs in spring. Steelhead may remain in the ocean from 1 to 4 years, growing rapidly as they feed in the highly productive currents along the continental shelf (Barnhart, 1986). Steelhead return to natal streams to spawn as 2- to 4-year-old adults.

Central Valley steelhead population declines are attributed to blockage from upstream habitats, entrainment from unscreened diversions, hatchery practices, and degraded habitat conditions due to water development and land use practices. Dams at low elevations on all major tributaries block access to an estimated 95 percent of historical spawning habitat in the Central Valley (Reclamation, BLM, and Western Shasta Resource Conservation District, 2006).

Anadromous steelhead are currently unable to access the proposed project reach because of existing downstream barriers. The most upstream passage barrier is the South Diversion Dam on SF Battle Creek, 6 RM below the project action area (see figure 3-1). An abundant population of resident rainbow trout was the only fish species observed in the reach during the stream habitat survey. Quarterly electrofishing surveys by FWS just upstream of Panther Grade have also indicated that rainbow trout and riffle sculpin are the only fish species present above Panther Grade (Whitton et al., 2010).

Steelhead would be a more likely anadromous species to be present in the reach above Panther Grade, based on its ability to pass through difficult migratory barriers. The smaller gravel patch sizes that are present in that reach would be more suitable for steelhead than the larger-bodied Chinook salmon. There are also two barriers upstream of Panther Grade that are largely impassable.

3.3.4.2 Environmental Effects

Slender Orcutt Grass, Vernal Pool Fairy Shrimp, and Valley Elderberry Longhorn Beetle

Project construction and operations would have no effect on slender Orcutt grass, vernal pool fairy shrimp, and valley elderberry longhorn beetle because these species are not likely to occur within proposed project lands.

Although these species and their habitats have not been documented on the proposed project lands, to avoid any potential effects of project construction and operation on these species and their habitats, Rugraw proposes to implement the measures discussed above under section 3.3.3.2, *Terrestrial Resources*, *Environmental Effects*, including preconstruction inspections in all areas of suitable habitat for threatened, endangered and special-status plant species where surveys have not previously been conducted. Additionally, during design of the transmission line, Rugraw would inspect vegetation at the location of pole placements within unsurveyed areas to ensure there would be no disturbance to vernal pool habitat or elderberry plants. Rugraw also proposes to implement the measures discussed above under sections 3.3.1.2, *Geology and Soil Resources*, *Environmental Effects*, and 3.3.2.2, *Aquatic resources*, *Environmental Effects*, which include steps that would be taken to preserve water quality in aquatic habitats. Interior requested formal consultation for potential effects on slender Orcutt grass and vernal pool fairy shrimp. Rugraw maintains that slender Orcutt grass and vernal pool fairy shrimp are not likely to occur in the project area and argues that no further consultation with Interior is necessary. However, to ensure that these species are not affected, as part of a construction plan, biological monitors (trained in identifying species and habitats) would investigate proposed areas of disturbance during project design to ensure that any sensitive species would be avoided by the project. If vernal pool habitat is discovered along the transmission line route, the route would be modified as necessary to avoid this habitat.

Interior also requested that Rugraw develop plans and BMPs for the conservation of listed species, following existing conservation guidelines and/or plans. Rugraw agrees to this request.

Our Analysis

Rugraw documented no vernal pool habitat on proposed project lands during 2013 field surveys. Two of the ESA-listed species, slender Orcutt grass and vernal pool fairy shrimp, are exclusively associated with vernal pool habitat. To ensure that these species are not affected, prior to construction, Rugraw would conduct additional inspections in all areas of proposed disturbance and inspect vegetation at the location of pole placements within previously unsurveyed areas during design of the transmission line. Also, as part of a construction plan, biological monitors (trained in identifying species and habitats) would be on-site during construction to ensure that any potential habitat would be

avoided by the project. If vernal pool habitat is discovered along the transmission line route, the route would be modified as necessary to avoid this habitat.

Similarly, Rugraw's 2013 surveys documented no valley elderberry longhorn beetles or host plants. To ensure that the valley elderberry longhorn beetle is not affected by the project, Rugraw's preconstruction inspection of proposed disturbance areas would include confirmation that no elderberry plants are present in the area. Biological monitors would be on-site during construction, as noted above, to further ensure that this species is not affected.

Avoidance of vernal pool habitat and elderberry plants would also protect slender Orcutt grass, vernal pool fairy shrimp, and valley elderberry longhorn beetle. Additionally, preconstruction inspections would be conducted to ensure that these species and habitats are not present in proposed disturbance areas.

Measures designed to limit effects on aquatic resources, as previously described, would also reduce potential effects on vernal pool fairy shrimp. Similarly, proposed measures to limit effects on special-status plant species would also avoid effects on slender Orcutt grass, if present in the project area.

Rugraw's proposal to conduct monitoring using onsite trained staff, provide environmental training to staff, and implement other environmental measures as described under the terrestrial resources section, and measures to avoid or minimize effects on water quality as described under the geology and soil resources and aquatic resources sections, would reduce the likelihood of effects on threatened and endangered species.

Based on a lack of documented occurrence of these species and their habitat on proposed project lands and Rugraw's proposed measures to avoid or minimize effects on aquatic and terrestrial resources, the project would have no effect on slender Orcutt grass, vernal pool fairy shrimp, and valley elderberry longhorn beetle.

California Red-legged Frog

The California red-legged frog is not likely to occur within proposed project lands. Rugraw's 2013 survey did not detect any evidence of this species; also, at locations where suitable habitat exists (Gun and Rod Club Pond and Manton School Road Pond), conditions were not favorable for the survival of the species because of the presence of predatory fish and bullfrogs. Furthermore, both ponds are about 200 feet from the transmission line centerline, about 10 miles from the proposed diversion dam construction site, and would not be directly affected by construction or operation activities. Marginal habitat at the South Fork Battle Creek diversion and intake location is not likely to support California red-legged frogs because of the physical characteristics of the site, including swift flow and minimal pool, emergent vegetation, or cover habitat.

To avoid any potential effects of project construction and operation on the California red-legged frog and its habitat, Rugraw proposes to implement the measures

discussed above for both terrestrial and aquatic resources. In addition, Rugraw proposes to develop an amphibian monitoring plan, in consultation with appropriate agencies, to monitor and evaluate long-term effects on the California red-legged frog and other amphibian species, consistent with Water Board preliminary condition 13. Rugraw also proposes to prepare a California red-legged frog protection plan in collaboration with FWS, consistent with Interior 10(j) recommendation 8, which would include measures for the conservation of California red-legged frogs to provide for and allow California red-legged frogs to become reestablished,[51] and protection from manageable threats. However, Interior's recommended plan would also include measures to control bullfrogs. Interior notes bullfrogs are predators of California red-legged frog and are able to outcompete California red-legged frogs for resources. Interior, contends dams and impoundments associated with hydroelectric projects have been shown to improve conditions for the establishment of bullfrog populations (Fuller et al., 2011), by creating deep water breeding habitat, warming water temperatures, promoting bullfrog dispersal through pond level reductions, and modifying the natural hydrograph in streams below dams. Interior also requests formal consultation for potential effects on California red-legged frog. Rugraw states Interior provides no evidence to suggest bullfrogs have contributed to the possible extirpation of California red-legged frogs on proposed project lands. Finally, Rugraw proposes to develop plans and BMPs for the conservation of listed species, following existing conservation guidelines and plans, consistent with Interior's request.

Our Analysis

The California red-legged frog has not been documented on proposed project lands and is not likely to occur because of unfavorable conditions at suitable habitat locations identified in Rugraw's study. The closest known population is over 40 miles away. Interior, however, has concerns that modifications associated with the proposed project could alter habitat conditions in such a way that would facilitate the establishment of bullfrog populations. We agree with Interior's analysis that in general, hydroelectric developments may modify existing habitat conditions to favor bullfrog. However, Interior provides no project specific rationale for this statement and it is unlikely that this general principal applies to the proposed project.

As discussed in section 3.3.3.2, *Aquatic Resources Environmental Effects*, we do not expect the proposed project to have substantial effects on water temperature. While some warming would occur under certain conditions, these effects are only expected to raise water temperature by 0.2ºC–0.5ºC. Under other inflow scenarios, the project would actually provide a cooling effect. Therefore, we find the project would not modify temperatures to benefit bullfrog over California red-legged frog.

[51] We interpret re-establishment to mean natural immigration from nearby populations and not reintroduction through restocking or transport of individuals to the project area.

Interior's rationale states that hydro projects promote bullfrog dispersal by dropping water levels in breeding areas, triggering adults to disperse to better habitat. However, the proposed project would operate as run-of-river. The project would not store water for release at later times, like some hydro projects do, so the water level in the impoundment is not expected to fluctuate as Interior suggests. Additionally, the project would preserve the summer low flow and winter high flow components of the natural hydrograph and is not expected to alter stream channel structure to favor bullfrog over California red-legged frog.

Further, while the final license application notes the presence of bullfrogs in the project area, the only sighting was at a manmade pond along the project transmission line route, over 10 miles from the proposed impoundment location and well removed from any hydraulic connection to South Fork Battle Creek. However, we agree that the small, 0.4-acre project impoundment could conceivably provide bullfrog breeding habitat. Because the state of California considers bullfrog an invasive aquatic species, including surveys for bullfrog in the impoundment area to be included as a component of the aquatic invasive species management plan, and eradicating bullfrog from the impoundment should they become established, would ensure the project does not promote bullfrog competition with California red-legged frog.

Rugraw's proposed measures, including biological monitoring, providing environmental training to staff, and development of plans and BMPs following existing conservation guidelines, as recommended by Interior, would further reduce the likelihood of any effects on this species if later found on proposed project lands. Further, if Rugraw stops work and notifies FWS if any California red-legged frog are observed during preconstruction surveys, potential effects would be reduced.

In addition to bullfrog control measures, Interior 10(j) recommendation 8 calls for a plan that would include measures for the conservation of California red-legged frogs to provide for and allow California red-legged frogs to become reestablished,[52] and protection from manageable threats. While Rugraw states it would prepare such a plan, Interior does not describe what specific measures the plan would include or how Rugraw would provide for reestablishment. Because there is no evidence California red-legged frog currently occur in the project, there is no nexus for reestablishment measures. Therefore, we cannot analyze the benefits of this measure.

Because the California red-legged frog has not been documented on proposed project lands, and Rugraw has proposed environmental measures to protect the species if later found, the project would have no effect on the California red-legged frog.

[52] We interpret re-establishment to mean natural immigration from nearby populations and not reintroduction through restocking or transport of individuals to the project area.

Northern Spotted Owl

Proposed project lands contain only a minimal amount of marginally suitable habitat, consisting of several mixed conifer patches along Battle Creek. If present, potential construction effects on this species would be limited to temporary disturbances from noise and the presence of construction equipment and crews. If present on proposed project lands during project operation, potential effects on this species would be limited to effects associated with the proposed transmission line (collision and electrocution) (see discussion in *Transmission Line Effects on Birds*).

To minimize the potential effects of project construction and operation on the northern spotted owl, Rugraw proposes to implement the measures discussed above under terrestrial resources. These measures include design and construction of the transmission line consistent with APLIC standards, and preparation of an avian protection plan, as recommended by Interior in 10(j) recommendation 7.

Interior also recommends that Rugraw develop plans and BMPs for the conservation of listed species, following existing conservation guidelines and/or plans. Rugraw agrees to this recommendation.

Our Analysis

Because limited northern spotted owl habitat occurs in the project area, the project is not expected to directly affect the northern spotted owl. However, if present, the northern spotted owl could be disturbed by noise from equipment and crews during construction and maintenance activities.

Rugraw's proposed measures to conduct monitoring using onsite trained staff, provide environmental training to staff, and develop plans and BMPs following existing conservation guidelines, as Interior recommends, would reduce the likelihood of effects on this species during project construction, should it occur.

Operation of the transmission line would present a long-term collision hazard for the northern spotted owl. However, mortality from collision with the line or electrocution is unlikely because of the limited amount of suitable habitat for this species in the project vicinity. Design and construction of the transmission line and preparation of an avian protection plan, as Interior recommends under 10(j) recommendation 7, would further reduce the likelihood of effects on the northern spotted owl by minimizing collision and electrocution risk, if this species were to occur in the project area.

Based on the probable occurrence of this species on proposed project lands, and the proposed environmental measures that would protect the species if found, the project may affect, but is not likely to adversely affect, northern spotted owl.

Effects of Project Construction and Operation on Listed Fish Species

Because access to the proposed project reach of South Fork Battle Creek is blocked by downstream barriers, the proposed project would have no direct or indirect effects on Central Valley spring-run and Sacramento River winter-run Chinook salmon,

or Central Valley steelhead. No effects are expected during construction because construction would occur well upstream of their current accessible range and would be finished before the Battle Creek Salmon and Steelhead Restoration Project would attempt to extend this range. Project operations would also have no effect on Chinook salmon and steelhead because of their inability to currently access the project action area, and even if the Battle Creek Salmon and Steelhead Restoration Project is successful in removing downstream man-made barriers to fish migration, it is not known if fish would be successful in passing the downstream natural barrier to fish migration at Panther Grade. However, if these anadromous species are successful in reaching the project area, protection and enhancement measures recommended for any license issued would protect any fish reaching the project area.

Our Analysis

Potential effects of the proposed project on these federally listed fish species would be limited to effects on their designated critical habitat. Temporary construction actions and subsequent project operations have the potential to directly and indirectly affect designated Chinook salmon and steelhead critical habitat in the proposed project reach. For example, construction activities could affect critical habitat through temporary increases in turbidity, loss of food resources and habitat, degradation of water quality, construction debris, and disturbance and noise. Project operations could also affect critical habitat through an altered flow and water temperature regime in the proposed bypassed reach, which in turn could affect habitat quality and availability for spring-run Chinook salmon and steelhead. Because all water diverted by the proposed project would be returned to South Fork Battle Creek at the proposed powerhouse location, the proposed project is not expected to affect critical habitat downstream of the proposed project reach.

Tailrace construction is the only construction activity that would have the potential to affect critical habitat in the proposed project reach. Although there are project actions at the proposed intake area that could have immediate adverse effects on stream habitat near the intake, such as temporary increases in turbidity, these effects would likely be negligible by the time waters reach steelhead critical habitat located about 0.7 mile downstream of Angel Falls.

As proposed by Rugraw, all tailrace construction activities would be outside of the ordinary high water and in the dry. However, these activities could still result in increases in turbidity and suspended sediment in South Fork Battle Creek from upslope areas. As described in section 3.3.1.2, *Geology and Soil Resources, Environmental Effects*, implementation of an erosion and sediment control plan (and its associated BMPs) should minimize the amount of erosion and sedimentation resulting from project construction, and implementation of an SWPPP would minimize sediment releases and any elevation of the turbidity level that could result from construction disturbance. Additionally, any in-channel construction would occur within the designated work window or with an approved extension. As a result, no destruction or adverse

modification of existing critical habitat in the project action area would result from project construction.

Rugraw modeled the effects of its proposed 13-cfs minimum flow release on steelhead and spring-run Chinook carrying capacity and designated critical habitat found in the proposed bypassed reach. The results of this effort determined that proposed project operations, including a 13-cfs minimum flow release in the bypassed reach, would maintain adequate spawning habitat for steelhead spawners to fully seed the rearing habitat capacity of the bypassed reach for steelhead. Project operations would not divert water during the lowest flow periods that naturally restrict rearing capacity, so the proposed minimum flows would not affect the production potential of this steelhead DPS. Similarly, production of spring-run Chinook salmon is limited by low flows in September at which the time the project would not operate, so the prescribed minimum flows would not limit spring-run Chinook salmon spawning habitat. Minimum flows bypassed by the project would also supply more than enough suitable rearing habitat for any juvenile Chinook salmon that could be produced by the naturally limited spawning area available.

The proposed project would have little effect on stream temperature, because diversions would cease during the summer when flows decrease to below the prescribed minimum, typically in early July (see section 3.3.2.2). During May through October, stream temperatures on any given day are warmest at the top end of the reach and decrease as they pass downstream to the site of the powerhouse site because of increased stream-side shading and naturally cool groundwater inflows. Consequently, temperatures near the base of Panther Grade should remain well within the optimal range for native salmon and trout through the summer and not be adversely affected by proposed project operations.

If, in the future, anadromous salmonids are found to be present and successfully reproducing in the bypassed reach, Rugraw would implement a suite of monitoring and mitigation measures to offset any adverse operational effects on listed Chinook salmon and steelhead and their designated critical habitat. These monitoring and mitigation options are described in detail in section 3.3.2.2.

Central Valley Spring-run Chinook Salmon

Central Valley spring-run Chinook salmon do not currently have access to the project reach because of several downstream barriers. Because the species would not be present, the project would not directly or incidentally take, harm, or harass Chinook salmon; consequently, the proposed project would have no effect on Central Valley Chinook salmon. Because construction and operation of the proposed project may cause short-term increases in turbidity and alter the water temperature and flow regime in the proposed project's bypassed reach, the project may affect, but is not likely to adversely affect, designated critical habitat for Central Valley Chinook salmon.

Sacramento River Winter-run Chinook Salmon

Chinook salmon spawning is currently restricted to approximately 44 miles of the mainstem Sacramento River, immediately downstream of Keswick Dam. Because the species would not be present in the proposed project reach, the project would not directly or incidentally take, harm, or harass Chinook salmon; consequently, the proposed project would have no effect on Central Valley Chinook salmon.

Central Valley Steelhead

As is the case for Chinook salmon, steelhead currently do not have access to the proposed project reach because of several downstream barriers. Consequently, the proposed project would have no effect on Central Valley steelhead. Because construction and operation of the proposed project may cause short-term increases in turbidity and alter the water temperature and flow regime in the proposed project's bypassed reach, the proposed project may affect, but is not likely to adversely affect, designated critical habitat for Central Valley steelhead.

Essential Fish Habitat Analysis and Determination

EFH for Pacific salmon refers to those waters and substrate necessary for salmon production needed to support a long-term, sustainable salmon fishery and salmon contributions to a healthy ecosystem. To achieve that level of production, EFH must include all those streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon in Washington, Oregon, Idaho, and California (PFMC, 1999). In the estuarine and marine areas, Pacific salmon EFH extends from the near shore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (230.2 miles) offshore of Washington, Oregon, and California north of Point Conception (PFMC, 1999). Foreign waters off Canada, while still salmon habitat, are not included in the Pacific salmon EFH because they are outside United States jurisdiction. The Pacific Coast Salmon Plan covers Chinook salmon, coho salmon, Puget Sound pink salmon (odd-numbered years only), and any other ESA-listed salmonid species that is "measurably impacted" by Pacific Fishery Management Council fisheries (PFMC, 1999). The plan does not cover steelhead.

EFH guidelines published in the federal regulations identify Habitat Areas of Particular Concern as types or areas of habitat within EFH that are identified based on one or more of the following considerations:

- the importance of the ecological function provided by the habitat;
- the extent to which the habitat is sensitive to human-induced environmental degradation;
- whether, and to what extent, development activities are or would be stressing the habitat type; and

- the rarity of the habitat type.

EFH for Chinook salmon have been identified in the Upper Cow – Battle Creek HUC 18020118, which includes the proposed project reach.

We conclude that the proposed project would have only minor, short-term, adverse effects on Chinook salmon EFH. We also conclude that staff-recommended measures would improve EFH overall over the long term. With this draft EIS, we are providing NMFS with our EFH assessment and request that NMFS provide any EFH conservation recommendations.

