Office of
Energy
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FERC/EIS-0281F

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE

Yuba River Development Project
Project No. 2246-065 – California

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

U.S. Army Corps of Engineers, Sacramento District
Operations and Readiness Branch
1325 J Street
Sacramento, CA 95814-2922

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FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Final Environmental Impact Statement

Attached is the final environmental impact statement (final EIS) for the Yuba River Development Project (No. 2246-065), located in northern California on the western slope of the Sierra Nevada Mountains. The project includes three developments—New Colgate, New Bullards Bar Minimum Flow, and Narrows 2—located on the Yuba River, North Yuba River, Middle Yuba River, and Oregon Creek in Yuba, Sierra, and Nevada Counties. The project occupies federal land, including 4,416.7 acres administered by U.S. Department of Agriculture, Forest Service, and 16.1 acres administered by the U.S. Army Corps of Engineers that is part of the Englebright Dam and Reservoir.

This final EIS documents the views 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 relicensing the Yuba River Development Project.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The final EIS will be part of the record from which the Commission will make its decision. The final EIS was sent to the U.S. Environmental Protection Agency and made available to the public on or about January 2, 2019.

Copies of the final EIS are available for review in the Commission's Public Reference Branch, Room 2A, located at 888 First Street, N.E., Washington 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: Final Environmental Impact Statement

COVER SHEET

a. Title:	Relicensing the Yuba River Development Project, Docket No. P-2246-065
b. Subject:	Final Environmental Impact Statement
c. Lead Agency:	Federal Energy Regulatory Commission
d. Cooperating Agency:	U.S. Army Corps of Engineers
e. Abstract:	The Yuba River Development Project (FERC No. 2246) is located in Yuba, Sierra, and Nevada Counties, California. The project comprises three developments—New Colgate, New Bullards Bar Minimum Flow, and Narrows 2—with a combined capacity of 361.9 megawatts and generates an average of about 1,418 gigawatt-hours of energy annually. The project affects 4,416.7 acres within the Plumas and Tahoe National Forests administered by the U.S. Department of Agriculture, Forest Service, and 16.1 acres that are administered by U.S. Army Corps of Engineers associated with the Englebright Dam and Reservoir. The Yuba County Water Agency (YCWA) proposes to implement measures to protect and enhance environmental conditions. YCWA proposes to maintain all existing facilities with modifications to project operation, including increased capacities of outlets to accommodate proposed increased minimum flows. Also, YCWA proposes to add (1) the New Bullards Bar Dam auxiliary flood control outlet and (2) the New Colgate Powerhouse tailwater depression system. The staff's recommendation is to relicense the project as proposed by YCWA with some modifications and additional measures.
f. Contact:	Alan Mitchnick Federal Energy Regulatory Commission Office of Energy Projects 888 First Street, N.E. Washington, D.C. 20426 (202) 502-6074 David Simpson U.S. Army Corps of Engineers, Sacramento District Operations Technical Section 1325 J Street, Sacramento, CA 95814 (916) 557-7129

g. Transmittal:	This final environmental impact statement to relicense the Yuba River Development Project is being made available to the public on or about January 2, 2019, as required by the National Environmental Policy Act of 1969[1] and the Commission's Regulations Implementing the National Environmental Policy Act (18 CFR, 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).

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 not inconsistent with the FPA 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]

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[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 CFR § 385.206 (2018).

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ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
Advisory Council	Advisory Council on Historic Preservation
APE	area of potential effects
AWQC	ambient water quality criterion
BAOT	boats-at-one-time
Basin Plan	Water Quality Control Plan for the Sacramento and the San Joaquin River Basins
BLM	Bureau of Land Management
BMI	benthic macroinvertebrates
BMP	best management practice
B.P.	before present
ºC	degrees Celsius
CAD	cumulative acre-days of floodplain inundation
California DFA	California Department of Food and Agriculture
California DFW	California Department of Fish and Wildlife
California DWR	California Department of Water Resources
cbec	cbec, inc. eco engineering
certification	water quality certification
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
Corps	U.S. Army Corps of Engineers
CTR	California Toxics Rule
DO	dissolved oxygen
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture, Forest Service
FPA	Federal Power Act
FR	Federal Register
FWN	Foothills Water Network
FWS	U.S. Department of the Interior, Fish and Wildlife Service
HPMP	Historic Properties Management Plan
HZ	hydrologic zones
Interior	U.S. Department of the Interior
kVA	kilovolt-ampere

kW	kilowatt
LWM	large woody material
mg/L	milligram per liter
MW	megawatt
MWh	megawatt-hour
National Park Service	U.S. Department of the Interior, National Park Service
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NFS	National Forest System
NFS land	National Forest System land (public land managed by the Forest Service)
NHPA	National Historic Preservation Act of 1966
NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NMWSE	normal maximum water surface elevation
NTU	nephelometric turbidity unit
PA	Programmatic Agreement
PBF	physical or biological feature(s)
PCE	primary constituent element
PG&E	Pacific Gas and Electric Company
PNF	Plumas National Forest
ppm	parts per million
RDs	recreation days
RM	river mile
RMT	Lower Yuba Accord River Management Team
ROS	Recreation Opportunity Spectrum
RV	recreation vehicle
SD1	Scoping Document 1
SD2	Revised Scoping Document
SHPO	State Historic Preservation Officer
SWPPP	stormwater pollution prevention plan
SYRCL	South Yuba River Citizen's League
TCP	traditional cultural property
TNF	Tahoe National Forest
U.S.C.	United States Code
USGS	U.S. Department of the Interior, Geological Survey
VQO	Visual Quality Objective
Water Board	California State Water Resources Control Board
WR	Water Right
WUA	weighted usable area
YCWA	Yuba County Water Agency
Yuba Accord	Lower Yuba River Accord

EXECUTIVE SUMMARY

On April 28, 2014, Yuba County Water Agency (YCWA or applicant) filed an application for a new license with the Federal Energy Regulatory Commission (Commission or FERC) to continue to operate and maintain the Yuba River Development Project (FERC No. 2246).[7] The project has an existing capacity of 361.9 megawatts (MW) and includes three developments located on the main stem of the Yuba River; Middle Yuba River; North Yuba River; and Oregon Creek, a tributary to the Middle Yuba River, in Yuba, Sierra, and Nevada Counties, California. The Yuba River is a tributary to the Feather River and is part of the Sacramento River Basin, which drains into San Francisco Bay. The project currently occupies 4,432.8 acres of federal land, consisting of 4,416.7 acres within the Tahoe and Plumas National Forest associated with the New Colgate Development, which is administered by the U.S. Department of Agriculture, Forest Service (Forest Service), and 16.1 acres associated with the Narrows 2 Development, which is administered by the U.S. Army Corps of Engineers (Corps).

Project Description

The project's three developments, generally situated upstream to downstream, are: (1) the New Colgate Development located on the North Yuba River, Middle Yuba River, Yuba River, and Oregon Creek; (2) the New Bullards Bar Minimum Flow Development, located on the North Yuba River; and (3) the Narrows 2 Development, located on the Yuba River. No project transmission lines are associated with any of the developments. The New Bullards Bar minimum flow unit ties into the electric grid at the transformer next to the unit. The New Colgate Powerhouse ties into the grid at the New Colgate Switchyard adjacent to the powerhouse.

New Colgate Development

Water impounded by the 70-foot-high Our House Diversion Dam on the Middle Yuba River is conveyed to Oregon Creek through the 19,395-foot-long Lohman Ridge Diversion Tunnel. From there, water impounded by the 42.5-foot-high Log Cabin Diversion Dam is conveyed to the 4,790-acre New Bullards Bar Reservoir on the North Yuba River through the 6,121-foot-long Camptonville Diversion Tunnel. Water is conveyed through the 645-foot-high New Bullards Bar Dam to the New Colgate Powerhouse on the Yuba River via the 5.2-mile-long New Colgate Power Tunnel and Penstock.