3.3.5 Recreational Resources

3.3.5.1 Affected Environment

Regional Recreational Resources

Lassen National Forest is the closest recreational resource to the project area in Tehama County. The southwest entrance to Lassen Volcanic National Park is located in nearby Mineral. The county includes three wildlife areas (Battle Creek Wildlife area, Merrill's Landing Wildlife Area, and the Tehama Wildlife Area) and two ecological reserves (Butler Slough Ecological Reserve and Dales Lake Ecological Reserve). Both wildlife areas and ecological reserves offer opportunities for wildlife viewing, birdwatching, hunting, and hiking (California DFW, 2017a). Tehama County is also home to two state parks: the William B. Ide Adobe State Historic Park and the Woodson Bridge State Recreation Area (California Parks, 2017).

Existing Recreational Resources in the Proposed Project Area

There are no developed recreation sites or specific recreational land use designations within proposed project lands, or within one mile of proposed project facilities. There are interspersed U.S. Department of the Interior, Bureau of Land Management (BLM) parcels in the project vicinity, but these sites are not open to the public. The majority of proposed project lands is in private ownership with limited public access, with all access roads to SPI land gated and locked. No overnight camping or fires are allowed on SPI land. The timberlands are patrolled by SPI, and signage indicates that trespassers will be prosecuted.

The closest developed recreation site to the project site is Battle Creek Campground, about 1.5 miles upstream of the diversion dam site. Lassen National Forest operates the 50-unit campground. The public land fronting South Fork Battle Creek is limited to a few hundred feet at the campground; adjacent land upstream is closed to public use. Along South Fork Battle Creek, the closest sites commonly used for boating are about 2.5 miles downstream.

Recreational Use

There is no formal recreational use of proposed project lands. Outdoor recreation visitors may travel to nearby Lassen National Forest, Lassen Volcanic National Park, and BLM lands. Total visitation at nearby Lassen Volcanic National Park was 536,068 persons in 2016, with 85 percent of those visits occurring from June to October (National Park Service, 2017). Lassen National Forest, which also operates the nearby Battle Creek Campground, had an estimated 323,000 visitors in 2015; approximately 22 percent of those visitors stayed overnight, and 2 percent of those visitors traveled to remote wilderness areas (Forest Service, 2017a). The U.S. Department of Agriculture, Forest Service's (Forest Service) information page for Battle Creek Campground reports that the campground has heavy usage with 50 designated sites and a maximum of 8 people per site (Forest Service, 2017b).

River Recreation

Whitewater rafting 2.5 miles downstream of the project site is a moderately popular recreational activity. That stretch of South Fork Battle Creek is 11.5 miles long and is rated as a class II-V (V+) section by American Whitewater.[53]

South Fork Battle Creek is stocked with hatchery trout at the intersection of South Fork and Cold Creek, located immediately upstream of the proposed diversion dam site. The area is described as a mix of forest and meadow, with primitive camping available (California DFW, 2017b).

3.3.5.2 Environmental Effects

Limited to no public recreation use occurs on proposed project lands. However, during periods of project construction, travelers going to nearby recreation sites may be temporarily impacted by increases in traffic along State Route 36, and other local roads used to access the project site. The increase in traffic would be caused by construction vehicle travel to the site, and the seasonal increase of recreation travelers going to the Battle Creek Campground, or other destinations in Lassen National Forest, and private recreational sites upstream of the project site. Project operation would regulate streamflow in the 2.4-mile-long bypassed reach between the proposed diversion dam and

[53] The American Whitewater Scale of River Difficulty: Class I, Easy: Fast moving water with riffles and small waves; Class II, Novice: Straightforward rapids with wide, clear channels that are evident without scouting; Class III, Intermediate: Rapids with moderate, irregular waves that may be difficult to avoid and that 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 boater to added risk; Class VI, Extreme and Exploratory: These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

powerhouse, which could affect any angler usage of that reach, although Rugraw proposes a minimum flow to protect aquatic habitat and fisheries in the reach. Rugraw has not proposed, nor have any other entities recommended, specific measures for protection or enhancement of recreational use.

Our Analysis

Traffic effects would be minor and would not affect other aspects of the traveler's recreational experience at a final destination. Water withdrawals for power generation would have minor effects on any private recreation (anglers) that may occur in the bypassed reach, which would also be provided with a minimum flow when the project is operating. However, the project would not typically operate from July through September each year (depending on actual rainfall), so would not affect recreation during the peak season for the recreational uses common in the project vicinity. There may be minor, negative recreational effects related to disturbances to river recreation at the intersection of South Fork Battle Creek and Cold Creek, which is regularly stocked with hatchery trout. However, if California DFW determines that the stocking location is adversely affected by the project, another stocking location could be chosen to avoid those effects.

The whitewater rafting reach located downstream of the project site should not be affected by construction or operation of the project. While construction activities could result in increases in turbidity in the South Fork, proposed erosion control measures would prevent any higher turbidity levels from extending further downstream from the immediate project site. Project operation should not affect the downstream boating reach because all diverted flows would be returned to the South Fork at the powerhouse. Although some flow fluctuations could occur at the powerhouse during startup and shutdowns, those fluctuations would be short-term and minor and should not be evident well downstream of the powerhouse.

To investigate the potential for whitewater boating, and any effects of the project on that boating, Rugraw organized a site visit in 1999 with representatives of local recreational organizations, FERC, SPI, and California DFW. During this site visit, all parties agreed the opportunities for whitewater rafting were marginal at best in the immediate project area. Hazardous conditions, including insufficient water flow and the lack of public access, were the primary reasons for the lack of whitewater rafting opportunities. Rugraw subsequently conducted a feasibility study of whitewater rafting in the project reach (Dimick, 1999), which concluded that this reach seldom has sufficient water for whitewater kayaking, and is potentially only navigable by an expert kayaker capable of running "extreme whitewater" around log jams, boulder sieves, and braided channels. In response to a request from the Water Board, Rugraw submitted the whitewater boating study to American Whitewater and Shasta Paddlers on July 19, 2001, with a request for any questions or comments. No comments were received from either group. There is limited potential for whitewater boating in the project reach under current conditions, so the proposed project would have no effect on boating.

3.3.6 Land Use and Aesthetics

3.3.6.1 Affected Environment

Regional Land Use

Proposed project lands are entirely within Tehama County, California. Land use in the county is guided by the Tehama County General Plan 2008-2028, adopted on March 31, 2009. Within proposed project lands, land use is mostly designated as Timber, with smaller areas of Resource Lands, Upland Agriculture, and Public.

Land Use within the Proposed Project Boundary

Land uses near the project site are predominantly forestry, rural development, and open space. Within proposed project lands, land cover is mostly forested or shrub/scrub vegetation, with some areas of grassland, developed open space, and low and medium intensity development. Table 3-10 in section 3.3.3.1, *Terrestrial Resources*, *Vegetation*, provides land cover by acres. Rugraw has recorded long-term and/or Grant Deed easements for project facilities on approximately 0.4 percent (82 acres) in the project vicinity. Principal landowners in the immediate vicinity of the project are as follows:

- **SPI**: In 1993, SPI bought much of the land of Diamond International Corporation, totaling approximately 233,000 acres within the region. This property is broken down into the northern and the southern tracts. The project site lies roughly in the center of the northern tract, which comprises approximately 70,000 acres.
- **Richard Montarbo**: In 1997, Richard Montarbo purchased approximately 600 acres in Sections 23 and 14 from Rugraw. Rugraw formerly used the southern portion of this land, nearest State Route 36, for cabin rentals (Lassen Lodge). This area is zoned R1-B(86) which permits development of single-family residential units on lots no smaller than 86,000 square feet (approximately 2 acres). The remainder of the property (Section 23 and the southwest quarter of Section 14) is designated Public and Resources Lands.
- **BLM**: BLM has jurisdiction and manages a portion of lands, approximately 181 acres, in Sections 19 and 20 (R2E, TS28N) classified "Vacant Public Domain" land and manages this land for multiple uses. This land is situated on the north side of South Fork Battle Creek, and, because of the steep terrain and limited access, is used as open space. BLM has determined this parcel is available for disposal due primarily to its inaccessibility. No proposed project facilities cross BLM-managed lands.

The Forest Service also manages a small portion adjacent to the project boundary, which is part of Lassen National Forest. Most of the National Forest property is located to the east of the project boundary at a distance of about 0.5 to 0.75 mile from the closest proposed project facility. One small National Forest parcel (37 acres) is located within

25 feet to the north of the proposed transmission line where the route crosses Ponderosa Way. This parcel does not appear to have any specific management prescription under the existing Lassen Forest Plan, and an existing road, Ponderosa Way, crosses the property. The majority of the Forest Service land in the area is managed for multiple uses under a General Forest Zone designation. These uses include timber harvesting; fish and wildlife habitat; watershed protection; and recreational activities such as camping, hiking, and fishing.

Aesthetic Resources

The visual setting of the project vicinity is characterized by the geologic features of South Fork Battle Creek. The drainage topography is a combination of steep canyon walls and inner canyon volcanic deposits incised by South Fork Battle Creek. The project site is adjacent and immediately downstream of Cold Creek Butte, a volcanic feature that provides a visual backdrop on the eastern end of the project site.

The overall project vicinity can be characterized by five distinct landscape types as follows:

- **South-Facing Slopes**: These are typified by a varied vegetative mosaic composed of isolated groupings of montane forest habitats associated with side drainages entering South Fork Battle Creek from the north. Inclusions of chaparral, talus, and rock outcrop are also observable on these slopes, which are generally light in color, with gray/green vegetation and red/brown geology and soils. The visual texture is predominantly rounded, low-profile forms, punctuated by isolated conical forms of individual and clumps of trees. Views and vistas are generally unobstructed.
- **Coniferous North-Facing Slopes**: These slopes are characterized by relatively dense and homogenous vegetative cover. Timber management activities, including harvesting and road construction, have increased the number of openings, thereby providing numerous inclusions that offer vegetative diversity. This slope also contains a utility corridor and State Route 36 on the southern edge of the project vicinity. These slopes are predominantly green, with red/brown soils in areas associated with roads and timber management activities. The visual texture is uniform, at the stand level. Timber management activities provide variation in size and density throughout, and views and vistas may be limited, except in areas where timber management activities and established uses (roads, utilities) have resulted in large, continuous openings in the canopy.
- **Mixed Woodland North-Facing Valley Slopes**: These slopes consist of dense cover of low growing chaparral species, punctuated by taller hardwood and conifer species. To a lesser extent, timber management

activities have occurred in this type of landscape, particularly in the form of roads and skid trails constructed to access conifer stands. These slopes vary between blue and green, depending on the type and density of vegetation. Soils and rock outcrops are typically various shades of red and brown. The visual texture has a high degree of diversity in shape and form, with the interaction of vegetation of geologic features and vegetation. The views and vistas are highly variable, particularly in areas where timber management activities have occurred.

- **Creek Floodplain**: This area is composed of relatively gentle slopes, a colluvial stream channel, localized alluvial deposits, and riparian vegetation. This landscape has elements of riparian and upland vegetation, including chaparral, hardwoods, and conifers. It also has flowing water and localized aquatic vegetation that contributes to the character of the landscape. Anthropogenic activities, including the old abandoned Highway 36 corridor, and timber management activities, have contributed to its character. Features such as bridges and abutments, paved roads, and are superimposed on the natural features of the landscape. This landscape has a wide range of colors, ranging from the blue-green water features to the black remnants of the old highway. The visual texture is highly diverse, and includes the sinuous feature of the creek and the distinct lines of roads and bridges. The views and vistas are largely dependent on the level of anthropogenic activity occurring in a specific area.
- **Creek Canyon and Gorge**: This landscape is characterized by cliff walls and outcrops of exposed basaltic lava flows, waterfalls and cascades, large boulders and intermittent vegetation (riparian and upland). The landscape is highly diverse in association with the topographic features of volcanic terrain. Although numerous roads and trails have been constructed on or adjacent to the rim of the gorge, little evidence of anthropogenic activity is observable below the rim. Colors within this landscape are a contrast of dark grey/brown rock, green vegetation, and the colors of water. The visual texture is dominated by canyon walls, with vegetation and channel features. The inner gorge with vertical walls in excess of 100 feet combined with the sinuous stream channel severely constrains views and vistas below the rim.

3.3.6.2 Environmental Effects

Land Use

The project would be located on land owned or managed by SPI, Tehama County, and other private landowners. Rugraw has long-term or Grant Deed easements on the property where project facilities would be located, shown by landowner (east to west) in

table 3-11 for a total of 92.28 affected acres. The project is not expected to affect land uses upstream of the diversion dam along South Fork Battle Creek or downstream from the powerhouse site. The 45-foot ROW required for the transmission line, pipeline, and penstock ROW would require vegetation management to ensure safe operation and reliability of the project. This ROW would not be eligible for reforestation in the future.

Table 3-11. Lassen Lodge Hydroelectric Project estimated easement acreage (Source: Rugraw, 2015).

Owner	Distance (feet)	Easement Width (feet)	Project Element(s)	Acres
Sierra Pacific	61,000	45	Diversion, Penstock, Powerhouse/ Substation, 60-kV Transmission Line, 12-kV Station Service Line	63.00
Richard Montarbo	4,000	45	Transmission Line	4.13
Mark Winning	170	45	Transmission Line	0.18
PG&E	5,280	45	Transmission Line	5.45
Lee et al.	9,000	45	Transmission Line	9.30
George Hrycenko	4,500	45	Transmission Line	4.65
Tehama County	7,400	20	Transmission Line	3.40
Patricia Grag	2,100	45	Transmission Line, Switchyard	2.17
Total				92.28

The proposed new 60-kV transmission line would come within 300 feet of several rural homes and other buildings at the western end of the project site. However, in these locations the line generally parallels the existing roadways, and it should not pose a significant change to the rural land use setting.

The transmission line route would not represent a significant conflict with the Timber, Resource Lands, and Upland Agriculture designations; however, a County Land Use Permit would be required. Rugraw is in discussion with the County and is updating the land use permit application to meet all current information requests.

To avoid and minimize effects on land use, Rugraw proposes to implement the following measures:

- Delineate roads and work areas prior to the start of construction, and restrict project activities to those designated areas;

- Use existing roads to the maximum possible extent, constructing new access roads only when no feasible alternative exists;
- Limit access roads to a one-lane width of 12 feet whenever possible;
- Restore vegetation directly removed or disturbed during project construction as appropriate in accordance with California forestry regulations and best practices;
- Consult with neighboring landowners prior to construction and maintain an ongoing public contact to address any questions and concerns.

Our Analysis

As described previously in section 3.3.3.2 of this draft EIS, project construction would result in the permanent removal of 68.79 acres of vegetation and temporary disturbance of an additional 11.37 acres. Although some permanent removal of vegetation for the construction of project facilities is unavoidable, Rugraw's proposals to limit ground disturbance and removal of vegetation, and to clearly delineate work area boundaries, would minimize permanent effects. Rugraw's proposal to map and quantify disturbances by vegetation type would provide a baseline for establishing targeted restoration goals and facilitate successful restoration of vegetation in areas of temporary disturbance.

Rugraw's proposal to use existing roads to the maximum possible extent, constructing new access roads only when no feasible alternative exists, as well as limiting access roads to a one-lane width of 12 feet whenever possible, would mitigate effects on land use within the project area. Maintaining ongoing public contact with neighboring landowners would minimize long-term effects on land use in the project area.

If Rugraw applies each of the mitigation measures indicated above, no significant long-term effects on land use are anticipated. However, as stated above, a County Land Use Permit would be required.

Aesthetics

Construction activities would be evident to the public, and construction equipment would be present along Manton School and Hazen Roads. Construction effects would only likely occur in the span of a few months during the spring. Some portions of the transmission line would have the poles and conductors installed by helicopter, which would result in less visual effect because there would be less landscape disruption during the construction phase.

Access roads would be used by maintenance crews and vehicles for inspection and maintenance activities of project facilities and the transmission line. Visual effects would result from inspection and maintenance activities producing traffic and dust on access roads; however, these effects would be temporary and minor.

The 60-kV powerline would have only a slight visual effect in the regional setting. Although some specific static viewpoints would have high visibility, the overall alignment would only affect about 1.5 miles of publicly accessible roadway views.

Rugraw has incorporated project-wide visual mitigation measures into the project design to help mitigate the visual contrast of the powerline in the landscape:

- All paint or discoloring agents applied to rocks or vegetation prior to or during construction activities that indicate limits of survey or construction activity would be removed upon completion of construction activities.
- To reduce visual contrast in areas where over-story vegetation is removed for access, pole locations, or conductor clearance, specific sections of the clearing edges would be feathered (trees thinned/removed from the edge of the ROW out or away from the ROW boundary) to give a natural appearance, where not in conflict with regulatory requirements (e.g., NERC, Western Electricity Coordinating Council, and Occupational Safety and Health Administration requirements).
- Wood poles would be used to support the transmission line to blend with surrounding vegetation and reduce contrast.
- Helicopter construction in specific areas would reduce effects on the ground surface.

Our Analysis

Short-term visual and noise effects would be caused by heavy equipment clearing and excavating land, and by construction of each project facility and feature. Although using helicopters to aid construction in specific areas would reduce effects on the ground surface, and removing all paint or discoloring agents used prior to or during construction would also limit adverse effects on aesthetics, short-term effects on aesthetics would still occur.

Overall, because proposed project lands are composed of natural forested landscapes with few visible structures, new project-related structures would affect the natural scenery. The typical viewer groups associated with the project would be residential and recreational users and motorists. Manton, a small town with a population of 423, is the closest developed community adjacent to the project site and is approximately 0.7 mile from the proposed project transmission line. The residents of Manton, most of whom are located on the western portion of the project site, would be the most affected viewer group by the visual disturbance because they are the only residents near, and closest to, the transmission line. The town of Mineral would be closest to the eastern part of the project site at the diversion dam, but proposed project facilities would not be visible to residents because the project site is within a deeply incised valley.

The transmission line on the western portion of the project site would be visible adjacent to the roadway for a distance of about 1.5 miles on Manton School and Hazen Roads. The new transmission line would be located on the north side of Hazen Road and the west side of Manton School Road. There currently is an existing wood pole line on the east side of Manton School Road.

Other motorists viewing the transmission line may be drivers or passengers using State Route 36. These users are commuters, local road users, or tourists. Tourists are generally more aware of overall appearance from the road, whereas local residents traveling the same routes frequently may be acclimated to the general view, but are more likely to be aware of visual changes. Regardless of the type of highway user, views are usually of short duration, with less foreground emphasis.

Implementation of other mitigation measures (feathering the clearing edges to reduce visual effects, and using wood poles to support the transmission lines to blend in with the surrounding vegetation) would further reduce effects on aesthetics from project operation. However, project components, primarily the transmission line, would still be visible to residents, recreational users, and motorists. Although long-term effects on aesthetics are anticipated, they are not expected to be significant because of the distance they would be from commuter roads and the town of Manton and its residents.

3.3.7 Cultural Resources

3.3.7.1 Affected Environment

Section 106 of the National Historic Preservation Act

Section 106 of the NHPA 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 if any adverse effects on historic properties are identified within the project's APE.

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 this document, we also use the term "cultural resources" to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources 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. TCPs are a type of historic property eligible for the National Register because of their association with cultural practices or beliefs of a living community that: (1) are rooted in that community's history; or (2) are important in maintaining the continuing cultural identity of the community (Parker and King, 1998).

Section 106 also requires that the Commission seek concurrence with the California State Historic Preservation Officer (California SHPO) on any finding involving effects or no effects on historic properties. If TCPs 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.