The powerhouse contains two vertical-shaft Pelton-type turbines with an installed capacity of 315 MW, operating at a maximum hydraulic capacity of 3,430 cubic feet per second (cfs). Powerhouse flows discharge into the Yuba River.

[7] YCWA filed an amended license application on June 5, 2017.

The New Colgate Development has 16 developed recreation facilities at New Bullards Bar Reservoir, which include: (1) Hornswoggle Group Campground; (2) Schoolhouse Campground; (3) Dark Day Campground; (4) Cottage Creek Picnic Area; (5) Garden Point Boat-in Campground; (6) Madrone Cove Boat-in Campground; (7) Frenchy Point Boat-in Campground; (8) Dark Day Picnic Site; (9) Sunset Vista Observation Site; (10) Dam Overlook Observation Site; (11) Moran Road Boating Site; (12) Cottage Creek Boat Launch; (13) Dark Day Boat Launch, including the Overflow Parking Area; (14) Schoolhouse Trail; (15) Bullards Bar Trail; and (16) floating comfort stations.[8]

New Bullards Bar Minimum Flow Development

Water from the New Bullards Bar Reservoir is conveyed to the New Bullards Bar Minimum Flow Powerhouse on the North Yuba River through a 70-foot-long steel penstock. The powerhouse contains a single Pelton-type turbine with an installed capacity of 150 kilowatts, operating under a rated flow capacity of 5 cfs. Powerhouse flows discharge directly into the North Yuba River, downstream of New Bullards Bar Dam.

Narrows 2 Development

Water from Englebright Reservoir (non-project) is conveyed to the Narrows 2 Powerhouse on the Yuba River through the 737-foot-long Narrows 2 Powerhouse Penstock. The powerhouse contains a single Francis-type turbine with an installed capacity of 52.5 MW, operating at a maximum hydraulic capacity of 3,400 cfs. Powerhouse flows discharge into the Yuba River downstream of Englebright Dam. During times of full or partial powerhouse shutdowns, water is conveyed to the Yuba River through the Narrows 2 full bypass.

[8] YCWA's revised Recreational Facilities Plan (RR1), filed September 19, 2018, revises the names of several of the recreation sites, notably, the Dark Day Picnic Area becomes the Dark Day Picnic Site; Sunset Vista Point becomes Sunset Vista Observation Site; Dam Overlook becomes Dam Overlook Observation Site; and Moran Road Day Use Area becomes Moran Road Boating Site. YCWA indicates that the names have been changed to be consistent with the Forest Service's current facility naming guidelines based on the amenities provided at each facility. To avoid confusion and maintain consistency, the names of the above-mentioned facilities have been changed in the final EIS.

Project Operation

The Our House Diversion Dam is used to divert up to 860 cfs of water from the Middle Yuba River to New Bullards Bar Reservoir via Oregon Creek, primarily in winter and spring during high-flow periods. A fish-release outlet near the base of the dam is used to maintain a minimum flow of 50 cfs from April 15 to June 15 and 30 cfs from June 16 to April 14 in the Middle Yuba River downstream of the diversion dam.

The Log Cabin Diversion Dam is used to divert up to 1,100 cfs of water from Oregon Creek to New Bullards Bar Reservoir, primarily in winter and spring during high-flow periods. The fish-release outlet is used to maintain a minimum flow of 12 cfs from April 15 to June 15 and 8 cfs from June 16 to April 14 in Oregon Creek downstream of the diversion dam.

The New Bullards Bar Reservoir is the principal storage facility for the project; it also provides flood control and serves as a water supply for both domestic and irrigation purposes. The reservoir has a gross storage capacity of approximately 966,103 acre-feet and a usable storage capacity of approximately 736,103 acre-feet. In accordance with a contract between YCWA and the Corps, a portion of the usable capacity, 170,000 acre-feet, must be available for flood management from November 1 through March 31, with lesser amounts of flood storage required during September, April, and May. Releases from New Bullards Bar Reservoir are made through the New Colgate Powerhouse on the Yuba River, the New Bullards Bar Minimum Flow Powerhouse at the base of the dam, a low-level outlet at the base of the dam, and/or the gated spillway. The New Colgate Powerhouse is used for a combination of peaking, ancillary services, and some baseload generation. The New Bullards Bar Minimum Flow Powerhouse is operated as a baseload facility, where flows are set at a constant rate to provide a flow of 5 cfs downstream of the dam.

The Narrows 2 Powerhouse is operated as a baseload facility, with flow releases established as part of the Lower Yuba River Accord (Yuba Accord).[9] YCWA and Pacific Gas and Electric Company (PG&E) coordinate releases from the Narrows 2 Powerhouse, full bypass, partial bypass, and PG&E's Narrows 1 Powerhouse in accordance with the streamflow requirements in Article 33 of the existing license for the Yuba River Development Project No. 2246 and Article 402 of PG&E's license for the Narrows Project No. 1403.[10]

Proposed Facility Modifications

YCWA proposes the following modifications to existing facilities:

- Add a tailwater depression system at the New Colgate Powerhouse that would inject compressed air into the turbine discharge chamber to lower the tailwater elevation and allow continued turbine operation during high flows in the Yuba River.
- Install a new auxiliary flood control outlet on New Bullards Bar Dam to improve flood management, which would require construction of approach channels, wing walls, intake gates, access roads, outlet structures, and other support facilities.

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[9] In 2005, YCWA and 16 other interested parties signed memoranda of understanding that specify the terms of the Yuba Accord, a comprehensive, consensus-based program to protect and enhance aquatic habitat in the Yuba River downstream of Englebright Dam. In 2006, YCWA implemented the flows specified in the Yuba Accord to test the effects on environmental resources in the lower Yuba River. Following environmental review, YCWA and the parties executed the following four agreements in 2007, which together compose the Yuba Accord: (1) the Lower Yuba River Fisheries Agreement, which specifies the Yuba Accord's lower Yuba River minimum streamflows and creates a detailed fisheries monitoring and evaluation program; (2) the Water Purchase Agreement, under which the California Department of Water Resources (California DWR) purchases water from YCWA, some of which is provided by the Yuba Accord's minimum streamflows for CALFED's Environmental Water Account and State Water Project and Central Valley Project contractors; (3) the Conjunctive Use Agreements with 7 of YCWA's member units, which specify the terms of the Yuba Accord's groundwater conjunctive-use program; and (4) amendments to the 1966 Power Purchase Contract between YCWA and PG&E.

[10] The operation of YCWA and PG&E's projects are coordinated to ensure compliance with downstream required minimum flows on the Yuba River and to manage inflows to Englebright Reservoir.

- Modify the Lohman Ridge Diversion Tunnel intake to allow it to be opened and closed during high flows on the Middle Yuba River to decrease fish entrainment.
- Modify the Our House Diversion Dam fish release outlet to allow for the release of higher minimum flows from the current range of 30 to 50 cfs to a range of 40 to 120 cfs.
- Modify the Log Cabin Diversion Dam fish release outlet to allow higher minimum flows from the current range of 8 to 12 cfs to a range of 6 to 43 cfs.
- Enhance existing recreation facilities, including campgrounds, picnic areas, boat launches, overlooks, and trails, and construct the following new facilities: Kelly Ridge and Shadow Ridge Campgrounds, Cottage Creek Picnic Site, Dark Day Recreation Vehicle (RV) Dump Station and Entrance Station, New Colgate Powerhouse Access, and West Shoreline Trail.
- Add some primary project roads as part of the project, add and remove recreation roads, and add some new recreation circulation roads.

Proposed Project Boundary

YCWA proposes changes to the existing project boundary that would: (1) include additional lands necessary for current and future operation and maintenance and recreation development; (2) remove lands where there are no project-related uses necessary for operation and maintenance; and (3) reduce the shoreline buffer along project impoundments to 30 feet where project infrastructure and recreation facilities are not located along the shoreline.

The proposed changes would decrease the total area within the project boundary by 1,593.5 acres, including 1,005.1 acres of land managed by the Forest Service and 5.0 acres of land managed by the Corps.

Based on staff recommendations in the draft EIS, YCWA also proposes to modify the proposed project boundary to enclose the following parcels of project land: (1) lands adjacent to New Bullards Bar Dam necessary for operating and maintaining the proposed auxiliary flood control outlet, and (2) lands necessary for the construction of the proposed trail along the west shoreline of New Bullards Bar Reservoir between Cottage Creek Campground and Madrone Cove Boat-in Campground. These changes would add 183.9 acres of land, managed by the Forest Service, to the project boundary.

Proposed Operation

YCWA proposes to continue to operate the project essentially as it has since 2006 when it started test flows associated with the Yuba Accord. Changes associated with YCWA's other proposed environmental measures are listed below.

Proposed Environmental Measures

YCWA proposes the following environmental measures[11] to protect or enhance environmental resources at the project:

General Measures

- Organize an ecological group comprising various stakeholders and host meetings at least once a year to facilitate consultation between YCWA and resource agencies and present results of any annual monitoring (GEN1).
- Annually review special-status species lists and assess new species on National Forest System (NFS) land that might be affected by project operation. Develop and implement study plans to evaluate potential project effects for newly added species that occur on NFS lands (GEN2).
- Provide environmental training to employees to help them identify special-status and noxious weed species and familiarize them with known locations of sensitive habitats in the project boundary (GEN3).
- Develop and implement a coordinated operations plan to assure YCWA's compliance with the new license flow requirements (GEN4).

Geology and Soils

- Implement the Erosion and Sediment Control Plan (GS1), filed on October 27, 2016, that includes measures to control sedimentation and erosion when stabilizing slopes affected by the project, and prepare a stormwater pollution prevention plan (SWPPP) to prevent stormwater from carrying pollutants to project waters.
- Implement the updated Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2), filed on July 27, 2018, that includes measures for the removal and transport of sediment from behind Log Cabin and Our House Dams.
- Implement the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan (GS3), filed on April 12, 2018, that includes measures for the collection, storage, and disposal of woody material from project reservoirs.

[11] We consider YCWA's proposed measure to obtain Forest Service approval prior to any new ground disturbance on National Forest System lands (GEN 6) to be administrative.

Water Quantity

- Determine water year types for flow requirements in the Middle Yuba River downstream of Our House Diversion Dam, in Oregon Creek downstream of Log Cabin Diversion Dam, and in the North Yuba River downstream of New Bullards Bar Dam using the Smartsville Hydrologic Index (WR2).
- Determine water year types for related measures pertaining to Narrows 2 Powerhouse and Narrows 2 full bypass using the North Yuba Index. Additionally, when the current water year type is a schedule 5, 6, or conference year and the total volume of New Bullards Bar Reservoir from October 1 through January 31 is less than 220,000 acre-feet, YCWA would not reevaluate the applicable water type in February of the following water year (WR3).
- Implement the Streamflow and Reservoir Level Compliance Monitoring Plan (WR4) included in the amended final license application.
- Maintain New Bullards Bar Reservoir at a minimum pool elevation of 1,730 feet,[12] except when drawdowns below this elevation are necessary to meet minimum streamflow requirements (WR5).
- Operate New Bullards Bar Reservoir for flood control in accordance with the rules prescribed by the Corps in the 1972 agreement (WR6).
- Implement the proposed Drought Management Plan (WR9) included in the amended final license application that includes a mechanism to address drought conditions.

Water Quality

- Implement the proposed Hazardous Materials Management Plan (WR1) included in the amended final license application and modified on July 30, 2018.
- Implement the Water Temperature Monitoring Plan (WR7), filed on October 27, 2016, that includes installation of continuous water temperature recorders at 12 stream locations and collection of water temperature profiles in New Bullards Bar and Englebright Reservoirs.
- Implement the Water Quality Monitoring Plan (WR8), filed on October 27, 2016, that includes sampling *in situ*, general, and recreation water quality and bioaccumulation data at 15 stream locations and New Bullards Bar and Englebright Reservoirs.

[12] All elevations are provided in National Geodetic Vertical Datum of 1929 unless otherwise noted.

Aquatic Resources

- Maintain minimum streamflows (depending on time of year and water year type) of 40 to 120 cfs in the Middle Yuba River below Our House Diversion Dam, 6 to 43 cfs below Log Cabin Diversion Dam (AR1), and 5 to 13 cfs below New Bullards Bar Dam (AR10).
- Limit the rate of flow reductions in the Middle Yuba River downstream of Our House Diversion Dam to a maximum of 50 cfs every 3 days for spills under 200 cfs; 100 cfs every 3 days for spills between 200 and 300 cfs; and 100 cfs every 2 days for spills between 300 and 600 cfs (AR2) to protect resident fish populations and foothill yellow-legged frogs.
- Maintain minimum flows of 500 to 700 cfs (as measured at Smartsville) and from 150 to 2,000 cfs (as measured at Marysville) in the Yuba River, depending on time of year and water year type, from the Narrows 2 Powerhouse and the Narrows 2 full bypass (AR3) to protect anadromous fish populations.
- Reduce flows of 2,000 cfs or less from New Bullards Bar Dam between May 1 and July 31 at a rate of 250 cfs per day to protect resident fish populations until the spill has ceased (AR4).
- Implement the Aquatic Invasive Species Management Plan (AR5), filed on October 27, 2016, that includes measures to prevent the introduction and spread of aquatic invasive species.
- Implement the New Bullards Bar Reservoir Fish Stocking Plan (AR6), filed on December 2, 2016, that includes measures to maintain the rainbow trout and kokanee recreational fisheries.
- Implement the Upper Yuba River Aquatic Monitoring Plan (AR7) included in the amended final license application that includes monitoring aquatic and riparian resources in the North Yuba, Middle Yuba, and Yuba Rivers and Oregon Creek.
- Implement the Lower Yuba River Aquatic Monitoring Plan (AR8), filed on December 2, 2016, that includes measures to develop information regarding aquatic resources in the Yuba River downstream of Englebright Dam in response to flow conditions in the new license.
- Reduce the rate of flow fluctuations in the Yuba River downstream of Englebright Dam associated with hydroelectric project operation to minimize salmonid fry and juvenile stranding and redd dewatering and enhance riparian seedling recruitment. Specifically, from September 1 through December 1, maximum flow reductions, depending on base flow, would range from 200 to 750 cfs per day. From January 1 through May 31, maximum flow reductions, depending on base flow, would range from 200 to 950 cfs per day. To enhance

riparian seedling recruitment, maximum daily flow reduction would range from 79 to 200 cfs from April 1 through July 15 and would be target rates from July 16 through September 30 (AR9; revised April 27, 2018).

- Close the Lohman Ridge Diversion Tunnel from mid-April through September 30 in wet water years when end-of-March New Bullards Bar Reservoir storage is equal to or greater than 775,000 acre-feet and from October 1 through December 31 if May is a wet, above normal, or below normal water year and the subsequent end of September New Bullards Bar Reservoir storage is 600,000 acre-feet or greater (AR11) to decrease fish entrainment.
- Reduce flows in Oregon Creek downstream of Log Cabin Diversion Dam by a maximum of 20 cfs every 4 days (AR12) to protect aquatic resources by reducing the potential for fish stranding.

Terrestrial Resources

- Implement the Integrated Vegetation Management Plan (TR1), filed on October 27, 2016, that includes measures for controlling non-native plant species, protecting special-status species, and revegetating disturbed areas.
- Implement the Bald Eagle and American Peregrine Falcon Management Plan (TR2), filed on October 27, 2016, that includes measures to protect eagles and falcons from disturbance.
- Implement the Ringtail Management Plan (TR3), filed on October 27, 2016, that includes measures to exclude ringtails from project facilities.
- Implement the Bat Management Plan (TR4), filed on October 27, 2016, that includes measures to exclude bats from project facilities.