If existing or potential adverse effects have been identified on historic properties, Rugraw must develop an HPMP to seek to avoid, reduce, or mitigate the effects. Potential adverse effects that may be associated with a hydroelectric project include any project-related effects associated with project construction and the day-to-day operations and maintenance of the project after issuance of a license.

By letter dated May 8, 2013, the Commission designated Rugraw as the Commission's nonfederal representative for carrying out day-to-day consultation in regards to the proposed project licensing effort pursuant to section 106 of the NHPA; however, the Commission remains ultimately responsible for all findings and determinations regarding the effects of the project on any historic property, pursuant to section 106.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of an original license within a project's APE. The APE, which is determined in consultation with the California SHPO, is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE for the proposed project includes land within the proposed project boundary, plus land outside the project boundary where project operations may affect the character or use of historic properties or TCPs.

Rugraw defined an initial APE for the proposed project in a letter sent to the California SHPO on June 23, 2013. In its letter, Rugraw requested the SHPO's concurrence with the APE boundaries. In a subsequent letter to the California SHPO filed on September 3, 2013, Rugraw requested concurrence on a revised APE (letter from J. Tompkins, Vice-President – Senior Project Manager, Rugraw, Inc., Redding, CA, to J. Tudor, Associate State Archaeologist, California Office of Historic Preservation, Sacramento, CA, dated August 29, 2013). In a response filed on December 18, 2013, the California SHPO stated that it did not object with this definition of the APE (letter from C. Roland-Nawi, SHPO, Office of Historic Preservation, Department of Parks and Recreation, Sacramento, CA, to J. Tomkins, Vice-President-Senior Project Manager, Rugraw, Inc., Tiburon, CA, dated October 3, 2013).

Rugraw subsequently revised the project APE and its application defines both a direct and "vertical APE" for the proposed project. The direct APE has the following elements:

- Diversions and intake structure: 2 acres
- Powerhouse: 3.5 acres
- Transition structure: 1 acre
- Multipurpose areas: 3.2 acres
- 120 foot-long by 2.4 mile-long penstock pipeline
- Potential tower location: 2.9 acres
- 120 foot-wide by 12 mile-long transmission line
- 120-foot-long by 0.4-mile-long station service line
- Transmission line pulling areas

The direct APE also includes the entire boundary of archaeological sites within the proposed areas of direct impact. The vertical APE extends about 0 to 60 feet above and 1 to 20 feet below the ground surface (depending on the height and depth of project facilities).

In a letter to Rugraw filed on November 30, 2015, the California SHPO acknowledged this definition of the revised APE (letter from C. Roland-Nawi, SHPO, Office of Historic Preservation, Department of Parks and Recreation, Sacramento, CA, to J. Tomkins, Vice-President-Senior Project Manager, Rugraw, Inc., Tiburon, CA, dated April 1, 2014).

Because licensing of a hydroelectric project is a single section 106 undertaking, the Commission recognizes a single APE that would encompass land both directly and indirectly affected by the proposed project (FERC, 2016).[54] This single APE for the proposed project would include both the direct and vertical APEs.

Cultural History Overview

The following summary is modified from Rugraw's cultural resources report (Tetra Tech, 2015c).

Prehistoric Background

The prehistory of the southern Cascade foothills has been structured into a five-phase cultural sequence based on previous archaeological investigations. The Deadman Complex (4,500 Before Present [BP] – 3,000 BP) represents the earliest identified cultural complex, followed by the Kingsley Complex (3,000 – 1,500 BP), the Dry Creek Complex (1,500 – 500 BP), the Mill Creek Complex (AD 1,500 – 1845), and the Proto-

[54] See discussion of APEs in FERC (2016, page 123).

Historic Period (AD 1845 – 1911; Ethnographic Yana). Each complex is primarily characterized by changes stone tool and other technologies. Over time, large-sized projectile points, such as those typical of the Deadman Complex, decreased in size as populations began to favor smaller points associated with bow and arrow technology and the hunting of smaller game. Changes in ground stone tools also reflect the processing of differing plant resources. The appearance of hopper mortars at archaeological sites associated with the Dry Creek Complex suggests that the processing of acorns at this time became increasingly important. Twined cordage and twined and coiled basketry, first associated with the Mill Creek Complex, also indicates the increased importance of resource storage. A complex trade network associated with all five complexes is indicated in the archaeological record by the recovery of large coastal *Haliotis* and *Olivella* shell beads. However, other bead materials vary over time and ornamental artifacts became more distinctive. Finally, sites typical of the early Deadman Complex have been identified in both open-air and rock shelter settings. While evidence of single- and multi-family residential dwellings are found at Kingsley Complex sites, large earth-covered ceremonial or communal structures are typical of Mill Creek Complex sites.

The Proto-Historic Period represents the time of historic contact with indigenous populations. Artifacts associated with this time period include tools and artifacts manufactured from Euro-American glass and metal refuse Euro-American trade goods such as glass and porcelain beads may also be found at Proto-Historic Period archaeological sites. Typical structures at this time include small pole-frame structures covered with brush, branches, animal skins, or other materials. Natural rock shelters and caves were also used.

Ethnography

The proposed project area is located within the ethnographic territory of the Hokan-speaking Yana and Yahi. The Southern Yana inhabited the land in the vicinity of the proposed Project and resided in village and campsites situated along foothill and mountain drainages. Yana and Yahi subsistence strategies included hunting deer and other game, salmon fishing, and the gathering of local plant resources including bulbs, greens, seeds, and pine nuts. Acorns were a main dietary staple and were collected and processed for immediate consumption or for long-term storage.

Domestic implements included baskets, cordage and ropes fashioned from plant materials, hopper mortars, unifacially used manos and slabs, and boulder metates, mahogany digging sticks, and juniper, hazel and mahogany bows. Bone and antler was used to manufacture a variety of tools and ornaments including wedges, awls, flakers, fish gorges and hooks, harpoon toggles, needles, beads, and bird bone whistles. Gaming pieces were often fashioned from incised rodent teeth. Lithic materials procured for stone tool manufacture consisted primarily of basalt, and andesite, but chalcedony, petrified wood, and obsidian were also used. Trade with neighboring tribes occurred for some of these raw materials although relations between tribal groups varied.

Much of the ethnographic information on the Yana and Yahi was provided by Ishi (1861-1916), who was made world famous by the anthropologist Alfred Kroeber. Ishi was considered, at the time, to be the last known Yana/Yahi survivor in California, living most of his life with his immediate family in the isolated foothills around Lassen Peak. After more than 40 years on the run and in hiding, and after losing all of his family members through violence and disease, Ishi was finally captured alone in 1911 on the outskirts of Oroville. When discovered, Ishi was about 50 years old, and for the next 5 years he collaborated with anthropologists at the University of California, becoming a valued research assistant and contributor of first-hand pre-contact knowledge unequaled in annals of American anthropology.

Historic Background

The earliest non-native exploration of the project area occurred in the 1830s by beaver trappers and fur traders. Ranching, logging, and agricultural pursuits were the primary economic endeavors in Tehama County during the late 1840s. Sawmills were established on Paynes Creek and Digger Creek in the late 1850s followed by homesteads and ranches in the 1860s. By 1870, the community of Paynes Creek was established about 11 miles east of the project APE, and by the late 1800s the settlement of Manton was established on Digger Creek. Between 1876 and 1907, the Sierra Flume and Lumber Company and the Sierra Lumber Company, which operated between 1875 and 1878 constructed several saw mills, lumber yards, and factories to process harvested timber. One of the important mills constructed by the Sierra Flume and Lumber Company was the New Champion Mill, built in 1876. Segments of the Last Chance Ditch (CA-TEH-1824H) may be associated with the New Champion Mill and pass through the project APE. Another important timber company in the area was the Blue Ridge Flume and Lumber Company, constructed in 1872. This company held 44 miles of flume that carried lumber from mills in the Manton area to the Sacramento River. The Blue Ridge Flume and Lumber Company was later purchased by the Sierra Flume and Lumber Company. In 1878, the Sierra Flume and Lumber Company was purchased by the Sierra Lumber Company, which in 1902 established the important Diamond Match Company.

A number of trails and roads were constructed in the area to support the lumber industry. One of these roads, State Route 36, was extended in 1913 to follow the alignment of the Old Country Wagon Road. In 1921, it was paved and currently passes by Lassen Lodge at Paynes Creek (CA-TEH-2500H). Over the years, the highway alignment shifted. Since its completion in 1937, it has seen a number of improvements. A former segment of the highway (CA-TEH-2499H) passes through the project APE.

A second important road in the region was Ponderosa Way (P-52-002474), also known as the Ponderosa Fire Break and Truck Trail. In the 1930s the Civilian Conservation Corps established camps in the Manton and Paynes Creek areas to house workers participating in federally funded forestry efforts. Ponderosa Way was constructed by the Civilian Conservation Corps as part of a 1929 CAL FIRE plan to

create a continuous firebreak to protect National Forest land along the western edge of the Sierra Nevada. This road also passes through the project APE.

These roads opened the region to tourism and a number of wagon stops arose in the 1910s and 1920s. Some of the wagon stops provided lodging, summer cabins, postal services, merchandise, fuel, and other amenities to travelers passing through on their way to Lassen National Volcanic Park. Lassen Lodge (CA-TEH-2500H) is one such location. Some grew into small towns and communities and became vacation destinations.

Previous Cultural Resources Investigations

Prior to conducting cultural resources fieldwork for the proposed project, Rugraw conducted background archival research at the Northeast Information Center of the California Historical Resource Information System at California State University, Chico. This work included the review of current survey databases, overviews, site records, and information about documented cultural resources, landscapes, and ethnographic resources. Historic maps and historic aerial photographs that could assist in identification of historic roads, features, and other areas of potential significance were also reviewed. Finally, a number of historic land patents were also identified during the record search. These patents may provide additional historical information about property ownership and land use which could shed light on documented historic sites in the project area.

The records search indicated that 24 archaeological surveys have been previously conducted within or crossing about 45 percent of the project APE (Tetra Tech, 2014). These surveys were deemed inadequate for current purposes because they were conducted more than 7 years prior and did not meet current standards for archaeological investigations in the State of California.

The previous studies documented 17 archaeological resources within one mile of the current project APE; of these, six were identified within the project APE, including two prehistoric sites (CA-TEH-595, CA-TEH-1490), one multi-component site (CA-TEH-1358/H), and three historic-period sites (CA-TEH-1824H, CA-TEH-2041H, CA-TEH-2113H,). Additionally, the record search indicated that eight buildings, structures, and objects have been previously recorded within one mile of the project APE. None of these were identified within the project APE; however, an unrecorded segment of a documented historic road (P-52-002474, Ponderosa Way) was later found to be within the APE and was recorded during fieldwork for the current project.

A review of ethnographic literature and consultation with the California Native American Heritage Commission (NAHC) did not result in the identification of any known TCPs or sacred sites within the project APE. However, NAHC provided Rugraw with a list of Native American organizations and individuals who could have interests in the project study area.

Identified Resources

Prehistoric and Historic Archaeological Resources

Rugraw conducted an archaeological survey of all accessible land within the project APE in August 2013 and January 2014. The results of the studies are provided in *Cultural Resources Inventory: Lassen Lodge Hydroelectric Project, FERC License No. 12486, Tehema County, California* (Tetra Tech, 2014, amended 2015c). A total of 299.9 acres was surveyed and 11 archaeological sites were identified consisting of four prehistoric sites and seven historic-period sites (table 3-12). These include the six previously recorded sites and five newly documented sites. A total of six isolated finds were also observed (four historic finds and one prehistoric find).

Table 3-12. Prehistoric and historic archaeological resources within or adjacent to the Lassen Lodge Project APE (Source: Tetra Tech, 2015c).

Resource Number	Description	National Register Eligibility
CA-TEH-595	Recorded in 1962 as a prehistoric "village site;" 3 flakes were observed in 1982 and site was described as destroyed. No cultural materials observed during current survey.	Unknown
CA-THE-1358/H	Multicomponent site; lithic and groundstone scatter; tools, midden, potential burials. Historic refuse scatter, two ditches	Unevaluated, assumed eligible
CA-TEH-1490	Prehistoric lithic scatter, tools, groundstone	Unevaluated, assumed eligible
CA-TEH-1824H	Segment of historic Last Chance Ditch (water conveyance, circa 1901)	Ineligible
CA-TEH-2041H	Historic saw mill remains and associated features and refuse	Ineligible
CA-TEH-2113H	Historic cans and glass refuse scatter	Ineligible
CA-TEH-2495	Prehistoric obsidian and basalt lithic scatter	Unevaluated; assumed eligible
CA-TEH-2496H	Historic refuse scatter: cans, nails, stove fragments, white improved earthenware, glass	Ineligible

Resource Number	Description	National Register Eligibility
CA-TEH-2497	Prehistoric obsidian and basalt lithic scatter	Unevaluated; assumed eligible
CA-TEH-2498H	Historic can scatter	Ineligible
CA-TEH-2520H	Historic refuse scatter: cans, white improved earthenware	Ineligible

Rugraw recommended that all historic-period archaeological sites were ineligible for listing on the National Register (Tetra Tech, 2014). Prehistoric site CA-TEH-595 was initially recorded in 1962 and described as a "destroyed" prehistoric village site (Treganza, 1962, as cited by Tetra Tech, 2014). The site was visited again in 1982 (Chavez and Hupman, 1983, as cited by Tetra Tech, 2014). At that time, only three flakes were observed. No artifacts were observed during fieldwork undertaken for the current project. This site has not been formally evaluated for listing on the National Register. The remaining four prehistoric sites or sites with prehistoric components (CA-THE-1358/H, CA-TEH-1490, CA-TEH-2495, CA-TEH-2497) have also not been evaluated for listing of the National Register. However, in its cultural resources report (Tetra Tech, 2014), Rugraw stated that these sites will be assumed to be eligible for listing under National Register Criterion D for their potential to provide information important to understanding prehistory. Isolated finds are generally not eligible for listing on the National Register. By letter dated April 2, 2014, the California SHPO concurred with all of Rugraw's eligibility recommendations for archaeological resources identified within the project APE.

Architectural Resources (Buildings, Structures, and Objects)

Rugraw conducted an architectural inventory of architectural resources (buildings, structures, and objects) of land within the project APE (Tetra Tech, 2014). This study identified one previously recorded feature (P-52-002474, historic Ponderosa Way) and seven new resources (table 3-13). All are historic roads or road segments except for a former wagon stop now known as Lassen Lodge (CA-TEH-2500H). Lassen Lodge consists of a series of structures, including a gas station, a lodge and three cabins, and other structures. Rugraw did not have property owner permission to access the lodge property. According to Rugraw (2015b), on October 7, 2013, the California SHPO agreed that, for the purposes of the current project recordation and evaluation, only those features visible from the State Route 36 public ROW would suffice (personal communication from K. Forest, State Historian II, Office of Historic Preservation, Sacramento, CA, with J. Mates, Tetra Tech, Seattle, WA, October 7, 2013. Not filed).

Table 3-13. Architectural resources (buildings, structures, objects) within or adjacent to the Lassen Lodge Project APE (Source: Tetra Tech, 2015c).

Resource Number	Description	National Register Eligibility
CA-TEH-2499H	Former segment of State Route 36 (SPO Road 120 A 7)	Eligible
CA-TEH-2500H	Lassen Lodge	Ineligible
CA-TEH-2501H	South Powerhouse Road	Ineligible
CA-TEH-2502H	Manton School Road	Ineligible
CA-TEH-2503H	Hazen Road	Ineligible
CA-TEH-2504H	Unnamed dirt road	Ineligible
CA-THE-20505H	Unnamed dirt road	Ineligible
P-25-002474	Ponderosa Way (historic road)	Eligible

Rugraw recommended that only CA-TEH-2499H (former segment of State Route 36) and P-25-002474 (Ponderosa Way) would be eligible for listing on the National Register (Tetra Tech, 2014). As mentioned above, State Route 36 was originally constructed in the 1860s as an unpaved wagon road; in the 20th century, the portion of the road in the project area was constructed and paved allowing for the development of local resort businesses and transportation of agricultural products. Ponderosa Way was crucial for the protection of timber land threatened by wildfires. In its cultural resources report, Rugraw recommended that both roads no longer contain information potential, but they are both eligible for listing on the National Register under National Register criterion A for their association with events significant to local history. All six other architectural resources were recommended as ineligible for listing. In its April 1, 2014, letter, the California SHPO concurred with these recommendations. The SHPO also agreed that Rugraw had provided sufficient justification that the entire landscape surrounding the Lassen Lodge (CA-TEH-2500H) including the valley below the lodge do not contribute to the potential National Register eligibility of the lodge itself.

Traditional Cultural Properties

NAHC was contacted on October 31, 2007, to determine if the agency was aware of any sacred land in the vicinity of the proposed project (Tetra Tech, 2015c). As mentioned previously, NAHC had no knowledge of sacred sites in the area but provided Rugraw's cultural resources consultant with a list of Native American contacts. Letters were sent to these individuals and organizations in November 2007; these letters were followed up with phone calls. No comments were received. NAHC was contacted a second time in December 2012 to request an updated search of the sacred lands file and an updated list

of Native American contacts. Although NAHC again responded that it was not aware of any sacred sites within the project area, the list of Native American contacts had expanded. The individuals and organizations on the list were contacted on April 30, 2013, and asked to provide any information they might have regarding potential Native American resources within the study area. A response was received from a representative of the Redding Rancheria who delegated consultation to a representative of the Maidu-Pit River-Atsugewi. Rugraw's cultural resources contractor invited this representative to attend field trips to the project area. These trips occurred on October 22, 2013, and December 2, 2013. Several of the archaeological sites within the project APE were visited. The attending tribal representative stated that the entire area is highly sensitive for prehistoric resources but that she was not aware of any ethnographic or sacred sites within the project APE.

No other Native American organizations or individuals provided information related to ethnographic sites or TCPS in the vicinity of the proposed project.

3.3.7.2 Environmental Effects

Project-related Effects on Cultural Resources

Project-related effects on cultural resources within the APE are likely to occur from project construction, operation and maintenance, use and maintenance of project roads, recreation, vandalism, and mitigation measures associated with other project environmental resources. Project effects are considered to be adverse when an activity may alter, directly or indirectly, the characteristics of a historic property that qualify the property for inclusion in the National Register. If adverse effects are found, consultation with the California SHPO and other parties would be required to develop alternatives or modifications to avoid, minimize, or mitigate such adverse effects.

Rugraw has identified project effects on eligible or unevaluated resources that may occur as a result of project construction, maintenance, and operation (Rugraw 2015a, 2015b). In the short term, construction activities associated with the proposed project may result in direct impacts on archaeological sites and historic structures in the project APE. Over the license term, other activities such as road maintenance and use could also affect these resources.

Prehistoric and Historic Archaeological and Architectural Resources

Within the project APE, the California SHPO determined that six historic-era archaeological sites and six architectural resources are ineligible for listing on the National Register. Under section 106, no further assessment of effects or continued management of these resources is required.

Five of the archaeological sites are prehistoric in nature. One of these sites (CA-TEH-595) is likely to have been destroyed by prior activities, and Rugraw stated that there likely would be no effects on the site from project-related activity (Tetra Tech,

2014). In its April 1, 2014, letter, the California SHPO concurred. The four remaining sites were not evaluated for listing on the National Register but are assumed to be eligible (CA-TEH-1358/H, CA-TEH-1490, CA-TEH-2495, and CA-TEH-2497).