Recreation Resources

- Implement the Recreation Facilities Plan (RR1), updated on September 19, 2018.
- Provide recreation flow information and monthly flow forecasts for the Yuba, North Yuba, and Middle Yuba Rivers and Oregon Creek and reservoir levels at New Bullards Bar to the public on a real-time basis (RR2).
- Provide whitewater boating flows of 600 to 2,000 cfs below Our House Diversion Dam on weekends between October 1 and March 31, with the frequency and flow amount determined by water year type (RR3).

Land Use

- Implement the Transportation System Management Plan (LU1) included in the amended final license application that provides guidance for the rehabilitation and maintenance of primary project roads and trails.

- Implement the Fire Prevention and Response Plan (LU2) included in the amended final license application that provides measures for preventing, reporting, and investigating wildfires.

Aesthetics

- Implement the Visual Resource Management Plan (VR1), filed on October 27, 2016, that includes measures to reduce the visual contrast of some project facilities.

Cultural Resources

- Revise the Historic Properties Management Plan (HPMP) included in the amended final license application (CR1) that provides specific actions and processes to manage historic properties.

Public Involvement

Before filing its license application, YCWA conducted pre-filing consultation under the Integrated 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 an application being formally filed with the Commission. As part of the pre-filing process, staff conducted scoping to identify issues and alternatives. Staff distributed a scoping document to stakeholders and other interested entities on January 4, 2011. Scoping meetings were held in Marysville, California, on February 2, 2011. A revised scoping document was distributed on April 18, 2011. On April 28, 2014, YCWA filed its final license application. On June 26, 2017, the Commission issued a public notice accepting the application and soliciting motions to intervene and protest, stating that the application is ready for environmental analysis, and requesting comments, terms and conditions, recommendations, and prescriptions.

The Commission issued a draft environmental impact statement (EIS) on May 30, 2018, and requested that comments be filed by July 30, 2018. The Commission also held two public meetings on July, 10, 2018, in Marysville, California to receive oral comments on the draft EIS.

Alternatives Considered

This final EIS analyzes the effects of continued project operation and recommends conditions for any license that may be issued for the project. In addition to YCWA's proposal, we consider three alternatives: (1) the applicant's proposal with staff modifications (staff alternative); (2) the staff alternative with all mandatory conditions; and (3) no action, meaning that YCWA would continue to operate the project with no changes.

Staff Alternative

Under the staff alternative, the project would include most of YCWA's proposed measures, with the exception of the proposed annual ecological group meeting (GEN1), annual review of special-status species lists (GEN2), annual employee training (GEN3), the coordinated operations plan for PG&E's Narrows 1 Powerhouse (Narrows Project No. 1403) and YCWA's Narrows 2 Powerhouse (Yuba River Development Project No. 2246) (GEN4), the Water Temperature Monitoring Plan (WR7), the Water Quality Monitoring Plan (WR8), and the Upper Yuba River Aquatic Monitoring Plan (AR7) as part of any license issued for the project.

We do not recommend organizing an ecological group meeting because standard Commission practices would require YCWA to consult with agencies during the preparation of monitoring reports that are components of Commission-approved management plans, and annual meetings alone would not provide additional benefits to environmental resources to warrant the cost.

Additionally, we do not recommend annual review of special-status species because YCWA is required to adhere to state and federal regulations pertaining to sensitive wildlife. We do not recommend a license condition requiring annual employee training because licensees are expected to train their employees to the extent needed for the licensee to maintain compliance with a license. We also do not recommend the coordinated operations plan because it is not needed to implement the other proposed measures and because any conflicts between YCWA's Yuba River Development Project and PG&E's Narrows Project would be addressed through standard Commission practices.

We do not recommend a Water Temperature Monitoring Plan because YCWA's proposed flow-related measures are expected to generally maintain or reduce water temperatures in project-affected waters and support resident and anadromous coldwater fishes, similar to what has occurred under existing operations. There appears to be little project-related basis for requiring water temperature monitoring to verify the status quo or the probable improvements in water temperature that would occur. There would be no value, from a license compliance perspective, to a comprehensive, long-term water temperature record that would result from YCWA's proposal and the California State Water Resources Control Board's (Water Board's) specification.

We also do not recommend a Water Quality Monitoring Plan because YCWA's operation of the project with the facility modifications and proposed flow-related measures are not expected to adversely affect water quality or bioaccumulation in aquatic organisms. There would be no value, from a license compliance perspective, to monitoring water quality or bioaccumulation to identify unexpected water quality issues under a new license.

Finally, we do not recommend an Upper Yuba River Aquatic Monitoring Plan because the proposed plan includes provisions for general resource management

monitoring, but does not provide any mechanisms for isolating specific project effects from non-project effects on monitored resources. Additionally, the plan does not identify how the monitoring would identify the specific effects of project operations. Further, the best available science indicates YCWA's proposed measures for increasing sediment transport and increasing large woody material (LWM) at the Our House and Log Cabin Diversion Dams would provide net benefits to aquatic resources in the Middle Yuba River and Oregon Creek, respectively. The information does not predict or demonstrate a specific, quantified population level response; therefore, there is no justification for monitoring to quantify the population's response to these benefits.

The staff alternative also includes the following recommended modifications of YCWA's proposal and some additional measures.

Water Quantity

- Modify the proposed Drought Management Plan (WR9), to change the definition of drought conditions based on available data specific to the proposed project, including current storage in New Bullards Bar Reservoir, watershed snowpack and soil moisture conditions, current and projected operating requirements for instream flows and water supply deliveries, weather forecasts, and other project operation limitations, rather than basing plan implementation on state-wide conditions.

Aquatic Resources

- Maintain summer water temperatures in the lower Yuba River in schedule 6 years by modifying proposed minimum flows from the Narrows 2 Powerhouse and the Narrows 2 full bypass (AR3) to include minimum flows of 350 cfs, from June 1 through August 31.
- Modify the proposed Aquatic Invasive Species Management Plan (AR5) to include monitoring Asian clams at Cottage Creek, Dark Day Boat Launch, and Emerald Cove.
- Modify the proposed New Bullards Bar Reservoir Fish Stocking Plan (AR6) to include annual consultation with the California Department of Fish and Wildlife (California DFW) to determine species of fish appropriate for stocking for recreational purposes.
- Modify the proposed Lower Yuba River Aquatic Monitoring Plan (AR8) to remove: (1) benthic macroinvertebrate (BMI) monitoring in the lower river; (2) upstream fish passage monitoring at Daguerre Point Dam; (3) weekly

Chinook salmon and steelhead spawning surveys in the lower river; and (4) general monitoring of riparian vegetation cover and community structure.[13]

- Develop a Narrows Reach fish stranding prevention plan for the lower Yuba River, downstream of the Narrows 1 and Narrows 2 Powerhouses, to include conducting fish rescues when stranding is observed, reporting estimates of the number and species of fish stranded and the number of fish rescued, recording any evidence of harm caused by project facilities or operation, identifying potential operational and/or structural measures that could be implemented to reduce stranding, and reporting requirements for unplanned flow reductions.
- Revise minimum streamflows below New Bullards Bar Dam (AR10) to use YCWA flows in October through May and agency flow recommendations in June through September.
- Develop a comprehensive LWM enhancement plan that: (1) identifies sources of LWM in the project reservoirs; (2) includes provisions for storing and transporting collected LWM; (3) identifies suitable LWM size classes for placement; (4) identifies locations for placement in the lower Yuba River; (5) details a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests; and (6) contains a monitoring and mapping process to provide an indication of the stability of these enhancements and inform the need for future placement activities.

Terrestrial Resources

- Modify the proposed Integrated Vegetation Management Plan (TR1) to: (1) include treatment and monitoring plans for target non-native invasive species on all lands in the project boundary; (2) apply revegetation measures (sections 4.1 through 4.5 of the plan) to all lands in the project boundary; (3) implement best management practices (BMPs) to protect foothill yellow-legged frog and California red-legged frog habitat when vegetation management activities occur within 300 feet of streams; (4) define BMPs for any pesticide use that is deemed necessary within the project boundary and within 500 feet of known locations of foothill yellow-legged frogs that avoid adverse effects on individuals and their habitats; (5) prohibit the use of pesticides within a 260-foot buffer around the mean high-water mark of aquatic features, unless necessary to ensure project safety; (6) avoid stockpiling and subsequent removal of any fuels, slash, or debris related to hazard tree removal within 1,000 feet of wetlands or aquatic features; and (7) prior to any activities that would result in vegetation disturbance, conduct

[13] However, as noted below in *Terrestrial Resources*, we do recommend monitoring riparian planting locations.

surveys for elderberry plants within 165 feet of the activity area and consult with FWS if elderberry plants are found to determine if additional protective measures are necessary.