Site CA-TEH-1358/H is bisected by paved Ponderosa Way and two other unpaved county roads. As a result, it has been affected by road construction and maintenance. Other activities such as logging, historic ditch construction, cattle grazing, fire, recreational use, deposition of modern refuse, and use of heavy machinery have also affected the site. Site CA-TEH-1490 is bisected by one unpaved road and has been affected by road construction. It has also been affected by fire, fire suppression activities and prior test excavations (Hamusek, 1988, as cited by Tetra Tech, 2015c). In its April 1, 2014 letter, the California SHPO determined that these two sites will be adversely affected by use of the existing roads that traverse these sites for construction, operation and maintenance purposes.

CA-TEH-2495 has been previously affected by fire, cattle grazing, recreational use (nearby gun club), and erosion. The site is located within the alignment of the proposed transmission line. CA-TEH-2497 is bisected by a paved SPI road and has been affected by past road construction and maintenance. It has also been affected by logging activities and pedestrian traffic. In its April 1, 2014 letter, the California SHPO determined that Project-related impacts to these two sites can be avoided.

Two architectural resources (CA-TEH-2499H [segment of State Route 36], P-25-002474 [Ponderosa Way]) were also determined to be eligible for listing on the National Register. Rugraw stated that Project construction and/or operation and maintenance activities would not include alteration, demolition, or destruction of these roads and that they would continue to be used in the same way that they are currently utilized. As such, Rugraw (Tetra Tech, 2014) recommended that the proposed Project will not affect their historic integrity. In its April 1, 2014 letter, the California SHPO concurred. The SHPO also concurred that the proposed transmission line will not be visible from Lassen Lodge (CA-TEH-2500H) thereby resulting in no potential effects on this structure.

A representative of the Redding Rancheria expressed concern regarding potential project-related effects on all prehistoric archaeological sites identified within the APE and recommended that all of these sites be monitored during construction activities. The representative also stated that the remaining segment of Last Chance Ditch (CA-TEH-1824H) and the historic saw mill remains (CA-THE-2041H) should be preserved. In its April 1, 2014, letter, the California SHPO determined that these two resources are not eligible for listing in the National Register and concurred with Rugraw's recommendation that no treatment measures were necessary.

Management of Historic Properties

On November 30, 2015, Rugraw filed a draft HPMP to address current and future project-related effects on eligible or potentially eligible cultural resources within the APE

with its final license application. The draft HPMP was prepared in accordance with the Advisory Council and Commission's *Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects* (2002).

In its HPMP, Rugraw proposes several general management measures for historic properties, including but not limited to: (1) the appointment of a Cultural Resources Coordinator to oversee implementation of the HPMP over the license term; (2) an employee education program; (3) a plan for monitoring eligible or potentially eligible resources during construction and throughout the license term; (4) a plan for maintenance of project roads, including historic roads; (5) a plan to protect historic properties during road maintenance and rehabilitation; (6) plans for additional cultural resources inventories, site evaluations, and data recovery excavations (as needed); (7) an inadvertent discovery plan; (8) procedures for the treatment of human remains that may be identified during project-related activities; and (9) requirements for annual cultural resources reporting to the Commission, California SHPO, and participating Native American tribes. Additionally, the HPMP contains a list of activities that would be exempt from section 106 consideration.

The HPMP also discusses specific project effects on all resources and provides measures to avoid, lessen, or mitigate adverse effects on those that are eligible or potentially eligible for listing on the National Register. For project-related effects as a result of using roads that bisect sites CA-TEH-1358/H and CA-TEH-1490 during project construction, in its HPMP, Rugraw proposes to develop a "capping" plan in consultation with the California SHPO, Commission, Native American tribes, and others, as appropriate. Sites CA-TEH-2495 and CA-TEH-2496 would be fenced for avoidance and monitored during construction. If effects on any of these sites as a result of construction or future project operation and maintenance activities cannot be avoided, Rugraw would formally evaluate each site for its National Register eligibility. If determined to be eligible, appropriate mitigation would be determined in consultation with the California SHPO, Commission, Native American tribes, and others, as appropriate.

In April 2014, Rugraw provided a draft of the HPMP to the California SHPO for review and received comments on August 1, 2014 (email from J. Tudor, Associate State Archaeologist, California Office of Historic Preservation, Sacramento, CA, to J, Farrell, Tetra Tech, Seattle, WA, filed November 30, 2015). Most of the SHPO's comments were addressed in the HPMP prior to its submittal to the Commission. Appendix C of the HPMP provides the California SHPO's comments and the extent to which they were addressed in the revised document.

Our Analysis

Rugraw's HPMP provides measures that are consistent with most of the Advisory Council and Commission's 2002 guidelines. However, inclusion of additional

information in a final HPMP would improve the document for full compliance under section 106.

The summary page of the HPMP (Tetra Tech, 2015c) states that the HPMP was developed in consultation with representatives of the Maidu-Pit River-Atsugewi, the Redding Rancheria, and the Greenville Rancheria. However, appendix D of the HPMP contains a matrix of Rugraw's tribal consultation efforts before June 2014, indicating that copies of the draft HPMP were provided to tribal organizations in April 2014 and that no comments were received. Section 1.6 of the HPMP states that a copy of the HPMP was submitted with the license application to the participating tribes, the U.S. Army Corps of Engineers, and others as appropriate for review. Appendix D of the HPMP should be updated to contain copies of any post-2014 correspondence received from the tribes with regard to the identification of cultural resources and development of the HPMP. If no comments were received, a statement to that effect should be included.

In section 4.2 of the draft HPMP, Rugraw proposes to provide an interpretive aspect for its employees (and others) to foster a better understanding of the importance of the project region to Native Americans, but does not specify this further in section 4.2.1. Installation of interpretive signs at select areas, possibly at one or more of the key viewing areas, would adhere to the Advisory Council and Commission's 2002 guidelines and ensure that the visiting public is also made aware of the importance of the project region to Native Americans, its rich cultural history, and the importance of protecting cultural resources.

Section 4.5 of the HPMP calls for the development of a monitoring plan. Additionally, sections 4.6.5 and section 5.1 of the HPMP specifies annual monitoring of eligible or unevaluated cultural resources (excluding site CA-TEH-595 which would be monitored every 5 years). However, the monitoring plan discussed in section 4.5 appears to pertain to construction monitoring only, and no description of annual monitoring is provided. An annual monitoring plan would specify those individuals who would participate in the monitoring, how the monitoring would be conducted, and how the results would be disseminated to consulting parties; results could be included in Rugraw's annual cultural resources report. Inclusion in the HPMP of these details, or a plan to include them in the monitoring plan specified in section 4.5 would ensure that the California SHPO, Commission, Native American tribes, and other parties are regularly informed of the condition of significant cultural resources within the project APE, both during construction and over the license term.

It is not clear why the sections of the HPMP pertaining to additional cultural resources inventories (4.6.3), archaeological site evaluation and data recovery excavation (4.6.4), and long-term historic property monitoring (4.6.5) are included in the HPMP as subsections of the main Road Maintenance and Rehabilitation section (4.6). These sections would also apply over the license term to resources and land in areas where no roads are present (e.g., CA-TEH-2495) and should be made separate sections within the General Treatment Measures section.

Although section 5.3 of the HPMP acknowledges that future changes to specific site treatment may be required and that consultation at such times with the Commission, California SHPO, Native American Tribes, and others, as appropriate, would be necessary, the HPMP should include provisions for periodic review and revision of the HPMP (typically every 5 years) with the consulting parties over the license term. This review could be commensurate with the preparation of every fifth annual report.

3.3.8 Socioeconomic Resources

3.3.8.1 Affected Environment

Population and Households

The project would be located between Paynes Creek and Mineral, California, in northeastern Tehama County. The county is largely rural and lies approximately 100 miles north of Sacramento.

According to 2011-2015, 5-year American Community Survey estimates, the population of Tehama County was 63,152 in 2015 (U.S. Census Bureau, 2015a). The county population in 2000 was approximately 56,039, and has grown at a 0.8 percent combined annual growth rate over the past 15 years. A total of 70.1 percent of the county population was white alone in 2015, compared to 38.7 percent of the population at the state level (U.S. Census Bureau, 2015b).

The three closest towns to the project site, Manton, Mineral, and Paynes Creek, had populations of 423, 199, and 70, respectively, in 2015. The two closest cities, Red Bluff and Redding (Shasta County), had populations of 14,065 and 91,063, respectively (U.S. Census Bureau, 2015a). In Tehama County, there were 27,220 total housing units in 2015, with a vacancy rate of 12.9 percent (U.S. Census Bureau, 2015c)

The median age in Tehama County was 40.5 years in 2015, approximately 5 years older than the state median of 35.8 years (U.S. Census Bureau, 2015b). Median household income in Tehama County was $41,001 in 2015; per capita income was $21,263; and 19.8 percent of the population in Tehama County had incomes that fell below the federal poverty level. For comparison, the state of California's poverty rate was 16.3 percent in the same year. In 2015, the median household income at the state level was approximately 51 percent higher than the county, at $61,818. State per capita income in 2015 was $30,318, approximately 43 percent higher than Tehama County (U.S. Census Bureau, 2015d).

Employment and Income

In 2016, Tehama County was highly specialized in agriculture, forestry, fishing and hunting relative to the state, with 1,926 employees in the sector. Using the state as a reference area, employment in that sector at the county level had a location quotient of 4.74, indicating that the county had more than four times as many employees in this sector than was true at the state level. The largest sector by total employment was health

care and social assistance, which accounted for more than 19 percent of all employment at 2,558 employees in 2016. Other sectors in the county with high levels of employment include retail trade, manufacturing, and transportation and warehousing (U.S. Bureau of Labor Statistics, 2016). The unemployment rate in the county was 7.1 percent in 2015, compared to 6.2 percent at the state level (U.S. Census Bureau, 2015d).

Total wages in Tehama County equaled approximately $534 million in 2016. The largest sector, by total annual wages, was health care and social assistance, which accounted for 17.7 percent of all wages. Other important sectors include manufacturing at 16.8 percent, and transportation and warehousing at 14.1 percent (U.S. Bureau of Labor Statistics, 2016).

Recreation and Visitation

According to Visit California, visitor spending in Tehama County supported $130 million in direct spending, and supported 1,610 jobs in 2016. Total tax revenue generated from visitor spending was $10 million (Visit California, 2017).

Agriculture and Irrigation

Farm-related income was estimated at $13.8 million in 2012 in Tehama County, of which forest products (including sales of standing timber) accounted for approximately 6.1 percent at $847,000 (USDA-NASS, 2014). According to the California State Board of Equalization, $9.7 million dollars' worth of timber was harvested in Tehama County in 2016, the eighth-highest value out of the 58 counties in California (California State Board of Equalization, 2017).

3.3.8.2 Environmental Effects

Project Construction and Operation

During the construction period, the project would employ approximately 30 people during the peak of activity. Average annual payroll during construction would be approximately $75,000 per person, assuming a pay scale typical for union employment; an average work force of 25 persons; and a typical distribution of supervisory, skilled, and unskilled labor. Over a 12- to 18-month construction period, this average monthly payroll would yield a total payroll of approximately $900,000 to $1,250,000. Estimated local and payroll taxes during the construction period would equal approximately $130,000 to $200,000.

Following construction, three full-time jobs are expected to be maintained for the operational life of the project. These jobs would result in minimal increase in payroll and other local taxes (including hotel taxes, gas taxes, and user fees), as well as an estimated $120,000 in annual property tax revenue for Tehama County (based on current design).

Our Analysis

Some additional direct and indirect economic benefits may occur from purchase of local construction materials; additional household spending in the area by full-time and construction personnel would result in small induced economic benefits. The cities of Red Bluff and Redding are within commuting distance of the project, and a large portion of the skilled work force likely would commute from those areas. The housing vacancy rate, 12.9 percent in 2015, suggests adequate housing is available (U.S. Census Bureau, 2015c). No residences or businesses would be displaced by project construction, and the labor force within commuting distance is expected to be adequate to meet project needs.

There may be increased traffic on State Route 36 as a result of the increase in the number of commuting workers, and from transportation of equipment and supplies. Increased traffic, activity, noise, dust, and general disturbance would occur in the construction areas of the proposed diversion works, the penstock route, the powerhouse, and along the transmission line ROW.

All construction activities would occur on private property or Tehama County land, with none planned on state or federal lands. The planned construction would not remove any public land from current recreational use. Downstream, there are limited uses of the river for angling, rafting, and kayaking. The planned timing of water withdrawals and proposed erosion control measures are expected to minimize effects on those users, and any project-related effects are expected to have a negligible effect on the regional economy. The small size of the expected workforce, both during construction and operations, is not likely to significantly affect recreationally based economic activity in the region. Generally, because of the small size of the project and its remote location, effects on county recreational users are expected to be negligible.

Construction and operation of the project would occur entirely on private property or Tehama County land and not result in permanent removal of land from agricultural use (either for grazing or for timber). Because of the small number of additional employees supported during both construction and operations, the project would have minimal effects on agricultural uses in the area. The project would not be used to provide water for general use or irrigation and have no effect on irrigation in Tehama County.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Lassen Lodge Project would not be constructed. The physical, biological, or cultural resources of the area would not change, and no electrical generation from the project would occur. The power that would have been developed from a renewable resource would have to be replaced from nonrenewable fuels. Existing fish and wildlife habitat and usage along about 2.5 miles of South Fork Battle Creek and 12 miles of the transmission line corridor would be preserved, and existing aquatic habitat in South Fork Battle Creek would remain available for anadromous species if the Battle Creek Salmon and Steelhead Restoration Project is successful in removing downstream barriers to anadromy in South Fork Battle Creek.

4.0 DEVELOPMENTAL ANALYSIS

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

In this section, we look at the Lassen Lodge Project's use of South Fork Battle Creek for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[55] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e. for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

Table 4-1 summarizes the assumptions and economic information we use in our analysis. This information was provided by Rugraw in its license application or assumed by staff where noted. We find that the values provided by Rugraw are reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes and insurance costs; estimated future capital investment required to maintain and extend the life of plant equipment and facilities; licensing costs; normal operation and maintenance cost; and Commission fees.

[55] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

Table 4-1. Parameters for economic analysis of the Lassen Lodge Project (Source: Rugraw, as modified by staff).

Economic Parameter	Value	Source
Proposed capacity	5.0 MW[a]	Rugraw
Proposed average annual generation	25,000 MWh[b]	Rugraw
Construction cost	$13,500,000[c]	Rugraw
Annual operation and maintenance cost	$210,000/year[d]	Rugraw
Cost to prepare license application	$3,900,000[e]	Rugraw
Period of economic analysis	30 years	Staff
Cost of capital (long-term interest rate)	8 percent	Staff
Federal tax rate	35 percent	Staff
Local tax rate	3 percent	Staff
Annual power value ($/MWh)	$88.00[f]	Staff

[a] Rugraw, November 2015, Initial Statement, page IS-2.

[b] Rugraw, November 2015, Initial Statement, page IS-2.

[c] Rugraw, March 31, 2017, response to Commission's additional information request dated February 24, 2017.

[d] Rugraw, March 31, 2017, response to Commission's additional information request dated February 24, 2017, reports $210,000/year in 2017 dollars excluding the cost of environmental mitigation measures. Costs include operation staff ($90,000), annual ROW expense ($25,000), annual utilities and operational equipment expense ($20,000), annual maintenance reserve ($50,000), and annual interconnection operator operation and maintenance fees ($25,000).

[e] Rugraw, March 31, 2017, response to Commission's additional information request dated February 24, 2017.

[f] Proxy power value based on PG&E's Chili Bar Project No. 2155 license order issued August 20, 2014.

4.2 COMPARISON OF ALTERNATIVES

Table 4-2 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power

and project cost for each of the action alternatives considered in the this EA: Rugraw's proposal and the staff alternative.

Table 4-2. Summary of the annual cost of alternative power and annual project costs for alternatives for the Lassen Lodge Project (Source: staff).

	Rugraw's Proposal[a]	Staff Alternative	Staff Alternative with Mandatory Conditions
Installed capacity (MW)	5	5	5
Annual generation (MWh)	25,000	25,000	25,000
Annual cost of alternative power	$2,200,000	$2,200,000	$2,200,000
($/MWh)	88.00	88.00	88.00
Annual project cost	$2,738,640	$2,665,050	$2,677,380
($/MWh)	109.55	106.60	107.10
Difference between cost of alternative power and project cost	($538,640)	($465,050)	($477,380)
($/MWh)	(21.55)	(18.60)	(19.10)

[a] A number in parentheses denotes that the difference between the cost of alternative power and project cost is negative, thus the project cost is greater than the cost of alternative power.

4.2.1 Applicant's Proposal

Under Rugraw's proposal, the Lassen Lodge Project would have an installed capacity of 5.0 MW and generate an average of 25,000 MWh of electricity annually. The average annual cost of alternative power would be $2,200,000, or $88.00/MWh. In total, the average annual project cost would be $2,738,640, or about $109.55/MWh. Overall, the project would produce power at a cost that is $538,640, or $21.55/MWh, more than the cost of alternative power.

4.2.2 Staff Alternative

The staff alternative includes the same developmental components as Rugraw's proposals and, therefore, would have the same capacity and energy values described above for Rugraw's proposals. For the Lassen Lodge Project, table 4-3 shows the staff-recommended additions, deletions, and modifications to each applicant's proposed environmental protection and enhancement measures, and the estimated cost of each.

For the Lassen Lodge Project, based on an installed capacity of 5.0 MW and an average annual generation of 25,000 MWh, the cost of alternative power would be $2,200,000, or $88.00/MWh. The average annual project cost would be $2,665,050 or about $106.60/MWh. Overall, the project would produce power at a cost that is $465,050 or $18.60/MWh, more than the cost of alternative power.

4.2.3 Staff Alternative with Mandatory Conditions

The staff alternative with mandatory conditions includes the same developmental components as Rugraw's proposal and, therefore, would have the same capacity and energy value described above for Rugraw's proposal. This alternative also includes five preliminary water quality certificate conditions recommended by the Water Board that are not included in the staff alternative. For the Lassen Lodge Project, table 4-3 shows the staff-recommended and mandatory condition additions, deletions, and modifications to each applicant's proposed environmental protection and enhancement measures, and the estimated cost of each.

For the Lassen Lodge Project, based on an installed capacity of 5.0 MW and an average annual generation of 25,000 MWh, the cost of alternative power would be $2,200,000, or $88.00/MWh. The average annual project cost would be $2,677,380 or about $107.10/MWh. Overall, the project would produce power at a cost that is $477,380 or $19.10/MWh, more than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 4-3 gives the cost of each of the environmental enhancement measures considered in our analysis. Environmental measures with no added cost are not included in table 4-3. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 4-3. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of operating the Lassen Lodge Project (Source: staff).