- Develop a lower Yuba River riparian restoration plan, in consultation with FWS, California DFW, the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), and the South Yuba River Citizen's League (SYRCL), that includes: (1) planting riparian vegetation on 100 acres of floodplain in the lower Yuba River, including no fewer than four separate planting sites; (2) a species list for plantings that includes, at a minimum, cottonwood and willow species; (3) a description of planting methods consistent with methods used at the Hammon Bar restoration site, including planting to ground water depth; (4) success criteria based on survivorship of plantings; (5) monitoring methods and a schedule for determining success; (6) provisions for additional plantings if success criteria are not met; (7) a process and schedule for identifying planting sites; and (8) a reporting schedule.
- Modify the proposed Bald Eagle and American Peregrine Falcon Management Plan (TR2) to include surveys for American peregrine falcon eyries every year or until a new eyrie is documented.
- Monitor water temperature continuously from April 1 through September 15 for 3 years at two foothill yellow-legged frog breeding sites in the Middle Yuba River downstream from Our House Diversion Dam and at two sites in Oregon Creek downstream of Log Cabin Diversion Dam. Monitoring sites should be selected to represent the upstream and downstream limit of breeding sites in each reach. After 3 years, file a summary report that: (1) summarizes the results of the temperature monitoring; (2) evaluates how often water temperatures fall below 16 degrees Celsius (ºC) during the tadpole development period; and (3) describes any changes in flow releases from Our House and Log Cabin Diversion Dams that may be warranted to address adverse effects on foothill yellow-legged frog reproduction.
- Ensure procedures for decontaminating field equipment to prevent the spread of aquatic pests and disease between waterbodies, as described in the Aquatic Invasive Species Monitoring Plan, are applied for all activities where equipment is transported from one body of water to another.

Cultural Resources

- Revise the HPMP included in the amended final license application (CR1) to include: (1) cultural resources information and consultation results developed after preparation of the 2016 draft HPMP; (2) updated determinations of National Register of Historic Places (National Register) eligibility of six historic sites (CA-YUB-1751H, CA-YUB-1760H, CA-YUB-1762H,

CA-YUB-1768H, CA-YUB-1770H and CA-YUB-1736H) and the New Colgate Penstock; (3) clarification of the description of site CA-SIE-1849H (previously CA-YUB-1733H); and (4) the results of YCWA's final supplemental traditional cultural property (TCP) report.

Staff Alternative with Mandatory Conditions

We recognize that the Commission is required to include valid section 4(e) and section 401 conditions in any license issued for the project. The staff alternative with mandatory conditions includes the staff-recommended measures noted above along with the following mandatory conditions not included in the staff alternative: (1) organize an ecological group and hold annual meetings (4(e) condition 2, preliminary 401 condition 26); (2) provide annual employee environmental awareness training for hydropower operation and maintenance staff (4(e) condition 28); (3) prepare a biological evaluation prior to the construction of new project features on NFS land (4(e) condition 29); (4) consult annually on current special-status species (4(e) condition 30); (5) implement the Upper Yuba River Aquatic Monitoring Plan for locations on NFS lands (4(e) condition 43); (6) monitor water temperature (preliminary 401 condition 14 and 4(e) condition 44); (7) implement the Water Quality Monitoring Plan for locations, on, or directly affecting, NFS lands (4(e) condition 45); (8) develop a restoration plan (preliminary 401 condition 3); (9) operate the upper and lower intakes for the New Colgate Powerhouse to provide year-round favorable water temperature for aquatic biota downstream of New Colgate Powerhouse and Englebright Dam (preliminary 401 condition 8); (10) develop a plan to mitigate for project-related effects on beneficial uses in the Middle Yuba River and Oregon Creek from the Log Cabin and Our House Diversion Dams and the Lohman Ridge and Camptonville Diversion Tunnels (preliminary 401 condition 10); (110) develop a water quality monitoring plan (preliminary 401 condition 13); (12) develop a plan to monitor the distribution, abundance, and condition of aquatic resources in project-affected creeks, rivers, and reservoirs upstream of Englebright Dam (preliminary 401 condition 15); (13) develop a plan to monitor the distribution, abundance, and condition of aquatic resources in the Yuba River downstream of Englebright Reservoir (preliminary 401 condition 16); (14) develop a plan to provide public access to the North Yuba River below New Bullards Bar Dam (preliminary 401 condition 22);and (15) provide general awareness training on compliance with water quality certification requirements (certification) to hydropower operation and maintenance staff each year (preliminary 401 condition 27).

Incorporating these mandatory conditions into a new license would cause us to eliminate one environmental measure that we include in the staff alternative: monitor water temperatures downstream from Our House and Log Cabin Diversion Dams and file a summary report that evaluates how often water temperatures fall below 16ºC during the tadpole development period and describes any changes in flow releases that may be warranted to address adverse effects on foothill yellow-legged frog reproduction.

No-Action Alternative

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented.

Environmental Effects of the Staff Alternative

The primary issues associated with licensing the Yuba River Development Project are effects of continued project operation on geology and soils, water quality, fishery resources and fish passage, terrestrial resources, threatened and endangered species, recreation and land use, and cultural resources. Below, we briefly discuss the anticipated environmental effects of issuing a new license for the project under the staff alternative.

Geology and Soils

YCWA proposes several construction-related activities, including an auxiliary flood control outlet at New Bullards Bar Dam; a tailwater depression system at New Colgate Powerhouse; modifications to fish release outlets at the Our House and Log Cabin Diversion Dams and to the intake for the Lohman Ridge Diversion Tunnel; and enhancements to recreation facilities. These activities would involve vegetation removal and cause ground disturbance, and potentially contribute to erosion. The proposed Erosion and Sediment Control Plan (GS1) and Transportation System Management Plan (LU1) include BMPs that would limit the adverse effects of erosion on terrestrial and aquatic habitats.

Under current conditions, the Log Cabin and Our House Diversion Dams trap sediment, limiting the recruitment of coarse sediment downstream. The proposed Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2) would improve sediment transport by opening low-level outlet valves during winter and spring high-flow periods. Improved sediment transport in these rivers would benefit aquatic resources by recruiting coarse gravels into fish spawning and rearing habitat, increase the likelihood of riparian woody species establishment, and improve habitat for sensitive amphibians and other wildlife.

Aquatic Resources

Project operation can require the use and storage of hazardous materials and pesticides to maintain project facilities. Such materials could be passed into the ground and surface water at the project via inadvertent spills. Implementing the proposed Hazardous Materials Management Plan, with modifications to include descriptions of spill containment measures and cleanup protocols, would ensure proper storage facilities and cleanup supplies are available and that spill prevention and cleanup protocols are in place, which would help mitigate the risk of a spill that could adversely affect water quality.

Climate variability in the region results in differences in annual runoff and water availability. If project operation, particularly during drought years, compounds natural variation in flows and results in insufficient river flows or reservoir levels, aquatic resources could be adversely affected. Possible effects on anadromous fish could include reductions in availability of spawning or rearing habitat or stranding when project flows change during downramping periods associated with variable minimum flow requirements. YCWA proposes a method for assessing water year type consistent with the Yuba Accord and to schedule project operation based on water year type in a manner that would minimize adverse effects on aquatic resources. Implementing flow schedules following agency recommendations for reevaluating water year type in February would also protect riparian vegetation communities and associated wildlife habitat. The staff-recommended revisions to the proposed Drought Management Plan would require YCWA to define drought conditions based on available data specific to the project, rather than regional or state-wide proclamations, to ensure modifications to operations during extended low-water periods are only implemented as necessary and in a manner that would protect aquatic resources. Implementing the Streamflow and Reservoir Level Compliance Monitoring Plan would provide the data needed to ensure project operation meets minimum flow, minimum reservoir pool, and flood control requirements.