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
Geology and Soils				
1. Stockpile natural topsoils and replace, regrade, and revegetate disturbed areas with native vegetation after construction of project facilities.	Rugraw, staff	$15,000	$0	$1,150
2. Restore disturbed areas with native vegetation using only seed mixes recommended by California DFW.	Staff	$0[d]	$0	$0
3. Develop an SWPPP that will describe the erosion and sedimentation control practices planned for implementation during project construction.	Rugraw	$260,000	$0	$20,000
4. Modify the proposed SWPPP to include measures for controlling runoff from the construction sites, preventing material from contacting or entering surface waters, and as recommended by the Water Board, using washed	Staff	$290,000[e]	$0	$22,310

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
riprap, rocks, and gravel for construction adjacent to or in the watercourses (Water Board preliminary condition 19).				
5. Store spoils from project construction in areas that limit erosion of spoil material and prevent runoff into aquatic habitats.	Rugraw, staff	$25,000	$0	$1,920
6. Surface permanent roads with gravel to a depth and quantity sufficient to maintain a stable road surface.	Rugraw, staff	$100,000	$0	$7,690
7. Install cofferdams, silt fences, or other structures to isolate in-water work areas.	Rugraw, staff	$10,000	$0	$770
8. Implement control measures for erosion, excessive sedimentation, and turbidity at the commencement of, and throughout, any ground-clearing activities, excavation, or other project activities that could result in erosion and sedimentation discharges to project waters	Water Board, staff	$0[d]	$0	$0

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
(Water Board preliminary condition 18).				
9. Develop a construction plan that incorporates the specific measures proposed for construction and file the plan with the Commission for approval.	Staff	$15,000[f]	$0	$1,150
Aquatic Resources				
10. Develop a DSMP to annually sluice sediments from the project's reservoir during annual high flows (greater than 400 cfs) or when flows are greater than 108 cfs if sluicing is deemed necessary.	Rugraw	$0	$10,000	$6,500
11. Develop a DSMP that includes requirements to: (1) sluice sediment; (2) remove woody debris impinged on or behind the dam, and place it downstream back into the active channel; and (3) monitor seven channel metrics (NMFS and Interior recommendation 6).	NMFS, Interior	$0	$90,000[f]	$58,500
12. Modify the proposed DSMP to include consultation with	Staff	$10,000[g]	$10,000[g]	$7,270

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
the Water Board and California DFW in low-flow years to determine if the sluicing of sediments should occur at flows less than 400 cfs.				
13. Maintain upstream and downstream fish passage during construction (California DFW recommendation 4).	Rugraw, California DFW, staff	$10,000	$0	$770
14. Provide a fish screen on the intake and downstream fish passage at the project diversion works (California DFW recommendation 4).	Rugraw, California DFW, staff	$0[h]	$5,000	$3,250
15. Provide upstream fish passage at the project diversion works (California DFW recommendation 4).	Rugraw, California DFW	$300,000[i]	$5,000[i]	$26,330
16. Coordinate with California DFW on the design of the downstream fish passageway and fish screen at the diversion (California DFW recommendation 4).	Rugraw, California DFW, staff	$0	$0[d]	$0
17. Design the upstream fish ladder according to design	Rugraw, California DFW	$0	$0[d]	$0

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
standards listed in California DFW recommendation 7 (California DFW recommendation 4).				
18. Implement a minimum instream bypass flow of 13 cfs, or inflow, whichever is less, and do not begin operations until flows reach 18 cfs (California DFW recommendation 1).	Rugraw, California DFW, staff	$0	$10,000	$6,500
19. Implement a minimum instream bypass flow of 35 cfs, or the natural flow, if less, (NMFS and Interior 10(j) recommendation 1).	NMFS, Interior	$0	$533,750[f]	$346,940
20. Monitor stream flow on upstream side of the diversion structure, in the bypassed reach just above the powerhouse tailrace, and below Ponderosa Way Bridge (California DFW recommendation 2).	Rugraw	$50,000	$20,000	$16,850
21. Monitor stream flow at a gage located downstream of the diversion dam and fish ladder (California DFW recommendation 1).	California DFW	$10,000[f]	$10,000[f]	$7,270

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
22. Monitor stream flow at seven locations; (1) just upstream of the diversion dam; (2) at the intake header box; (3) just upstream of Angel Falls; (4) upstream of powerhouse Spring #4, just downstream of Angel Falls; (5) at the powerhouse discharge; (6) just downstream of the powerhouse (or just upstream of Panther Grade); and (7) just downstream of Panther Grade (NMFS and Interior 10(j) recommendation 3).	NMFS, Interior	$90,000[f]	$30,000[f]	$26,420
23. Monitor real-time streamflow at the following locations: (1) upstream of the project impoundment; (2) just downstream of the diversion dam; and (3) in the bypassed reach just upstream of the Spring #4 influence.	Staff	$20,000[f]	$15,000[f]	$11,290
24. Develop a streamflow monitoring plan that includes Rugraw's proposed stream flow monitoring, as modified by staff, and specifies monitoring equipment and	Staff	$10,000[j]	$10,000[j]	$7,270

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
methods, and provisions for annual operation and compliance reports, to document compliance with any license requirements for flow and ramping rates.				
25. Provide a ramping rate of change that will not exceed 0.1 foot of stage change per hour (California DFW recommendation 2).	Rugraw, California DFW	$0	$5,000	$3,250
26. Provide a ramping rate that would not exceed 0.1 foot of stage change per hour as measured at the staff-recommended streamflow monitoring point immediately downstream of the diversion dam.	Staff	$0	$5,000[f]	$3,250
27. Provide a ramping rate of change that will not exceed 1 inch of stage change per hour (NMFS and Interior 10(j) recommendation 1).	NMFS, Interior	$0	$5,000[k]	$3,250
28. Develop a flow gage monitoring plan (NMFS and Interior 10(j) recommendation 3).	NMFS, Interior	$10,000[f]	$0	$770

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
29. Conduct snorkel surveys for anadromous fish upstream of Panther Grade within a month of each 400 cfs or greater flow event and when Chinook salmon and steelhead have passed upstream of Coleman, Inskip, and South Diversion dams.	Rugraw	$25,000	$4,790[l]	$5,040
30. Develop an annual salmonid monitoring plan with seasonal monitoring (NMFS and Interior 10(j) recommendation 4).	NMFS, Interior	$25,000[f]	$25,000[f]	$18,170

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
31. Conduct genetic sampling of rainbow trout fry, and, if anadromous steelhead are detected in the bypassed reach, evaluate potential impediments to habitat connectivity to steelhead within the bypassed reach and implement adaptive management to provide habitat connectivity as appropriate address the impediments.	Rugraw	$0	$1,490[m]	$970
32. Monitor fish behavior at the project's tailrace and modify the tailrace if fish attraction is observed.	Rugraw, staff	$0	$3,000	$1,950
33. Develop a water temperature monitoring plan with six monitoring stations.	Rugraw	$60,000[f]	$70,000[f]	$50,120
34. Develop a water temperature monitoring plan with six monitoring stations (some locations differ from proposed) (California DFW recommendation 3).	California DFW	$80,000[f]	$70,000[f]	$51,660

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
35. Develop a water temperature monitoring plan with seven monitoring gages (Interior and NMFS 10(j) recommendation 2).	NMFS and Interior	$120,000[f]	$70,000[f]	$54,730
36. Discontinue project operations when the average daily stream temperature exceeds 20^0C as measured within the bypassed reach.	Rugraw	$0	$15,000	$9,750
37. Induce project shutdown or reduction when temperature exceeds 18ºC 7DADM (Interior 10(j) recommendation 2).	Interior	$0	$20,000[n]	$13,000
38. Induce project shutdown or reduction when 7DADM temperature exceeds 18ºC for migration/over-summering, 16ºC for rearing, and 13ºC for spawning (NMFS 10(j) recommendation 2).	NMFS	$0	$25,000[o]	$16,250
39. Induce project shutdown or reduce operations when instantaneous water temperature in the bypassed reach is 20ºC.	California DFW	$0	$15,000[p]	$9,750

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
40. Develop a water quality monitoring plan to monitor water quality, including turbidity, during project construction (Water Board preliminary condition 10).	Water Board, staff	$10,000[q]	$890[q]	$1,350
41. Perform water quality monitoring: (1) when performing any in-water work; (2) if project activities result or have the potential to result in a discharge to surface waters; or (3) when project-related activities result in the creation of a visible plume in surface waters (Water Board preliminary condition 6).	Water Board, staff	$0[d]	$0[d]	$0
42. Develop a BMI monitoring plan (NMFS and Interior 10(j) recommendation 5).	NMFS, Interior	$15,000[r]	$7,690[r]	$6,150
43. Develop a drought plan (Water Board preliminary condition 4).	Water Board	$25,000[f]	$0	$1,920
44. Develop an aquatic invasive species monitoring plan; including monitoring and corrective action steps	Water Board, staff	$10,000[f]	$5,000[f]	$4,020

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
(Water Board preliminary condition 8).				
45. Develop a pesticide use plan (Water Board preliminary condition 9).	Water Board, staff	$10,000[f]	$0	$770
46. Develop a fish habitat assessment plan, in consultation with Water Board staff and other relevant resource agencies (Water Board preliminary condition 12).	Water Board	$25,000[s]	$2,910[s]	$3,820
47. Develop a fish population monitoring plan (Water Board preliminary condition 11).	Water Board	$25,000[f]	$4,820[f]	$5,060
Terrestrial Resources				
48. Conduct monitoring during construction to ensure that measures to protect biological resources are implemented appropriately.	Rugraw, staff	$25,000	$0	$1,920
49. Provide environmental training to construction staff regarding laws, regulations, and BMPs to protect threatened and endangered species and special-status	Rugraw, staff	$5,000	$0	$390

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
plant species and their habitats.				
50. Delineate the limits of construction, work areas, and multipurpose areas with flagging, fencing, and/or stakes, and prohibit ground disturbance outside of these limits.	Rugraw, staff	$5,000	$0	$390
51. Reclaim temporarily disturbed stream and riparian habitat through restoration of preconstruction conditions and riparian plantings and/or seeding, where applicable, with seed mixes recommended by California DFW.	Rugraw, staff	$10,000	$0	$770
52. Conduct preconstruction inspections for sensitive and federally listed plants in all areas where surveys have not previously been conducted, and implement specified protection measures as necessary.	Rugraw, staff	$10,000	$0	$770
53. Conduct preconstruction inspections for slender Orcutt grass, elderberry and vernal	Staff	$5,000[f]	$0	$390

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
pool habitat in areas of proposed disturbance not previously surveyed in 2013 and adjust the transmission line design to avoid any areas where these species or habitats are found.				
54. Revise the Noxious Weed Management and Revegetation Plan, which includes measures to ensure weeds and non-native invasive vegetation do not establish at onsite disposal areas during project construction, and include provisions for riparian plantings along disturbed portions of South Fork Battle Creek to provide overhanging vegetation and if revegetation success criteria are not met after 2 years, continue reseeding and monitoring until criteria are met.	Rugraw, staff	$5,000	$0	$390
55. Modify the Noxious Weed Management and Revegetation Plan to include provisions for	Water Board, staff	$0	$1,000[f]	$650

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
preconstruction treatment of existing non-native invasive weed populations on project lands, additional reseeding and monitoring if restoration success criteria are not met by the end of the 2-year monitoring period, and measures to protect rare plant species from control measures targeting noxious weed species (consistent with Water Board preliminary condition 14).				
56. Map and quantify, by vegetation type, the vegetation to be removed as a result of project construction.	Rugraw, staff	$5,000	$0	$390
57. Conduct preconstruction surveys for migratory birds within 100 feet of the project (disturbance area) immediately prior to construction if disturbance will occur during the nesting season (typically April 15 to July 31).	Rugraw, staff	$5,000	$0	$390

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
58. Establish a 100-foot buffer around active nests of bird species protected under the Migratory Bird Treaty Act.	Rugraw, staff	$2,500	$0	$190
59. Conduct preconstruction pedestrian or aerial nest surveys in suitable habitat within 1 mile of the project disturbance area during the appropriate nesting time periods needed to identify raptor nest locations and establish the status of nests.	Rugraw, staff	$5,000	$0	$390
60. Provide an appropriate buffer to active raptor nests during project construction.	Rugraw, staff	$2,500	$0	$190
61. Modify the proposed measure for restricting construction activities around active raptor nests to include consultation with California DFW in determining the appropriate buffer distances.	Staff	$0[d]	$0	$0
62. Design and construct the transmission line in compliance with APLIC guidance to reduce effects on avian species (APLIC, 2006;	Rugraw, Interior	$12,500	$0	$960

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
2012) (Interior 10(j) recommendation 7).				
63. Design and construct the transmission line to reduce impacts to avian species.	Staff	$12,500[f]	$0	$960
64. Develop an avian protection plan that incorporates Rugraw's transmission line design and considers FWS's Avian Protection Plan Guidelines to reduce the risk of avian interactions with the proposed transmission line, and implement the plan throughout the term of the license. (Interior 10(j) recommendation 7).	Interior, staff	$10,000[f]	$1,250[f]	$1,580
65. Develop a bald eagle and raptor management plan that considers FWS's National Bald Eagle Management Guidelines and includes the use of species-specific distance buffers, landscape buffers, seasonal restrictions, and additional recommendations to benefit raptors. (Interior 10(j) recommendation 7).	Interior, staff	$10,000[f]	$1,250[f]	$1,580

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
Threatened and Endangered Species				
66. Develop a California red-legged frog protection plan and protect their breeding habitat during construction (Interior 10(j) recommendation 8).	Rugraw, Interior	$10,000	$0	$770
67. Conduct preconstruction surveys for juvenile and adult foothill yellow-legged frogs immediately prior to construction when in-water work will occur during the breeding season (typically mid-March to August).	Rugraw	$10,000	$0	$770
68. Relocate larval, juvenile, and adult foothill yellow-legged frogs found within the project reach or 500 feet downstream, outside the project construction area.	Rugraw	$1,000	$0	$80
69. Develop an amphibian monitoring plan with monitoring for California red-legged frog, foothill yellow-legged frog, and Cascade frog, specifically: egg masses, tadpoles, and adult amphibians on South	Water Board	$10,000[f]	$0	$770

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
Fork Battle Creek (Water Board preliminary condition 13).				
70. Develop a foothill yellow-legged frog monitoring plan (California DFW 10(j) recommendation 2B).	California DFW	$10,000[f]	$0	$770
71. Develop a special-status amphibian protection plan that includes the following provisions to protect foothill yellow-legged frog, Cascade frog, and California red-legged frog: (1) conduct preconstruction surveys for all life stages during the breeding season; (2) avoid construction activities in riparian areas when egg masses are present; (3) stop work and notify FWS if California red-legged frogs are observed during preconstruction surveys or during construction; and (4) relocate larval, juvenile, and adult foothill yellow-legged and Cascade frogs prior to construction activities to an area	Staff	$21,000[t]	0	$1,620

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
sufficiently upstream to prevent them from re-entering the construction area.				
72. Consult annually with resource agencies to review current lists of rare, threatened, and endangered species and special-status plant and wildlife species to identify species that have the potential to be adversely impacted by the project and develop protection measures as needed (Water Board preliminary condition 5).	Water Board	$10,000[f]	$0	$770
Land Use and Aesthetics				
73. Restore vegetation directly removed or disturbed during project construction, including along temporary access roads, as appropriate and in accordance with California forestry regulations and best practices.	Rugraw, staff	$17,500	$0	$1,350
Cultural Resources				
74. Implement the HPMP filed on November 30, 2015.	Rugraw	$20,000	$2,000	$2,840

Enhancement/Mitigation Measures	Entities	Capital Cost (2017$)[a, c]	Annual Cost(2017$)[b, c]	Levelized Annual Cost (2017$)
75. Revise the HPMP filed on November 30, 2015, to include: (1) copies of any post-2014 tribal correspondence and consultation related to the identification of cultural resources and development of the HPMP to document full compliance with section 106; (2) a cultural resources interpretive element, such as installation of interpretive signs at key viewing areas); (3) a detailed plan for annual monitoring of cultural resources within the APE that are eligible for listing on the National Register or have yet been evaluated that are eligible for listing on the National Register or have not yet been evaluated; (4) provisions for periodic review and revision of the HPMP; and (5) editorial corrections as specified in section 5.1.2 of this EIS.	Staff	$25,000[u]	$5,000[u]	$5,170

a. Costs were provided by Rugraw in its March 31, 2017, filing unless otherwise noted.
b. Capital costs typically include equipment, construction, permitting, and contingency costs.

c. Annual costs typically include operation and maintenance costs and any other costs that occur on a yearly basis.
d. Staff estimates there would be no additional cost to implement this measure.
e. Staff estimates the cost of prewashing riprap, rocks and gravel would be approximately $30,000 above the proposed cost of the SWPPP.
f. Staff estimate.
g. Staff estimate; annual cost includes $10,000 per year for debris management.
h. Rugraw included the capital cost for this measure in the overall construction cost with no breakdown; we estimate the cost of the fish screen and downstream passage to be $800,000 out of the total construction cost of $13,500,000.
i. Rugraw did not provide an estimate; staff provided an estimate for the capital cost to construct the upstream fish passage facilities and an annual cost to operate and maintain the facilities.
j. Staff estimate; capital cost includes $10,000 for development of the plan; annual cost includes $10,000 per year for flow monitoring.
k. Staff estimate; assumed to be the same as cost provided by the application for comparable measure.
l. Staff estimate; annual cost includes $10,000 every 2 years starting in year 2.
m. Staff estimate; annual cost includes $10,000 in years 5, 10, 15, and 20.
n. Staff expects the lost energy for this measure to be greater than for the Rugraw proposal because of the more restrictive temperature criteria.
o. Staff expects the lost energy for this measure to be greater than for the Interior recommendation because of the more restrictive temperature criteria.
p. Staff estimate; assumed same energy loss as for the Rugraw proposal.
q. Staff estimate; annual cost includes $10,000 in year 1.
r. Staff estimate; annual cost includes $15,000 in years 1-4, 8, 12, 16, 20, 24, and 28.
s. Staff estimate; annual cost includes $15,000 in years 1, 5, and 10.
t. Cost equals the cost for the previous three measures in the table.
u. Staff estimate; assumes an additional $5,000 to the capital cost for HPMP revisions and installation of signage and an additional $3,000 to the annual cost for additional annual monitoring beyond the cost estimated by Rugraw.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection of, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the Lassen Lodge Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency comments filed on the project and our review of the environmental and economic effects of the proposed project and project alternatives, we selected the staff alternative as the preferred alternative. The staff alternative includes elements of Rugraw's proposal with some modifications and additional staff-recommended measures. We recommend this alternative because: (1) issuing an original license for the project would allow Rugraw to operate the Lassen Lodge Project as a dependable source of electrical energy; (2) the 5 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of the staff alternative would exceed those of the no-action alternative; and (4) the proposed and recommended measures would protect and enhance fish and wildlife resources.

In the following section, we make recommendations as to which environmental measures proposed by Rugraw or recommended by agencies should be included in any license issued for the project.

5.1.1 Measures Proposed by Rugraw

Based on our environmental analysis of Rugraw's proposal discussed in section 3 and the costs discussed in section 4, we recommend including the following environmental measures proposed by Rugraw in any license issued for the project. Our recommended modifications to Rugraw's proposed measures are shown in ***bold italics***, and parts of measures that we do not recommend are shown in ~~strikeout~~.

Project Construction

- Limit land disturbance and vegetation clearing to those areas needed for construction. Delineate the limits of construction, work areas, and

multipurpose areas with flagging, fencing, and/or stakes to prevent land-disturbing activities outside of construction areas.

- Stockpile natural topsoils and replace, regrade, and revegetate disturbed areas, in accordance with California forestry regulations and best practices, with native vegetation. Restore disturbed stream and riparian habitat to preconstruction conditions and with riparian plantings and/or seeding, where applicable, ***with seed mixes recommended by California DFW***~~, with approved seed mixes~~.
- Develop an SWPPP with measures to prevent storm-induced erosion and sedimentation during ground-disturbing construction activities, including:
    - Store spoils from project construction in areas that limit erosion of spoil material and prevent runoff into aquatic habitats.
    - Install cofferdams, silt fences, or other structures to isolate in-water work areas ***and, consistent with the Water Board's preliminary condition 19, only use washed riprap, rocks, and gravel adjacent to or in watercourses.***
- Use existing roads to the maximum possible extent, constructing new access roads only when necessary; limit access roads to a width of 12 feet whenever possible; and surface permanent roads with gravel to a depth and quantity sufficient to maintain a stable road surface and minimize erosion and dust.
- Conduct in-water work activities between July 1 and October 15 when streamflows are low to protect water quality and aquatic resources.
- Maintain upstream and downstream fish passage at the project during construction by constructing the diversion structure in phases or by providing a temporary diversion culvert to allow fish to pass the site.
- Conduct ~~biological~~ monitoring during construction to ensure that measures to protect biological resources are implemented appropriately, ***using staff trained in the identification of special-status species and their habitats***.
- Provide environmental training to construction staff ~~regarding laws, regulations~~, and ***implement*** BMPs to protect threatened and endangered species and special-status plant species and their habitats.
- Conduct preconstruction ~~surveys in~~ ***inspections of*** all areas of suitable habitat for threatened and endangered and special-status plant species where surveys have not previously been conducted, and implement specified protection measures as necessary.
- Avoid streams, wetlands, and pond habitats to the extent possible during construction, and use existing stream and wetland crossings where possible.

Incorporate this and other construction-specific measures into a construction plan for Commission approval.

- Implement the Noxious Weed Management and Revegetation Plan (filed on November 30, 2015), which includes measures to ensure weeds and non-native invasive vegetation do not reestablish at onsite disposal areas during project construction, with modifications to include provisions for riparian plantings along disturbed portions of South Fork Battle Creek to provide overhanging vegetation***, monitoring of restoration success and criteria for additional reseeding if by the end of a 2-year monitoring period the criteria are not met, preconstruction treatment of existing non-native invasive plant populations on project lands, and measures to protect rare plant species from control measures targeting noxious weed species.***
- Map, evaluate, and quantify, by vegetation type, the vegetation that would be removed as a result of project construction.
- Conduct preconstruction surveys for migratory bird nests within 100 feet of any areas that will be disturbed during the typical nesting season of April 15 to July 31 to identify nest locations and their status.
- Restrict construction activities within 100 feet of any active migratory bird nests found during the preconstruction surveys.
- Conduct preconstruction raptor nest surveys in suitable habitat within 1 mile of any areas that will be disturbed during the appropriate nesting time periods (January–through August) to identify nest locations and their status.
- Determine ***in consultation with California DFW*** and apply an appropriate buffer for restricting construction activities around any active raptor nests found during preconstruction.
- Avoid ground-disturbing activity on or near talus slopes to protect Sierra Nevada red fox and American pika.
- Avoid construction activity within or near potential bat roosting habitat, including rock crevices, cliffs, and snags.
- Conduct surveys for ~~juvenile and adult~~ ***all life stages (egg masses, larvae, juveniles, and adults) of*** foothill yellow-legged frogs ***and Cascade frogs*** immediately prior to construction when in-water work would occur and relocate juvenile and adult frogs found within the project reach and up to 500 feet downstream, outside the project construction area. ***Incorporate these measures into the staff-recommended special-status amphibian protection plan discussed below.***
- Avoid construction activities in riparian areas during the time that egg masses of foothill yellow-legged frogs are present (typically mid-April

through mid-May); postpone construction around the immediate area where egg masses of foothill yellow-legged frogs*, **Cascade frogs, and California red-legged frogs*** are found until the eggs have hatched; avoid collection of rocks from in-water environments and minimize disturbance to pools and shallow runs between March 1 and August 31 to protect foothill yellow-legged frogs and their habitat. ***Incorporate these measures into the staff-recommended special-status amphibian protection plan discussed below***.

- Develop a California red-legged frog protection plan to allow for California red-legged frogs to become reestablished in the project area and to be protected from manageable threats during construction***. Incorporate the plan into the staff-recommended special-status amphibian protection plan discussed below***.
- Reduce visual contrast where over-story vegetation is removed by thinning and removing trees from the edge of the ROW to give a natural appearance, where possible.
- Use wood poles to support the project transmission line to blend with surrounding vegetation.

Project Operation

- Operate the project in a run-of-river mode, ~~maintaining the water surface elevation within +/- 0.5 inch of the normal pool elevation~~ ***where outflow from the project reservoir approximates inflow on a near-instantaneous basis.***
- Provide a ramping rate that will not exceed 0.1 foot of stage change per hour as measured ~~by a stream gage to be located within the bypassed reach between the diversion structure and the Old State Highway Route 36 Bridge~~ ***at the staff-recommended streamflow monitoring gage located just downstream of the diversion dam***.[56]
- Develop a DSMP for the sluicing of sediment and debris at the project that would include: annual sluicing of sediments from the project's reservoir when natural flow at the diversion site exceeds 400 cfs; or in years where natural flows never reach 400 cfs, the sediment deposits in the reservoir would be evaluated to determine if sluicing is needed, ***and the Water Board and California DFW would be consulted to determine if the***

[56] On August 31, 2016, Rugraw filed a letter in response to the Water Board's preliminary condition and California DFW's preliminary 10(j) recommendations adopting the agencies' preliminary recommended ramping rate, filed on June 24, 2016, and June 15, 2016, respectively; and thereby amended the proposed ramping rate provided in the final license application.

sluicing of sediments should occur ~~If so, the sluicing would occur at~~ ***when*** flows ***are less than 400 cfs.*** ~~greater than 108 cfs (minimum instream flow of 13 cfs plus turbine design flow of 95 cfs).~~

- Maintain a minimum instream flow of 13 cfs or inflow, whichever is less, ***as measured just downstream of the diversion dam***, in the bypassed reach to protect aquatic resources.
- Monitor ***real-time*** stream flow at the following locations: (1) ***upstream of the project impoundment, (2) just downstream of*** ~~(1)~~ the diversion dam, and ***(3)*** ~~(2)~~ in the bypassed reach just ***upstream of Spring #4*** ~~above the powerhouse tailrace, and (3) at the existing station below Ponderosa Way Bridge~~***. Incorporate these measures into the staff-recommended streamflow monitoring plan discussed below.***
- Construct ~~an upstream and~~ a downstream fish passageway and fish screen structure at the project diversion works to ensure fish are able pass the diversion dam and design the facilities in coordination with California DFW incorporating the NMFS Southwest Region Fish Screening Criteria for Anadromous Salmonids and NMFS Northwest Region Anadromous Salmonid Passage Facility Design.
- Monitor fish behavior at the project's tailrace and modify the tailrace in the event fish attraction is observed.
- Design and construct the transmission line to protect avian species (APLIC, 2006; 2012) ***and incorporate this measure into the avian protection plan discussed below.***
- ~~Implement~~ ***Revise*** the HPMP filed on November 30, 2015 ***to include: (1) copies of any post-2014 tribal correspondence and consultation related to the identification of cultural resources and development of the HPMP to document full compliance with section 106; (2) a cultural resources interpretive element, such as installation of public interpretive signs at key viewing areas; (3) a detailed plan for annual monitoring of cultural resources within the APE that are eligible for listing on the National Register or have not yet been evaluated; (4) provisions for periodic review and revision of the HPMP; and (5) editorial corrections as specified in section 5.1.2 of this EIS.***

5.1.2 Additional Measures Recommended by Staff

In addition to Rugraw's proposed measures and the staff modifications listed above, we recommend including the following staff-recommended measures in any license issued for the Lassen Lodge Project:

Project Construction

- Develop a plan for monitoring turbidity and pH and documenting observations of oily sheens and turbidity plumes during project construction.
- Conduct preconstruction inspections for slender Orcutt grass, elderberry, and vernal pool habitat in areas of proposed disturbance not previously surveyed in 2013, and adjust the transmission line design to avoid any areas where these species or habitats are found.

Project Operation

- Develop a streamflow monitoring plan that includes Rugraw's proposed stream flow monitoring, as modified by staff,[57] and specifies the proposed monitoring locations, monitoring equipment, and methods, and provisions for annual operation and compliance reports, to document compliance with any license requirements for flow and ramping rates.
- Develop a pesticide use plan that would include BMPs to manage the risk associated with pesticide application and use to protect water quality, ESA- and CESA-listed species, and/or associated habitat in or downstream of application areas.
- Develop an aquatic invasive species monitoring plan that incorporates measures to help prevent the introduction and/or spread of aquatic nuisance species (flora and fauna) into the proposed project area, including construction BMPs, to prevent the spread of aquatic nuisance species (e.g., bullfrog).
- Develop an avian protection plan that incorporates Rugraw's proposed transmission line design and considers FWS's Avian Protection Plan Guidelines to reduce the risk of avian interactions with the proposed transmission line, and implement the plan throughout the term of the
- Develop a bald eagle and raptor management plan that considers FWS's National Bald Eagle Management Guidelines and includes the use of species-specific distance buffers, landscape buffers, seasonal restrictions, and additional recommendations to benefit raptors.

[57] Staff is recommending monitoring (1) upstream of the project impoundment; (2) just downstream of the diversion dam; and (3) in the bypassed reach just upstream of Spring #4 influence, instead of Rugraw's proposed locations (1) immediately downstream of the diversion dam, (2) in the bypassed reach just above the powerhouse tailrace, and (3) at the existing station below Ponderosa Way Bridge.

- Develop a special-status amphibian protection plan that includes the following provisions to protect foothill yellow-legged frog, Cascade frog, and California red-legged frog: (1) conduct preconstruction surveys for all life stages during the breeding season; (2) avoid construction activities in riparian areas when egg masses are present; (3) stop work and notify FWS if California red-legged frogs are observed during preconstruction surveys or during construction; and (4) relocate larval, juvenile, and adult foothill yellow-legged and Cascade frogs prior to construction activities to an area sufficiently upstream to prevent them from re-entering the construction area.

The following section presents the basis for our recommended measures and our recommended modifications to the proposed measures.

Erosion Control and Sedimentation

Rugraw proposes to develop an SWPPP that outlines measures to prevent erosion and sedimentation during project construction. Consistent with Rugraw's proposal, the Water Board recommends control measures for erosion, excessive sedimentation, and turbidity at the commencement of, and throughout, any ground-clearing activities, excavation, or other project activities that could result in erosion and sedimentation discharges to project waters (preliminary condition 18). In addition, the Water Board recommends the use of washed riprap, rock, and gravel placed within or adjacent to any watercourses (preliminary condition 19); and monitoring of water quality for turbidity during construction (preliminary condition 6).

As discussed in section 3.3.1.2, *Geology and Soil Resources, Environmental Effects*, developing the proposed SWPPP with the additional measures recommended by the Water Board would minimize the amount of erosion and sediment transport to South Fork Battle Creek from project construction. Use of washed riprap, rock, and gravel would prevent fines from rock crusher operations from entering South Fork Battle Creek. Monitoring the functionality of erosion and sediment control structures, especially around rainfall events and disturbance activities, would help to identify any necessary maintenance, repair, or improvement/replacement of erosion and sediment control structures. We estimate that incorporating the Water Board's preliminary conditions 6 and 19 into the proposed SWPPP would only marginally increase the cost of the proposed SWPPP and would be warranted to protect aquatic resources during construction.

Construction Plan

In addition to the erosion and sedimentation control measures developed as part of the SWPPP, Rugraw is also proposing several construction measures for protection of environmental resources, including the timing of construction; delineation of construction areas using fencing and/or flagging; using existing roads to the maximum extent possible, and constructing any new access roads to a width of no more than 12 feet; maintaining upstream and downstream fish passage at the project during construction; avoiding

streams, wetlands, and pond habitats to the extent possible during construction, and use existing stream and wetland crossings where possible; and providing environmental training to construction staff regarding laws, regulations, and BMPs to protect threatened and endangered species and special-status plant species and their habitats. These are reasonable measures to implement during construction, and to ensure that these measures are implemented and coordinated, should be included in a construction plan to be filed for Commission approval prior to the start of ground-disturbing activities. This construction plan should also be closely coordinated with the SWPPP. We estimate that preparation of a construction plan would have a levelized annual cost of $1,150 and would be worth the cost.

Debris and Sediment Management Plan

Rugraw proposes to develop a DSMP that includes annual sluicing of sediment from the project reservoir into the bypassed reach when flows are 400 cfs or greater. However, if inflow does not reach 400 cfs in a given year, Rugraw would evaluate the sediment deposits behind the diversion to determine the need to sluice at lower flows.[58]

NMFS and Interior recommend that Rugraw develop a DSMP that includes a monitoring component to measure the sediment retention upstream of the sluice gates, debris and sediment distribution downstream of the diversion, and the riparian response to new conditions resulting from the proposed project. Specifically, the monitoring would measure: (1) reach-wide parameters (e.g., total length and gradient, average width and depth); (2) wetted width of each riffle; (3) water velocity; (4) relative substrate composition (i.e., fines, gravel, cobble, boulder, and bedrock); (5) pebble count; (6) substrate consolidation and percent embeddedness; (7) canopy cover; (8) canopy height; and (9) diameter of canopy trees.

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects,* the periodic downstream transport of small and large woody debris would reduce operational effects on downstream aquatic habitat, and the annual sluicing of sediment would help to maintain sediment supply to the bypassed reach and reduce the potential of clogging project facilities. Sediment sluicing at flows less than 400 cfs may have a negative effect on turbidity and sedimentation downstream, but this effect would be offset by the greater habitat benefits of passing sediment and woody debris downstream of the dam. We expect that the proposed sediment sluicing and passage of woody debris past the proposed diversion dam would be successful in maintaining aquatic habitat. Therefore, there would be no basis for requiring the detailed monitoring program recommended by the agencies to verify the probable minor effects of the proposed project on sediment and woody debris movement. As a result, we do not recommend the monitoring, which would have a substantial cost (levelized annual cost of $58,500), and minimal benefits.

[58] Rugraw's *Baseline Hydrologic Analyses for South Fork Battle Creek* (2014) determined that the maximum daily flow of 380 cfs (as measured upstream of Angel Falls) would typically occur every 2 years.

We estimate that implementation of the DSMP as proposed would have a levelized annual cost of $25,000 and that the benefits to aquatic resources would warrant the cost.

Ramping Rate

In its response to California DFW preliminary recommendations (10(j) recommendation 2), Rugraw proposes to implement a ramping rate of 0.1-foot-per-hour as measured by a stream gage to be located within the bypassed reach between the diversion structure and the Old State Highway Route 36 Bridge. Interior and NMFS, however, recommend a 1.0-inch-per-hour ramping rate (10(j) recommendation 1) as measured between Angel Falls and Powerhouse Spring No. 4.

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, our analysis found that proposed project operations could result in fluctuations in flow and water levels (ramping events) in the project's bypassed reach. While our analysis found that these events would be relatively infrequent, any rapid changes in stream flow associated with project start-ups or shut-downs could adversely affect downstream aquatic resources. Although each of the recommended ramping rate restrictions (0.10-foot-per-hour and 1-inch-per-hour) would eliminate any sudden changes in flow and protect aquatic resources, the less conservative 0.10-foot-per-hour (1.2-inch-per-hour) restriction would be sufficient to protect fish and other aquatic biota in the bypassed reach, which is a relatively high gradient and confined channel, and may be easier to comply with from an operational perspective. Therefore, we recommend Rugraw implement this ramping rate restriction during project shut-down and start-up, and when changing operations. We agree that compliance with this ramping rate can be monitored at a single location downstream of the diversion dam, but recommend that Rugraw monitor this ramping rate at the staff-recommended streamflow monitoring gage located just downstream of the diversion dam. We estimate this ramping rate and associated monitoring would have a levelized annual cost of $3,250 and be worth the cost for protection of aquatic habitat and biota.

Streamflow Compliance Monitoring

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, project operation would alter the existing flow regime in the project's bypassed reach of South Fork Battle Creek. The project would operate in run-of-river mode diverting between 5 and 105 cfs for power generation while meeting the specified minimum instream flow and ramping rate restriction.

Rugraw proposes and resource agencies recommend alternative monitoring programs to ensure compliance with any streamflow requirements of any license issued.

Rugraw proposes to monitor streamflow at three locations.[59] Interior and NMFS recommend the development of a flow gage monitoring plan (10(j) recommendation 3) that would specify monitoring at seven locations.[60] California DFW recommends monitoring flow (10(j) recommendation 1) at a single location downstream of the diversion dam and fishway. In its August 31, 2016, response to resource agency comments, Rugraw agreed to develop the flow gage monitoring plan recommended by Interior and NMFS and did not dispute including seven monitoring gages as recommended by NMFS and Interior. Rugraw commented, however, that one site[61] recommended by NMFS and Interior, immediately downstream of Angel Falls, would not be accessible for maintaining a gage, and instead proposed an alternative location just upstream of the powerhouse tailrace and downstream of Spring #4.[62]

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, the project would have negligible effects on streamflow downstream of the powerhouse discharge. Therefore, there is no justification for a license condition that requires monitoring flow at the two locations downstream of the powerhouse discharge as recommended by NMFS and Interior.[63]

To document compliance with license requirements for flow and ramping rates, in addition to powerhouse flows, we recommend Rugraw monitor flow in South Fork Battle Creek at the following locations: (1) upstream of the project's impoundment; (2) in the bypassed reach at a station just downstream of the diversion dam; and (3) in the bypassed reach at a station just upstream of Spring #4's influence. We recommend locating the uppermost station upstream of the project's impoundment, instead of at the diversion dam as proposed by Rugraw and recommended by the agencies, to obtain inflow data to the

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[59] Rugraw proposes to monitor stream flow at the following three locations: (1) just upstream of the diversion dam; (2) just upstream of the powerhouse tailrace; and (3) downstream of Ponderosa Bridge.

[60] The agencies' recommended locations for the flow gages are as follows: (1) just upstream of the diversion dam; (2) at the intake's header box; (3) upstream of Angel Falls; (4) upstream of powerhouse Spring #4; (5) at the powerhouse discharge; (6) downstream of the powerhouse; and (7) downstream of Panther Grade.

[61] Rugraw indicates that the NMFS and Interior recommended site referred to as "Upstream of Powerhouse Spring Number 4, just downstream of Angel Falls (between Angel Falls and Powerhouse Spring No. 4)" was not accessible, but makes no such comment for California DFW's recommended station upstream of powerhouse Spring #4.

[62] The proposed and recommended locations of the flow gages as described in previous footnotes range from upstream of the diversion dam at RM 23.0 to RM 18.5, 2.1 miles downstream of the proposed powerhouse and are fully discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects.*

[63] Downstream of the powerhouse and downstream of Panther Grade.

project and to support compliance monitoring with run-of-river project operation, and enable evaluation of project effects within the impoundment. Monitoring flow at the stations just upstream of the project's impoundment and just downstream of the diversion dam and through the project powerhouse would enable compliance monitoring with our recommended run-of-river operation and minimum instream flows. The monitoring station just downstream of the diversion dam would also serve as the compliance point for the ramping rate restriction. Monitoring at the three staff-recommended locations would fully capture project-induced effects on flow in South Fork Battle Creek, and, as such, any additional or different locations proposed by Rugraw or recommended by the agencies would not be necessary to monitor compliance with our recommended measures associated with stream flow.

To ensure monitoring is conducted at a sufficient resolution for project operation to be responsive to changes in flows, we recommend real-time streamflow monitoring at 15-minute intervals.

Consistent with the agencies' recommendations, we recommend that Rugraw develop, in consultation with NMFS, FWS, California DFW, and the Water Board, a streamflow monitoring plan. The plan would specify monitoring locations, monitoring equipment, and methods. The plan would include a provision for annual operation and compliance reports, which would document compliance with all license requirements for flow and ramping rates. We estimate that development of a streamflow monitoring plan that includes our recommended components noted above would have a levelized annual cost of $18,560, and that the benefits to aquatic resources would outweigh the cost.