Implementing the proposed minimum flows, with staff recommendations to increase minimum flows below New Bullards Bar Dam in June through September in all water years and from June through August in schedule 6 water years would protect and enhance aquatic habitat conditions during low-water periods by ensuring suitable habitat for multiple lifestages of fish, macroinvertebrates, and aquatic plants. The proposed high-flow recession rates would reduce potential for dewatering aquatic habitat and fish stranding by limiting the range of potential flows from project facilities. This measure would also provide conditions suitable for germination of riparian woody species by ensuring soils do not dry faster than seedling root development. Staff's recommended development and implementation of a Narrows Reach fish stranding prevention plan would further reduce effects of project-controlled changes in flow on fish stranding below the Narrows 1 and Narrows 2 Powerhouses.

Project impoundments and modified streamflows provide habitat suitable for invasive aquatic organisms, which, when established in the ecosystem, can reduce habitat quality for native species. Implementation of the proposed Aquatic Invasive Species Management Plan, with staff-recommended modifications to include monitoring sites for Asian clams would provide for monitoring and management of invasive species; it would also include BMPs (e.g., public outreach) to reduce the potential for new introductions. These measures would reduce potential effects associated with invasive aquatic species on project lands and waters and help protect habitat for a broad assemblage of native fish and plants.

The staff-recommended modifications to the operation of the Our House and Log Cabin Diversion Dams would improve aquatic habitat conditions and stream channel morphology compared to existing operations. These modifications include providing

higher instream flows and slower spill recession rates, periodically closing the diversion tunnel, and passing LWM and sediment. These measures would have a range of benefits for aquatic and terrestrial species. Better LWM distribution below the dams, cooler water temperatures during late summer, and lower flow conditions in certain periods would improve habitat for native fish, western pond turtle, and foothill yellow-legged frogs.

Developing the staff-recommended comprehensive LWM enhancement plan for the lower Yuba River, which identifies sources of LWM, options for storing and transporting LWM, and locations for placement of LWM would enhance lower river juvenile salmonid rearing habitat.

Terrestrial Resources

Construction of the auxiliary flood control outlet, improvements to recreation facilities, and maintenance of project facilities would result in some level of vegetation disturbance. The proposed Integrated Vegetation Management Plan would include measures for periodic vegetation surveys for non-native invasive plant species, revegetation activities, and treatment of non-native invasive weeds on all project lands. The proposed invasive species control and revegetation measures are more stringent on NFS lands compared to non-NFS lands (e.g., annual control on NFS lands compared to every 5 years on non-NFS lands). Staff's recommended modifications to the plan would extend YCWA's proposed measures for revegetation and weed control proposed for NSF lands to all land within the project boundary, to provide consistent management practices on project lands. Staff's recommended restrictions on pesticide use would further reduce potential effects on sensitive amphibians by providing buffers between the use of pesticides and aquatic habitats.

Proposed project operation would retain portions of spring high flows in New Bullards Bar Reservoir and store this water for release during drier parts of the year. As a result, the extent of spring flooding in the lower Yuba River would be moderated by project operation. Such moderation of inundation would constrain development of riparian vegetation. YCWA's proposed measures to provide spring flow recession rates that are consistent with the needs of cottonwood and willow seedling establishment would partially mitigate for these effects and likely result in increased establishment of these species. Developing a lower Yuba River riparian restoration plan, as staff recommends, would include provisions for planting of cottonwood and willow on 100 acres of currently unvegetated floodplains. These revegetation efforts would further mitigate for project effects on riparian vegetation establishment and would provide shorter term increases in canopy structure, sediment retention, organic input into the lower Yuba River, and seed sources for further expansion of these species.

Vegetation management and project construction activities could also affect habitat for nesting birds by creating noise and potentially removing nests (e.g., construction of the auxiliary flood control outlet could affect a suspected peregrine falcon eyrie in the North Yuba River canyon below New Bullards Dam). The timing

restrictions included in the Integrated Vegetation Management Plan and Bald Eagle and American Peregrine Falcon Management Plan would provide protection for nesting migratory birds and raptors by ensuring that vegetation management does not occur during important life stages for these species. Project facilities can provide habitat for bats and ringtail, potentially resulting in animal disturbance or mortality or exposure of humans to disease. Implementation of YCWA's proposed Bat Management Plan and Ringtail Management Plan would minimize effects by excluding wildlife from project structures and properly removing waste.

High-flow releases from project diversion dams could reduce the reproductive success of foothill yellow-legged frogs by washing out egg masses or flushing larval lifestages downstream to poor quality habitat, and reduced water temperatures associated with increased minimum flows could adversely affect egg and tadpole maturation. Reducing flow pulses associated with changes in diversion rates during spring and early summer downstream of the Log Cabin and Our House and Diversion Dams, as proposed, would reduce these effects by providing more stable conditions downstream of project facilities. Staff's recommended monitoring of water temperature at breeding locations would provide data that would allow YCWA to evaluate whether any changes in minimum flows are warranted to improve tadpole maturation through water temperature changes. Finally, staff's recommendation to develop protocols for decontaminating equipment used during project activities that require moving equipment from one body of water to another would reduce the risk of spreading chytrid fungus.

Threatened and Endangered Species

Proposed construction activities at the project include new and modified facilities, roads, trails, and recreation areas. The proposed construction BMPs, erosion prevention and control measures, SWPPP, Streamflow and Reservoir Level Compliance Monitoring Plan, and Hazardous Materials Management Plan associated with construction, as modified by staff, would minimize the potential for adverse effects on fish species listed under the Endangered Species Act (ESA) by limiting erosion or siltation effects. Providing adequate flows and reducing flow fluctuations would protect habitat.

Ramping rates associated with reductions in flow during operation of the project under the staff alternative, which would be similar to current operation as defined in the Yuba Accord, can affect spring-run Chinook salmon and steelhead by dewatering redds and stranding juvenile fish in the lower Yuba River. The proposed monitoring and management of minimum flows and ramping rates, as modified by staff, would minimize these effects. However, continued project operation would likely adversely affect spring-run Chinook salmon and steelhead and may affect, but would not likely adversely affect designated critical habitat for these species.

Continued project operation, as proposed with staff-recommended measures, would have "no effect" on other listed species because surveys indicate these species, including Layne's ragwort, Hartweg's golden sunburst, Pine Hill flannelbush, Stebbin's

morning-glory, vernal pool fairy shrimp, or vernal pool tadpole shrimp are not present in areas of project effects.

Damage to elderberry plans resulting from project construction and maintenance activities could affect valley elderberry longhorn beetles, which use the plants for reproduction. The staff-recommended additional surveys for elderberry plants prior to activities that result in vegetation disturbance would help protect this plant from project-related activities. Therefore, relicensing the project, as proposed with the staff-recommended measures is not likely to adversely affect the valley elderberry longhorn beetle.

Project operation, including water storage, LWM management, treatment of noxious weeds, and construction of recreation trails could affect California red-legged frogs by increasing habitat for predatory bullfrogs, reducing habitat quality, or through direct injury.

LWM mats in New Bullards Bar Reservoir create habitat for bullfrogs that out-compete and prey on California red-legged frogs. Woody debris in riparian areas provides habitat for California red-legged frogs, which could be injured during subsequent burning or removal of this debris. Staff modifications to YCWA's proposed plans would reduce potential effects by limiting pesticide use near potential habitat and managing removal and storage of woody material. Any resulting impacts would be insignificant. We conclude that continued project operation may affect, but is not likely to adversely affect, California red-legged frog or its designated critical habitat.

Recreation

Numerous recreation opportunities exist at the project. Implementing YCWA's proposed Recreation Facilities Plan would expand recreation opportunities by adding new facilities, improve the current recreation experience with improvements to existing recreation facilities, and improve maintenance at recreation facilities. Implementing the proposed measures for providing real-time flow information and boating flows below Our House Diversion Dam, as well as monthly flow forecasts and supporting operation and maintenance of the Oregon Creek Day Use Area for whitewater boating use would enhance whitewater boating opportunities at the project compared to existing conditions. Implementing the New Bullards Bar Fish Stocking Plan would improve the recreational fishery at New Bullards Bar Reservoir by increasing the abundance of rainbow trout.

Land Use and Aesthetics

Implementing the proposed Transportation Management Plan would help to ensure that project roads are maintained to current standards, allowing continued and improved public access to and through project. The fire management measures provided in the Fire Prevention and Response Plan would improve public safety by ensuring that project operation and maintenance are conducted in a manner that would help to prevent the ignition and spread of wildfires and guiding response should wildfires occur. Using

natural colors for project facilities as described in the Visual Resource Management Plan would better blend the facilities with the surrounding environment and improve the overall visual quality of the project. Modifying the proposed project boundary to enclose the parcels of project lands adjacent to New Bullards Bar Dam that are necessary for operating and maintaining the proposed auxiliary flood control outlet and lands necessary for the construction of the proposed trail along the west shoreline of New Bullards Bar Reservoir between Cottage Creek Campground and Madrone Cove Boat-in Campground would ensure the project boundary includes all lands needed for project operation.

Cultural Resources

Project-related effects on cultural resources within the area of potential effects (APE) could occur from construction of new facilities, maintenance activities, use and maintenance of project roads, and mitigation measures associated with other environmental resources. YCWA's HPMP includes measures that are consistent with most of the Commission and Advisory Council on Historic Preservation's 2002 guidelines. Implementing the HPMP, with staff-recommended modifications, 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 project for the protection of historic properties that would be affected by project construction, operation, and maintenance activities. The terms of the PA would require YCWA to implement the revised HPMP.

Socioeconomics

Project construction activities would generate short-term construction jobs and potentially result in temporary, minor increases to local area population. These changes to the local population would likely not be a large enough to generate significant increases in demand for local housing or public services.

Additional visitation connected with upgrades to campgrounds and trails would be associated with local and regional spending that would benefit the local economy through the purchase of gas, food, lodging, and supplies. Similarly, new recreation opportunities provided by whitewater boating flows would result in beneficial effects on local area economies.

In addition to energy generation, YCWA uses the project for water storage and provides water supply for agricultural use. During the driest water years, the proposed project would result in an additional 23,237 acre-feet of water remaining in the river to support streamflows and benefit aquatic habitat. These conditions would only occur about 1 percent of the time, so any effects on total irrigation deliveries or YCWA's ability to provide late-season irrigation water to its members would be infrequent. Exercising the option of modifying carryover storage, should YCWA elect to do so, would potentially mitigate effects on irrigators from the proposed flow regime, resulting in virtually no effect on local irrigation deliveries,.

The proposed installation of a new auxiliary flood control outlet on New Bullards Bar Dam would increase operational flexibility during storm events, which should result in lower flood stages downstream and improve downstream flood management.

Environmental Effects of the Staff Alternative with Mandatory Conditions

The staff alternative with mandatory conditions would include all measures discussed above for the staff alternative, plus the additional measures discussed in the following sections.

Geology and Soils

Monitoring sediment in the Our House and Log Cabin Diversion Dams, as part of the Upper Yuba Aquatic Monitoring Plan (4(e) condition 43) would provide data to quantify the effects of sediment sluicing through the Our House and Log Cabin Diversion Dams. Overall, the effects of the staff alternative with mandatory conditions on geology and soils would be similar to the effects of the staff alternative.

Water Quantity

The Water Board states that it will likely condition the North Yuba River below New Bullards Bar Dam, Oregon Creek below Log Cabin Diversion Dam, the Middle Yuba River below Our House Diversion Dam, and the Yuba River below Englebright Dam with minimum flows specific to water-year types, based on the record for the relicensing proceeding and its final California Environmental Quality Act document (preliminary 401 condition 1). The effects of these minimum flow requirements would depend on the flows specified in the final 401 certification issued for the project.

Water Quality

Developing a water quality monitoring plan (preliminary 401 condition 13) and implementing the proposed Water Quality Monitoring Plan on NFS lands (4(e) condition 45) would have little effect on environmental conditions because the water quality of project waters is currently at levels consistent with the levels stipulated by the current state water quality standards, and no changes in project operation are proposed that would substantially alter water quality.

Aquatic Resources

Organizing an ecological group that would meet annually to discuss project operation and monitoring results (4(e) condition 2, preliminary 401 condition 26) would provide a forum for consultation between YCWA and project stakeholders. These meetings could identify potential revisions to monitoring requirements or recommend license modifications to adaptively manage project effects on aquatic resources. However, because YCWA would be required to file annual reports for stakeholder review and Commission approval, consistent with general Commission policies, which would provide an opportunity to review project effects and inform the need for any license

modifications, organizing an ecological group would provide limited additional benefit to aquatic resources.

Similarly, consulting annually on revisions to sensitive-species lists (4(e) condition 30) would have limited additional benefits to sensitive aquatic species. Commission licenses do not reduce a licensee's responsibility related to the ESA or state laws pertaining to sensitive species. As such, regardless of whether it is a condition of the license, licensees are responsible for consulting with management agencies if licensed projects have the potential to affect newly listed species.

Preparing a biological evaluation prior to the construction of new project features on NFS land (4(e) condition 29) would provide no additional benefit to aquatic resources. This final EIS serves as the biological evaluation for YCWA's proposed development of new project features, as identified in the amended final license application. Prior to construction, YCWA would file final plans with the Commission that would be available for stakeholder review. Any future development of new project facilities would require a license amendment, and further evaluations of effects on aquatic resources would occur as part of the license amendment process.

The effects of the minimum flow requirements for North Yuba River below New Bullards Bar Dam, Oregon Creek below Log Cabin Diversion Dam, Middle Yuba River below Our House Diversion Dam, and Yuba River below Englebright Dam (preliminary 401 condition 1) on aquatic resources would depend on the flows specified in the final 401 certification issued for the project.

Implementing water temperature and biotic monitoring (4(e) conditions 43 and 44, and preliminary 401 conditions 14, 15, and 16) would provide data to base evaluations of any changes in temperature regimes or biotic populations and habitat following implementation of the new license. This information could help identify further management actions and ultimately benefit aquatic resources in the project area, either through potential modifications to license requirements or other resource management agency actions.

Developing a restoration plan for the lower Yuba River that includes riparian planting and addition of LWM (preliminary 401 condition 3) would enhance habitat for salmonids by providing cover, increasing habitat availability for juveniles, and providing sources of organic matter to enhance foraging resources. These measures would benefit aquatic resources in the lower Yuba River.

Developing a plan to mitigate for project-related effects on beneficial uses in the Middle Yuba River and Oregon Creek from the Log Cabin and Our House Diversion Dams and the Lohman Ridge and Camptonville Diversion Tunnels (preliminary 401 condition 10) would minimize fish entrainment in the tunnels and benefit fish populations in the Middle Yuba River and Oregon Creek by reducing inter-basin fish movement.

Operating the upper and lower intakes for the New Colgate Powerhouse to provide year-round favorable water temperature for aquatic biota downstream of New Colgate

Powerhouse and Englebright Dam (preliminary 401 condition 8) would preserve the coldwater pool in New Bullards Bar Reservoir. This colder water could then be released during warmer periods and reduce water temperature in the lower Yuba River to benefit salmonids.

Providing general awareness training on compliance with 401 certification requirements to hydropower operation and maintenance staff each year (preliminary 401 condition 27) would ensure YCWA employees are aware of license conditions and able to identify potential violations that may be incidentally observed during normal work duties. Promoting general awareness could allow YCWA to address potential issues in a timely fashion and reduce potential effects on aquatic resources.