Pesticide Use Plan

The Water Board recommends that Rugraw develop a pesticide use plan (preliminary condition 9) if pesticide use related to the project has the potential to affect water quality. As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, using pesticides to control pests near project buildings, roads, and other physical structures presents a risk of contaminating surface waters in the project area, and developing a pesticide use plan would provide a comprehensive source documenting how Rugraw would manage these risks to protect water quality, ESA- or CESA-listed species, and/or associated habitat in or downstream of application areas. Therefore, we recommend that Rugraw develop a pesticide use plan. We estimate that the levelized annual cost of the plan would be $770 and that the benefits to aquatic resources would warrant the cost.

Water Quality Monitoring Plan

The Water Board recommends that Rugraw monitor water quality, with an emphasis on turbidity, when performing any in-water work, if project activities could have a discharge to surface waters, and when project-related activities result in the creation of a visible plume in surface waters (preliminary condition 6); develop a water quality monitoring plan, install and operate equipment at multiple water quality

monitoring locations as determined by Rugraw and relevant resource agencies; and make data publicly available (preliminary condition 10).[64] The Water Board includes a list of other potential water quality parameters to be monitored in preliminary condition 10: BMI, turbidity, flow, water surface level, pH, temperature, alkalinity, minerals, and/ or conductivity.

As described in sections 3.3.1.2, *Geology and Soil Resources*, and 3.3.2.2, *Aquatic Resources,* implementation of our recommended measures to control erosion, stormwater runoff, and in-water work periods and methods would minimize elevated turbidity and pH. However, monitoring for pH, turbidity and oily sheens during project construction would ensure that any adverse effects on water quality in South Fork Battle Creek would be identified, and allow for remediation, as needed. Therefore, we recommend that Rugraw conduct water quality monitoring during construction, and estimate that this monitoring would be conducted at no additional cost and would benefit aquatic resources at no cost.

Development of a water quality monitoring plan would provide a means of determining the effectiveness of mitigation measures aimed at maintaining water quality during the proposed construction period. Monitoring water quality daily before construction begins for the day, near the middle of the work day, and at the end of the work day would provide data sufficient to determine construction effects. Reporting observations of oily sheens and turbidity plumes on surface waters would also document potential fuel and oil spills and major erosion events. These observations combined with monitoring data could be used to determine what caused them and facilitate initiation of appropriate responses, including clean-up actions. The water quality monitoring plan should specify the methods, quality assurance measures, and reporting schedules. We recommend preparation of a water quality monitoring plan for the construction period, which would have a levelized annual cost of $1,350, and would be worth the cost for protection of water quality during construction.

Aquatic Invasive Species Monitoring Plan

To address the potential infestation and/or spread of invasive aquatic plant or animal species in the proposed project area, the Water Board recommends Rugraw develop an aquatic invasive species monitoring plan in consultation with relevant resource agencies (preliminary condition 8). The plan would: (1) identify potential sources related to, or conditions associated with, the proposed project that have the potential to transport or spread aquatic non-native invasive species; (2) identify BMPs to reduce and/or minimize the transportation or spread of aquatic non-native invasive species; and (3) include monitoring and corrective action steps to address potential spread

[64] Although the Water Board does not specify a temporal period for a recommended water quality monitoring plan, it appears to be intended for construction of the project.

of invasive species. As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects,* although project construction and operation could cause the introduction of aquatic invasive species, early detection and rapid response efforts are the most effective and cost-efficient responses to invasive species that become introduced and established. Therefore, we recommend that Rugraw develop an aquatic invasive species monitoring plan. The plan should incorporate measures to help prevent the introduction and/or spread of aquatic nuisance species, including bullfrog, into the proposed project area. Coupled with annual reporting, these measures should adequately monitor and help prevent the introduction or spread of aquatic invasive species within the proposed project area. We estimate the aquatic invasive species monitoring plan would have a levelized annual cost of $4,020 and that the benefits to aquatic resources would warrant the cost.

Noxious Weed and Revegetation Management Plan

Construction of the project would temporarily disturb 11.37 acres of vegetation. During operation, vegetation maintenance would occur within the project transmission corridor. These activities have the potential to create suitable habitat for new populations of noxious weeds. To address this, Rugraw proposes to implement its Noxious Weed and Revegetation Management Plan (filed on November 30, 2015) that includes numerous measures to prevent transportation of noxious weeds to the project site; monitoring and control measures for new weed populations that occur within the project boundary; and success criteria. However, the plan does not provide for additional actions if success criteria are not met, as recommended by Interior, nor does it include the Water Board's recommendations to treat existing noxious weed populations in the project boundary (preliminary condition 14) or provide for the protection of sensitive plants during treatment of weeds (preliminary condition 14).

As discussed in section 3.3.3.2, *Terrestrial Resources, Environmental Effects*, treating existing populations would reduce seed sources that could spread to areas of project disturbance. Additionally, while the proposed plan includes appropriate methods for measuring success of revegetation and weed treatments, there is no discussion of what would occur if criteria are not met. Modifying the plan to include additional seeding and weed treatment, as Interior recommends, would ensure the activities are not discontinued prematurely, but are implemented until goals are achieved and vegetation resources are restored. Finally, modifying the plan to include measures that would protect sensitive plants during application of weed treatments would reduce potential for accidental trampling, mechanical damage, or herbicide damage to sensitive species.

Therefore, we recommend modifying Rugraw's Noxious Weed and Revegetation Management Plan to include provisions for treatment of existing non-native invasive plant populations in the project boundary, additional reseeding and monitoring if restoration success criteria are not met by the end of the 2-year monitoring period, and measures to protect sensitive plant species from treatment would provide additional benefit to vegetation resources. We estimate these modifications would have a levelized annual cost of $650 and that the benefits to vegetation resources would warrant the cost.

Avian Protection Plan

Rugraw proposes to construct the project transmission line in accordance with APLIC recommendations. Interior recommends that Rugraw develop an avian protection plan that describes the protective measures that would be implemented to protect all avian species from adverse effects of power transmission line construction and operation (10(j) recommendation 7). As discussed in section 3.3.3.2, *Terrestrial Resources, Environmental Effects,* the APLIC manuals provide a variety of potential measures for minimizing potential for transmission lines to electrocute birds or cause injury associated with collisions. However, these manuals do not necessarily identify specific measures to be used in specific situations. Requiring Rugraw to develop a plan specifying which measures it proposes to implement would allow agencies to comment on whether the proposed measures are suitable for this specific project. Therefore, we recommend that Rugraw prepare, in consultation with California DFW and Interior, an avian protection plan describing what measures it would use to minimize effects of transmission lines on birds and describing how APLIC guidelines were considered in the development of the plan. We estimate the plan would have a levelized annual cost of $1,580 and that the benefits to wildlife resources would warrant the cost.

Bald Eagle and Raptor Management Plan

Rugraw proposes to conduct preconstruction surveys for raptors, including bald eagles, and implement appropriate protection buffers as needed during project construction. Interior recommends that Rugraw prepare a bald eagle management plan that would identify specific measures for protecting bald eagles from effects during project operations including, but not limited to, maintenance activities. As discussed in section 3.3.3.2, *Terrestrial Resources, Environmental Effects*, the National Bald Eagle Management Guidelines (FWS, 2007) recommend a variety of buffer distances to eagle nests depending on the intensity of disturbance activity, the location of the disturbance relative to nests, and the extent to which individual birds may be accustomed to noise disturbance and human activity. Other raptor species vary in sensitivity to disturbance and may require different buffer distances than bald eagles. Consultation with California DFW and FWS to prepare a bald eagle and raptor management plan would ensure any buffer distances proposed for the protection of raptors would be appropriate to the specific project conditions and species in consideration. Therefore, we find Rugraw should prepare a bald eagle and raptor management plan that specifies the project-specific buffers to be applied and describes how FWS guidelines were considered in identifying the buffers. We estimate the plan would have a levelized annual cost of $1,580 and that the benefits to bald eagles and other raptors would warrant the cost.

Special-status Amphibian Protection Plan

Rugraw proposes to avoid construction activities in riparian areas during the period when foothill yellow-legged frog egg masses are typically present (mid-April through mid-May). Rugraw also proposes to conduct preconstruction surveys for juveniles and adults immediately prior to in-water work during the foothill yellow-legged

frog breeding season (mid-March through August) and relocate any that are found to areas outside of potential disturbance.

Water Board preliminary condition 13 would require Rugraw to develop an amphibian monitoring plan that includes monitoring for all life stages of California red-legged frog, foothill yellow-legged frog, and Cascade frogs, specifically egg masses, tadpoles, and adult amphibians on South Fork Battle Creek between March and October. California DFW (10(j) recommendation 2) similarly recommends foothill yellow-legged frog monitoring. The recommended plan would also include annual reports that present monitoring data and analyze and evaluate frog populations and recommend actions based on population changes observed during monitoring.

Interior recommends that Rugraw prepare a California red-legged frog protection plan to provide for and allow the establishment of red-legged frogs in the project area, protection from manageable threats, and control of bullfrogs, which are an aquatic invasive species that prey upon red-legged frogs. Rugraw supports this measure, but contends there is no evidence bullfrogs caused the reduction in California red-legged frog populations in the project area.

As discussed in sections 3.3.2.2, *Aquatic Resources, Environmental Effects*, 3.3.3.2, *Terrestrial Resources, Environmental Effects,* and 3.3.4.2, *Threatened and Endangered Species, Environmental Effects*, project construction would potentially affect habitat for foothill yellow-legged frog, Cascade frog, and California red-legged frog. Protection measures are needed during construction to prevent effects on breeding foothill yellow-legged frog. We note that Rugraw's proposed measures do not address potential effects on larval frogs. We also note that, because larval frogs have potential to move back downstream into the construction zone, consultation with California DFW would be needed to identify a suitable distance upstream of the project area for the placement of relocated foothill yellow-legged frogs. Although they are unlikely to occur in the project area, Rugraw's proposal does not include preconstruction surveys and relocation of juvenile and adult Cascade frogs or surveys for California red-legged frogs.

To facilitate consultation and compliance, we recommend Rugraw prepare a special-status amphibian protection plan that incorporates all measures related to the protection of foothill yellow-legged frog, Cascade frog, and California red-legged frog. The special-status amphibian protection plan would be developed in consultation with FWS and California DFW, and include: (1) conducting preconstruction surveys for all life stages during the breeding season; (2) avoiding construction activities in riparian areas when egg masses are present; (3) stopping work and notifying FWS if California red-legged frogs are observed during preconstruction surveys or during construction; and (4) relocating larval, juvenile, and adult foothill yellow-legged and Cascade frogs prior to construction activities to an area sufficiently upstream to prevent them from re-entering the construction area. Although we find that the project impoundment could provide suitable breeding habitat for bullfrog, and thus impede potential reestablishment of California red-legged frog, measures to monitor and control bullfrogs in the

impoundment area are already included in our recommended aquatic invasive species monitoring plan discussed previously. Therefore, we do not recommend including any bullfrog control measures in the special-status amphibian protection plan. We estimate development of the special-status amphibian protection plan would have a levelized annual cost of $1,620, and the benefits to amphibian resources would justify this cost.

Historic Properties Management Plan

Rugraw proposes to implement the HPMP filed with its application that provides for the management of cultural resources and historic properties within the proposed project APE. Our analysis in section 3.3.7.2, *Cultural Resources, Environmental Effects*, indicates that, while the draft HPMP includes many of the standard requirements of an HPMP, some measures contained within the draft HPMP still require some clarification and/or more detail. In addition, there are other measures that should be included in the HPMP to ensure that the operation and maintenance of the project would not adversely affect historic properties over the term of any new license. As such, we recommend the implementation of Rugraw's draft HPMP with the following revisions: (1) inclusion of copies of all post-2013 tribal correspondence and consultation to document full compliance with section 106; (2) inclusion of a cultural resources interpretive element (e.g., installation of public interpretive signs at key viewing areas); (3) details for annual monitoring cultural resources that are eligible or potentially eligible for listing on the National Register, including filing of an annual monitoring report, or a plan to include these measures in the construction monitoring plan specified in section 4.5 of the HPMP; (4) provisions for periodic review and revision of the HPMP; and (5) editorial corrections.[65] We estimate that the levelized annual cost to revise and implement the

[65] Several small errors were identified in the HPMP and should be corrected in the revised HPMP: (1) sections 5.1 and 5.2 of the HPMP describe each site, building, structure, and object recorded in the project APE. In these sections, the descriptions of "*Treatment Measures During Project-related Construction*," "*Treatment Measures During Project-related O&M*," and "*Long-Term Monitoring Frequency*" for some non-road resources (CA-TEH-1824H [ditch]; CA-TEH-2041H [historic sawmill]; CA-THE-2113H [historic can and refuse scatter]; CA-TEH-2496H [historic refuse scatter]; CA-THE-2498H [historic refuse scatter]; CA-TEH-2520H [historic refuse scatter]; and CA-TEH-2500H [Lassen Lodge]) are described as: "None: road is not NRHP eligible." Please re-check, and if not a road, then change the description of the resource to what it actually represents; (2) include stand-alone sections for additional cultural resources inventories (section 4.6.3), archaeological site evaluation and data recovery excavation (section 4.6.4), and long-term historic property monitoring (section 4.6.5) rather than subsections of Road Maintenance and Rehabilitation (section 4.6); (3) "Atsugewi" is incorrectly spelled as "Astugewi" in the document and should be corrected, accordingly, and (4) Appendix D of the HPMP is difficult to read because of its extremely small font size. Use of a larger font or different format for the table would ensure legibility.

HPMP for the project would be $5,170 and conclude the benefits of cultural resource protection justify the cost.

5.1.3 Other Measures Not Recommended by Staff

In addition to those measures discussed in the previous section for which staff recommended alternatives or modifications, staff finds that some of the measures recommended by Rugraw or other interested parties would not contribute to the best comprehensive use of South Fork Battle Creek water resources, do not exhibit sufficient nexus to project environmental effects, or would not result in benefits to non-power resources that would be worth their cost. The following section presents the basis for staff's conclusion not to recommend those measures.

BMI Monitoring Plan

NMFS and Interior recommend (10(j) recommendation 5) that Rugraw develop a BMI monitoring plan that includes surveys at least 1 year prior to construction and in years 1 through 4 and every 4 years thereafter through the term of the license. Interior further stipulates that, if key BMI population parameters decrease by more than 50 percent, Rugraw would prepare a riparian restoration plan and mitigation plan targeted at increasing BMI production. In response to the NMFS and Interior recommendations, Rugraw agreed to conduct a baseline BMI survey in the proposed bypassed reach prior to project construction.

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects,* operation of the proposed project would alter the existing flow, water temperature, water quality, and sediment transport characteristics of South Fork Battle Creek, which in turn could affect distribution, abundance, and composition of BMI. However, it is anticipated that Rugraw's proposed mitigation measures including run-of-river operation, minimum flows, ramping rates, BMPs during construction, and sediment and woody debris passage at the dam, would adequately protect aquatic habitat and BMI in the project affected reach. While continued sampling of BMI, as recommended by the resource agencies, would enable any general trends to be documented, we cannot envision a scenario where project construction and operation, with protection and enhancement measures that would be included in any new license, would result in a different conclusion as to the overall project effects on the resource beyond that already evaluated in this EIS. Further, general monitoring of BMI would not necessarily isolate any project-specific effects on the resources. Consequently, we find that the monitoring data would provide minimal benefits from a project-specific perspective. We estimate that BMI monitoring would have a levelized annual cost of $6,150, and would not be worth the cost to implement.

Fish Habitat Assessment Plan

To monitor the effects of the proposed project on aquatic habitat, the Water Board recommends that Rugraw develop a fish habitat assessment plan (preliminary condition

12). The fish habitat assessment plan would be prepared in consultation with Water Board staff and other relevant resource agencies and include monitoring of habitat features (such as water temperature, stream depth, flow velocities, water quality, sediment transport, etc.) associated with resident fish populations and ESA- and CESA-listed fish species potentially found within the project area.

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects,* operation of the proposed project would alter the existing flow, water temperature, water quality, and sediment transport characteristics of South Fork Battle Creek, which in turn could affect the distribution and abundance of resident rainbow trout, BMI, and potentially Chinook salmon and steelhead, if introduced to the reach. Although long-term monitoring of aquatic habitat conditions in the project's proposed bypassed reach, as recommended by the Water Board, could allow Rugraw and resource agencies to evaluate any changes in aquatic habitat over time and determine if required mitigative measures are effective at meeting resource objectives, we cannot envision a scenario where project construction and operation, with protection and enhancement measures that would be included in any new license, would result in a different conclusion as to the overall project effects on the resource beyond that already evaluated in this EIS. Further, general monitoring of fish habitat would not necessarily isolate any project-specific effects on the resources. Consequently, we find that any monitoring data would provide minimal benefits from a project-specific perspective. Measures proposed by Rugraw and recommended by staff should adequately protect aquatic habitat in the project affected reach of South Fork Battle Creek. Therefore, we are not recommending the fish habitat assessment plan.

Minimum Instream Flow of 35 cfs

We do not recommend NMFS's and Interior's 35-cfs minimum flow recommendation because it was developed based on results of a PHABSIM study performed in the bypassed reach that predicted the usable habitat for steelhead and spring-run Chinook salmon juveniles and fry (Thomas R. Payne & Associates, 1995). At present, neither steelhead trout nor spring-run Chinook salmon occur in the proposed bypassed reach. Panther Grade at RM 18.9 would prevent these species from entering the project reach in all but the most extreme high flow conditions, assuming that fish are passed upstream of Inskip dam.[66] Setting the minimum flow at 35 cfs to provide maximum habitat for a non-extant fish assemblage is questionable, particularly in light of potential effects on power generation. However, if anadromous salmonids gain access to the project reach, the project would not be operating during Chinook salmon spawning season. During steelhead spawning, the recommended 13-cfs minimum instream flow would support a spawning capacity that would produce a number of steelhead parr that

[66] Fish passage at Inskip dam is planned as part of the Battle Creek Salmon and Steelhead Restoration Project and scheduled for 2020.

would far exceed the steelhead rearing capacity of the reach, and a 35-cfs instream flow would exceed that capacity many times over.

In the absence of anadromous fish, rearing capacity is also the most limiting factor for resident rainbow trout in the bypassed reach. This rearing capacity is determined by the limited volume of habitat during the low flow season, when the project would not be operating and thus would not affect the rearing capacity of rainbow trout. According to Cramer et al. (2015), the parr equivalent capacity for rainbow trout spawning is slightly less than that for steelhead, but still far greater than needed to fully seed the available rearing habitat, even for spawning at 13 cfs. Although spawning capacity would increase at flows above 13 cfs, the increased number of offspring would be forced to migrate in search of vacant rearing habitat downstream. However, this would appear to be of negligible benefit, because similar stream morphology downstream from the project indicates that spawning capacity likely exceeds rearing capacity throughout South Fork Battle Creek. The levelized annual cost for a 13-cfs minimum flow would be $6,500, while the levelized annual cost of a 35-cfs minimum flow would be $346,940, which would have major effects on project economics without providing substantial additional fishery habitat benefits. Therefore, we do not recommend a 35-cfs minimum flow for the bypassed reach.

Temperature Thresholds

Operation of the project could result in slightly less cooling in the bypassed reach than occurs under existing conditions during periods with warmer inflow temperatures. Rugraw proposes and California DFW recommends (10(j) recommendation 1) that the project cease operating when water temperature in the bypassed reach exceeds an average daily temperature of 20ºC. Interior and NMFS (10(j) recommendation 2) request that project operations be curtailed as needed to prevent exceedance of EPA's (2003) 7DADM of 18ºC in the bypassed reach. In addition, NMFS recommends limiting bypassed reach 7DADM temperatures both upstream and downstream of Angel Falls to 13ºC and 16ºC from November 1 to March 1 for salmonid spawning, and from March 2 to May 31 for salmonid rearing, respectively (10(j) recommendation 2).

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, implementing a temperature threshold would provide little, if any, benefit, because the limiting factor for salmonid populations in the bypassed reach is the volume of habitat during the low flow season, when the project would not be operating. Furthermore, temperature modeling shows that project inflow temperatures exceeding 20ºC would cool in the bypassed reach under project operation. However, whenever the project is shut down because of insufficient flows or temperature criteria, if implemented, the warming and cooling patterns observed in the bypassed reach would be the same as baseline conditions. Any of the project effects (warming or cooling water temperatures) predicted by the modeling would not occur during project shutdown.

We also considered the maximum water temperatures likely to occur with project operation, based on water temperature modeling and existing data. Maximum water temperatures of 17 to 18°C (occasionally higher than 20°C) could occur both under baseline conditions and during project operation in warmer months. Maximum temperatures would depend on the water year type, with lower temperatures during higher flow years. For rainbow trout, the most common species in the project reach of South Fork Battle Creek, the University of California, Division of Agriculture and Natural Resources (2017) states that optimal rainbow trout growth occurs at temperatures ranging from 15 to 18ºC, and mortality typically results at 24 to 27ºC. Therefore, maximum water temperatures would generally remain within the optimum growth range for rainbow trout, while occasionally approaching the range where stress could occur.

This analysis concludes there would be little benefit in requiring temperature criteria to trigger project shutdowns: in many years the project would already be shut down because of low streamflow during those periods, and, even if the project is operating, it would act to cool temperatures in the creek. There would be minimal benefits to water temperature in requiring Rugraw to establish a water temperature monitoring program and an operational program to direct project shutdown when temperature criteria are exceeded. We describe other limiting factors for salmonid populations in South Fork Battle Creek (see *Operational Effects on Aquatic Habitat and Biota*), and those factors would likely have a greater effect on those populations than any minor temperature effects of proposed project operation. We estimate that operating the project to avoid or prevent instantaneous water temperatures in the bypassed reach greater than 20ºC would have a levelized annual cost of $9,750, compared to a levelized annual cost of $13,000 for the Interior recommendation, and $16,250 for the NMFS recommendation using the 7DADM criteria, which would not provide greater benefits to aquatic resources. Therefore, we do not recommend using a temperature criterion as a temperature threshold for project shutdown.

Temperature Monitoring

As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, project operation would alter the existing flow regime of South Fork Battle Creek and may have minor effects on water temperature in the project's bypassed reach. The project would operate in run-of-river mode diverting between 5 and 105 cfs for power generation, primarily during the winter and spring months when peak streamflows in the watershed occur. During the summer months, when higher water temperatures would occur, the project would be mostly shut down, all inflow would be passed into the bypassed reach, and water temperatures would be the same baseline conditions.

Although Rugraw, California DFW, Interior, and NMFS all recommend developing water temperature criteria that would require project shutdown whenever those criteria are exceeded, our analysis concludes that project shutdowns based on those criteria would not be beneficial and are not recommended (see above discussion, *Temperature Thresholds*). Rugraw and the agencies also propose and recommend a

water temperature monitoring program to ensure the project operates in compliance with any water temperature criteria. Rugraw and the agencies propose and recommend a different number and locations for water temperature monitoring stations. However, we conclude that, because we are not recommending any water temperature criteria related to project operation, there would be no need for water temperature monitoring and are therefore not recommending it.

We estimate that Rugraw's proposed water temperature monitoring would have a levelized annual cost of $50,120, California DFW's recommended water temperature monitoring would have a levelized annual cost of $51,660, and NMFS/Interior's recommended water temperature monitoring would have a levelized annual cost of $54,730. These costs would not be worth the limited benefit of any water temperature monitoring.

Salmonid Monitoring Plan

Rugraw proposes to conduct snorkel surveys for anadromous fish upstream of Panther Grade within a month of each 400 cfs or greater flow event.[67] Rugraw also proposes to conduct genetic tissue sampling of steelhead/rainbow trout within the bypassed reach. Interior and NMFS recommend long-term monitoring of both resident and anadromous fish, and Water Board preliminary condition 11 specifies "monitoring all fish species within and downstream of the Project area." As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects,* although Rugraw's proposal to conduct genetic sampling for steelhead and snorkel surveys could provide general fisheries management information on the distribution of resident and anadromous salmonids in the bypassed reach, this information would be unrelated to a specific project effect (i.e., the presence of anadromous fish at the project would depend upon, among other non-project-related factors, successful fish passage at downstream dams and over Panther Grade). Therefore, there is no project-specific basis for requiring Rugraw to monitor for any future presence of anadromous fish at the project as a condition of any license issued. For resident salmonids, we have already evaluated the potential project effects and benefits and costs of mitigation measures in this EIS. We have further concluded that our recommended environmental measures would adequately protect resident fish within the bypassed reach. Therefore, there is no project-specific need for the monitoring data. For these reasons, we do not recommend Rugraw's proposed general monitoring or the resource agencies' recommended long-term general monitoring of resident and anadromous salmonids in the bypassed reach, including Water Board preliminary condition 11. We estimate that Rugraw's proposed monitoring program would have a levelized annual cost of $5,040, and the Interior and NMFS recommended monitoring program would have a levelized annual cost of $18,170. We assume that the cost for preliminary condition 11 would be similar to the Interior and NMFS program. None

[67] As noted in section 3.3.2.2, *Aquatic Resources,* Panther Grade is a barrier to upstream fish migration when flows are less than approximately 400 cfs.

would be worth the cost for the minimal project-specific benefit from the information that would be obtained by any fish monitoring program.

Streambed and Riparian Area Restoration

Interior recommends that, if water is not available to comply with the 7DADM criteria specified in its temperature threshold recommendation discussed above, or if water temperature above the project's influence exceeds the criteria, Rugraw should restore streambed and riparian areas to provide additional shading to reduce instream water temperatures (10(j) recommendation 2). As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, it is conceivable that streambed and/or riparian restoration projects could contribute to reducing warming in the creek and/or increasing water availability. However, our water temperature analysis indicates that the project would have minor effects on water temperature in South Fork Battle Creek, and under some conditions would act to cool temperatures in the creek. There would still be the potential for warmer water temperatures in waters entering the project area from upstream anthropogenic effects, but Rugraw should not be required to address effects upstream of the project that do not have a project nexus and are beyond its control.

Upstream Fish Passage at the Diversion Dam

Rugraw proposes and California DFW recommends (10(j) recommendation 4) the design and construction of upstream fish passage facilities at the project diversion in coordination with California DFW, and incorporating NMFS Southwest Region Fish Screening Criteria for Anadromous Salmonids and NMFS Northwest Region Anadromous Salmonid Passage Facility Design, to ensure fish are able to pass over the diversion dam after completion of the project. Although installation of the proposed upstream fish passage facilities would likely provide safe, timely, and effective upstream passage for resident rainbow trout, this measure would only benefit resident trout residing in the 0.7-mile-long reach of South Fork Battle Creek between Angel Falls and the diversion dam.[68] Given the limited extent of the reach (0.7 mile) and the limited amount of summer rearing habitat for rainbow trout located there, as well as the lack of anadromous species, we find that the benefit of providing upstream fish passage at the project's diversion dam to be outweighed by the estimated capital cost of $300,000 (levelized annual cost of $23,080). As we previously described, reseeding of the stream with trout occurs naturally from upstream and does not depend on the ability of trout downstream to migrate upstream over passage barriers. If anadromous salmonids gain access to the bypassed reach in the future, they would not require passage at the diversion dam because the impassable Angel Falls would prevent fish from reaching the dam. Any upstream passage facility at the dam would likely only be used by a limited number of resident fish that would not require upstream passage to complete their life history. Therefore, we do not recommend Rugraw's proposal or California DFW's

[68] Angel Falls, located at RM 22.3, is a natural barrier to upstream fish passage.

recommendation for the design and construction of upstream fish passage facilities at the diversion dam.

Drought Plan

The Water Board recommends implementation of a drought plan to outline project operation, including flows, during a drought and/or multiple critically dry years (preliminary condition 4). The drought plan would also include a measure for requesting WQC variances during drought conditions. As discussed in section 3.3.2.2, *Aquatic Resources, Environmental Effects,* developing a drought plan to maintain flows and water levels during drought conditions would not be required to protect water quality for aquatic species. The proposed project would operate in a run-of-river mode with a proposed minimum bypassed reach flow, operate as a non-consumptive use of water for power generation (i.e., all of the diverted flow would be returned to South Fork Battle Creek), and would not store flow in a reservoir. The project as proposed would not exacerbate drought conditions in downstream stream reaches. Therefore, we do not recommend that Rugraw develop a drought plan as outlined in the Water Board's preliminary condition 4.

Special-status Amphibian Monitoring

The Water Board (as part of preliminary condition 13) and California DFW (10(j) recommendation 2) recommend general post-construction monitoring for foothill yellow-legged frog, Cascade frog, and California red-legged frog. Rugraw is in agreement with these recommendations. However, as discussed in sections 3.3.3 and 3.3.4, the recommended measures do not indicate how monitoring would be used to identify project-related effects, what level of effects would be considered adverse, or what mitigation would be implemented. Monitoring alone would not provide project-related protection, habitat enhancement, or mitigation, so any benefits of this measure cannot be analyzed. Further, because the project would not create artificial high flows in summer, would not remove channel-forming winter and spring flood flows, and would only create a small impoundment, we find the project avoids the primary mechanisms through which hydro projects typically affect sensitive frogs. We find the benefits of the monitoring efforts are not worth the estimated levelized annual cost of $770. Therefore, we do not recommend including monitoring of sensitive frogs as part of the license.

California Red-legged Frog Protection Measures

Interior 10(j) recommendation 8 includes measures for the conservation of California red-legged frogs to provide for and allow California red-legged frogs to become reestablished and protection from manageable threats. However, Interior does not specify what actions these measures would include or how it intends Rugraw to provide for reestablishment. As discussed in section 3.3.4.2, *Threatened and Endangered Species*, there is no evidence California red-legged frog currently exists in the project vicinity. Areas where project studies identified suitable habitat are associated with

manmade ponds on private property adjacent to the transmission line route. The project would have no effect on habitat in these areas. Aside from control of bullfrog, if the species become established in the project impoundment, which is incorporated into our recommended aquatic nuisance species management plan, we have not identified any protection or reestablishment measures that would have a nexus to the project. We find the benefits of these measures are not worth the estimated levelized annual cost of $770. Therefore, we do not recommend including these components of Interior's 10(j) recommendation 8 in our recommended special-status amphibian protection plan.

Consultation and Review

Water Board preliminary condition 5 would require Rugraw to consult annually with relevant resource agencies to review current lists of rare, threatened, and endangered species and special-status plant and wildlife species to identify species that have the potential to be adversely impacted by the project. Species-specific study plans would be developed or updated, in consultation with relevant resource agencies, whenever new potential impacts or newly listed species are identified. Rugraw agrees to implement this measure.

Our analysis in section 3.3.4.2, *Threatened and Endangered Species, Environmental Effects*, indicates that although we agree that consultation prior to new construction and non-routine maintenance would protect federally listed species and their habitats over the term of the license, the Commission typically includes in its licenses a standard license article providing such protection. This license article contains a fish and wildlife reopener provision that could be used to require changes to project facilities, operations, or maintenance plans upon the Commission's motion, or as recommended by the appropriate state or federal fish and wildlife agencies, after notice and opportunity for hearing. This standard reopener provision retains authority for the Commission to implement any measures that may be needed to protect threatened or endangered species or other fish and wildlife resources over the term of any license issued for the project. We recognize, however, that these annual review and consultation measures are included in the preliminary WQC conditions and would be required as mandatory conditions of any license issued for the project if they also are included in the final WQC.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Project construction would disturb soils in the project area, resulting in temporary adverse effects on soil resources. Rugraw's proposed erosion control measures, SWPPP, and proposed construction plans provide a comprehensive set of measures to avoid or minimize construction effects on soil erosion, sedimentation, and water pollution during construction. Even with implementation of these plans, there would still be temporary increases in sediment and turbidity levels that would cause short-term effects on aquatic biota in South Fork Battle Creek.

Construction of the diversion dam would create a small headpond of about 0.4 acre with negligible storage. Although this small impoundment would replace existing

stream habitat, this new impoundment would be similar to other pools within South Fork Battle Creek and overall would not have a substantial effect on stream habitat in the creek.

Project operation would cause some flow fluctuations in the bypassed reach. Reducing flows in the bypassed reach could reduce transport of gravel and fine sediment within South Fork Battle Creek. Rugraw's proposal to sluice gravels and fines at the diversion dam, however, would ensure suitable spawning and rearing habitat is available to salmonids and minimize any adverse effects downstream of the dam.

Project construction would result in the permanent loss or alteration of about 69 acres of vegetated wildlife habitat, including about 31 acres of Sierran mixed conifer, 5 acres of annual grassland, 3 acres of blue oak woodland, 4 acres of blue oak-foothill pine-interior live oak, and about 7 acres of mixed and montane chaparral. Roughly 11 acres of temporary vegetation disturbance would also occur during project construction. The use of construction equipment could introduce invasive plant species and provide opportunities for them to colonize areas where land has been disturbed during project construction. However, revegetating the disturbed areas and ensuring the successful establishment of native vegetation would help to control the introduction and spread of invasive plant species.

Wildlife would be disturbed by noise and human presence during the construction period and, to a lesser extent, project operation and maintenance. The overhead transmission line could result in bird collisions which could cause direct injury or mortality of individual animals. Designing the overhead line consistent with practices outlined by APLIC, including marking to increase visibility, would minimize this potential to the greatest extent practicable. Existing recreational access to the project area, while generally minor and limited to private recreation, would be periodically interrupted during the construction period.

5.3 RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, 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 will attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

In response to our April 26, 2016, notice accepting the application to license the project and soliciting motions to intervene, protests, comments, recommendations,

preliminary terms and conditions, and preliminary fishway prescriptions, California DFW, NMFS, and Interior, collectively, filed 22 recommendations under section 10(j) of the FPA.[69] We found that 14 of the 22 recommendations to be within the scope of 10(j). Of the 14 recommendations within the scope of 10(j), we determined that 4 may be completely inconsistent, and one is partially inconsistent with the purpose and requirements of the FPA or other applicable law. Table 5-1 lists each of these recommendations and whether they are adopted in the staff alternative. Environmental recommendations that we consider outside the scope of section 10(j) are considered under section 10(a) and addressed in the specific resource sections of this document and the previous section.

Sections 5.1.2, *Additional Measures Recommended by Staff*, and 5.1.3, *Other Measures Not Recommended by Staff*, discuss the reasons we do or do not recommend adopting measures that we have determined are within the scope of section 10(j).

Table 5-1. Fish and wildlife agency recommendations for the Lassen Lodge Project (Source: staff).

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
1. Maintain upstream and downstream fish passage during construction.	California DFW (Recommendation 4)	Yes	$770	Yes
2. Provide downstream fish passage at project diversion works.	California DFW (Recommendation 4)	Yes	$3,250	Yes
3. Provide upstream fish passage during project operation	California DFW (Recommendation 4)	Yes	$26,330	No (see section 5.1.3).[a]

[69] As shown in table 5-1, California DFW filed 10 recommendations on June 16, 2016; NMFS filed 7 recommendations on June 21, 2016; and Interior filed 11 recommendations on June 24, 2016. Because six of the recommendations filed by both NMFS and Interior are identical, we refer to the overall number of recommendations as 22.

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
4. Coordinate with California DFW on the design of the fish screen at the diversion.	California DFW (Recommendation 4)	No, not a specific measure to protect, mitigate, or enhance fish and wildlife resources	$0	Yes
5. Design the upstream fishway according to California DFW design standards.	California DFW (Recommendation 4)	No, compliance with agency standards is not a specific fish and wildlife measure.	$0	No (see section 5.1.3).[a]
6. Implement a minimum instream bypass flow of 13 cfs, or inflow, whichever is less, at all times, and do not begin operations until flows reach 18 cfs.	California DFW (Recommendation 1)	Yes	$6,500	Yes
7. Implement a minimum instream bypass flow of 35 cfs, or the natural flow, if less, at all times.	NMFS and Interior (Recommendation 1)	Yes	$346,940	No (see section 5.1.3).[a]
8. Monitor stream flow at the diversion structure.	California DFW (Recommendation 1)	Yes	$7,270	Yes

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
9. Develop a flow gage monitoring plan and monitor stream flow at seven locations	NMFS and Interior (Recommendation 3).	Yes	$26,420	Yes, included in our recommended streamflow and water temperature monitoring plan, except we recommend flow and temperature monitoring at three locations (see section 5.1.2).
10. Provide a ramping rate of change that will not exceed 1 inch of stage change per hour.	NMFS and Interior (Recommendation 1)	Yes	$3,250	Yes, except we recommend a ramping rate of 0.1 foot per hour (see section 5.1.2)
11. Provide a ramping rate of change that will not exceed 0.1 foot of stage change per hour.	California DFW (Recommendation 2)	Yes	$3,250	Yes
12. Develop a salmonid monitoring plan that includes quarterly snorkel surveys for anadromous and resident salmonids for the duration of the license term	NMFS and Interior (Recommendation 4)	No, general presence/ absence fish monitoring is not a specific fish and wildlife measure	$18,170	No

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
13. Develop a water temperature monitoring plan with six monitoring stations and project shutdown or reduction when temperature exceeds 20ºC.	California DFW (Recommendation 3)	No	$51,660	No (see section 5.1.3).[a]
14. Develop a water temperature monitoring plan with seven monitoring gages	NMFS and Interior (Recommendation 2)	No	$54,730	No (see section 5.1.3).[a]
15. Implement a project shutdown or reduction when temperature exceeds 18ºC 7DADM in the bypassed Reach.	Interior (Recommendation 2)	Yes	$13,000	No (see section 5.1.3).
16. Implement a project shutdown or reduction when temperature exceeds 7DADM criteria of 13ºC for salmonid spawning, 16ºC for salmonid rearing, and 18ºC at other times.	NMFS (Recommendation 2)	Yes	$16,250	No (see section 5.1.3).
17. Develop a BMI monitoring plan to monitor BMI once prior to project construction, during	NMFS and Interior (Recommendation 5)	No	$6,150	No (see section 5.1.3).[a]

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
the first 4 years of project operation, and every 4 years thereafter for the term of the license.				
18. Design and construct the transmission line in compliance with APLIC guidance to reduce effects on avian species.	Interior (Recommendation 7)	No, compliance with agency guidelines is not a specific fish and wildlife measure	$960	No
19. Develop a bald eagle management plan.	Interior (Recommendation 7)	Yes	$1,580	Yes
20. Develop an avian protection plan.	Interior (Recommendation 7)	Yes	$1,580	Yes
21. Develop a California red-legged frog protection plan and protect their breeding habitat during construction.	Interior (Recommendation 8)	Yes	$770	Yes, included in our recommended special-status amphibian monitoring and protection plan (see section 5.1.2).

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
22. Develop a foothill yellow-legged frog monitoring plan.	California DFW (Recommendation 2)	No, general monitoring without triggers for mitigation is not a specific fish and wildlife measure	$770	No (see section 5.1.3).

[a] Preliminary findings that recommendations found to be within the scope of section 10(j) are inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA, are based on staff's determination that the costs of the measures outweigh the expected benefits.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C.§803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 16 comprehensive plans that are applicable to the Lassen Lodge Project, located in California and no inconsistencies were found:

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