Terrestrial Resources

The effects of annual meetings with an ecological group (4(e) condition 2, preliminary 401 condition 26), annual consultation to update sensitive species lists (4(e) condition 30), preparation of biological evaluations for new project facilities (4(e) condition 29), and general employee training on terrestrial resources (preliminary 401 condition 27) would be similar to those described above for Aquatic Resources. As such, these measures would provide limited additional benefit to terrestrial resources.

Requiring YCWA to provide project employees with environmental awareness training would ensure employees are familiar with the identification of sensitive or invasive species and their occurrences within the project boundary. This knowledge would provide resources to minimize inadvertent disturbance of sensitive species and facilitate updates to location maps. Such training would also limit potential for inadvertent spread of invasive species and reduce the need for control measures.

Developing a restoration plan that includes riparian planting in the lower Yuba River (preliminary 401 condition 3) would increase vegetation cover along the banks of the river and provide additional habitat for wildlife and seed sources for further expansion of riparian vegetation over the term of the license. Such efforts would have beneficial effects on vegetation and wildlife resources.

Recreation, Land Use, Cultural, and Socioeconomic Resources

Providing public vehicle access below New Bullards Bar Dam (preliminary 401 condition 22) would increase access to class V and V+ whitewater boating resources. However, because of the infrequent occurrence of boatable flows and the limited number of boaters with sufficient expertise to safely boat the flows, these benefits to recreation resources would be small. Providing public access would increase security concerns around and operation of project infrastructure, and public vehicular use on the narrow road and sudden, high outlet or spillway releases would increase public safety concerns.

No-action Alternative

Under the no-action alternative, the project would continue to operate as it has in the past. None of YCWA's proposed measures or the resource agencies' recommendations and mandatory conditions would be required. None of the staff-recommended measures would be implemented, including measures to enhance environmental conditions for fish and wildlife within the project area, measures to improve flow conditions downstream of the project for salmonids, and measures that would expand and improve recreation opportunities.

License Conditions

Staff recommendations for conditions for any new license for the project are based on the analysis presented in this final EIS. Draft license articles are attached in appendix C.

Conclusions

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

In section 4.2 of this final EIS, we estimate the likely cost of alternative power for each of the three alternatives identified above. Our analysis shows that during the first year of operation under the no-action alternative, project power would cost $4,342,220, or $3.06 per megawatt-hour (MWh) less than the likely alternative cost of power. Under the proposed action alternative, project power would cost $12,329,290, or $8.97/MWh more than the likely alternative cost of power. Under the staff alternative, project power would cost $12,676,940, or $9.23/MWh more than the likely alternative cost of power. Under the staff alternative with mandatory conditions, project power would cost $14,816,460, or $10.78/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 (1,374,003 MWh annually); (2) the 361.9 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by YCWA, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

FINAL ENVIRONMENTAL IMPACT STATEMENT

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

U.S. Army Corps of Engineers, Sacramento District
Operations and Readiness Branch
Sacramento, CA

Yuba River Development Project
Docket No. P-2246 - California

1.0 INTRODUCTION

1.1 APPLICATION

On April 28, 2014, the Yuba County Water Agency (YCWA or applicant) filed an application for a new license with the Federal Energy Regulatory Commission (Commission or FERC) to continue to operate and maintain the Yuba River Development Project (Docket No. P-2246). On June 5, 2017, YCWA filed an amended license application (errata filed July 21, September 15, and November 1, 2017). The 361.9-megawatt (MW) project is located on the Yuba River, North Yuba River, Middle Yuba River, and Oregon Creek (a tributary to the Middle Yuba River) in Yuba, Sierra, and Nevada Counties near the city of Marysville, California (figures 1-1 and 1-2). The project currently occupies 4,416.7 acres of federal lands within the Tahoe and Plumas National Forests (TNF and PNF), administered by U.S. Department of Agriculture, Forest Service (Forest Service), and 16.1 acres of federal lands administered by the U.S. Army Corps of Engineers (Corps), associated with the Corps' Englebright Dam and Reservoir. The project generates an average of about 1,418,044[14] megawatt-hours (MWh) of energy annually.

[14] This value was estimated using YCWA's modeled generation for water years 1970–2010 (see license application, table 5.2-2).

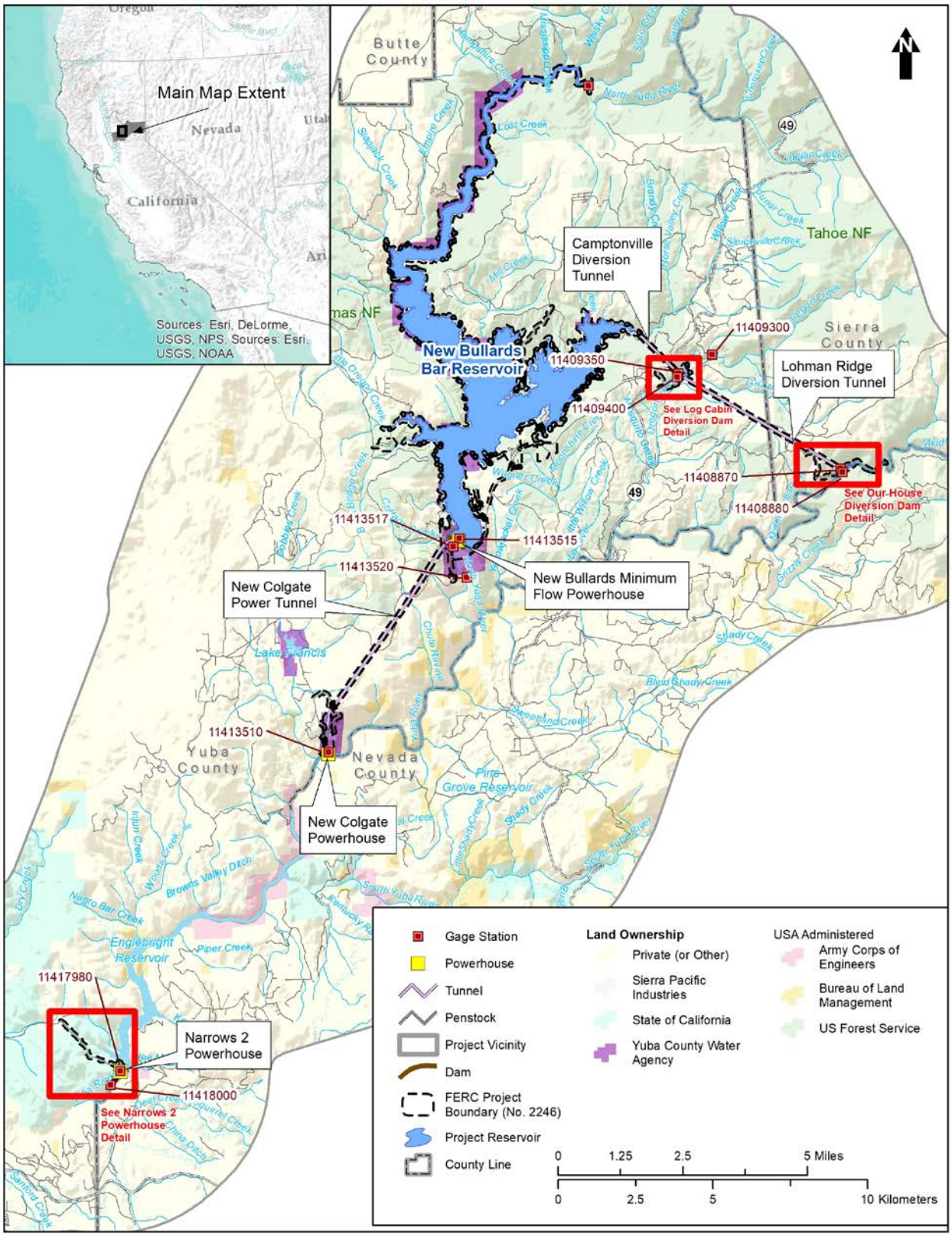

Figure 1-1. Location of Yuba River Development Project (Source: YCWA, 2017a, as modified by staff).

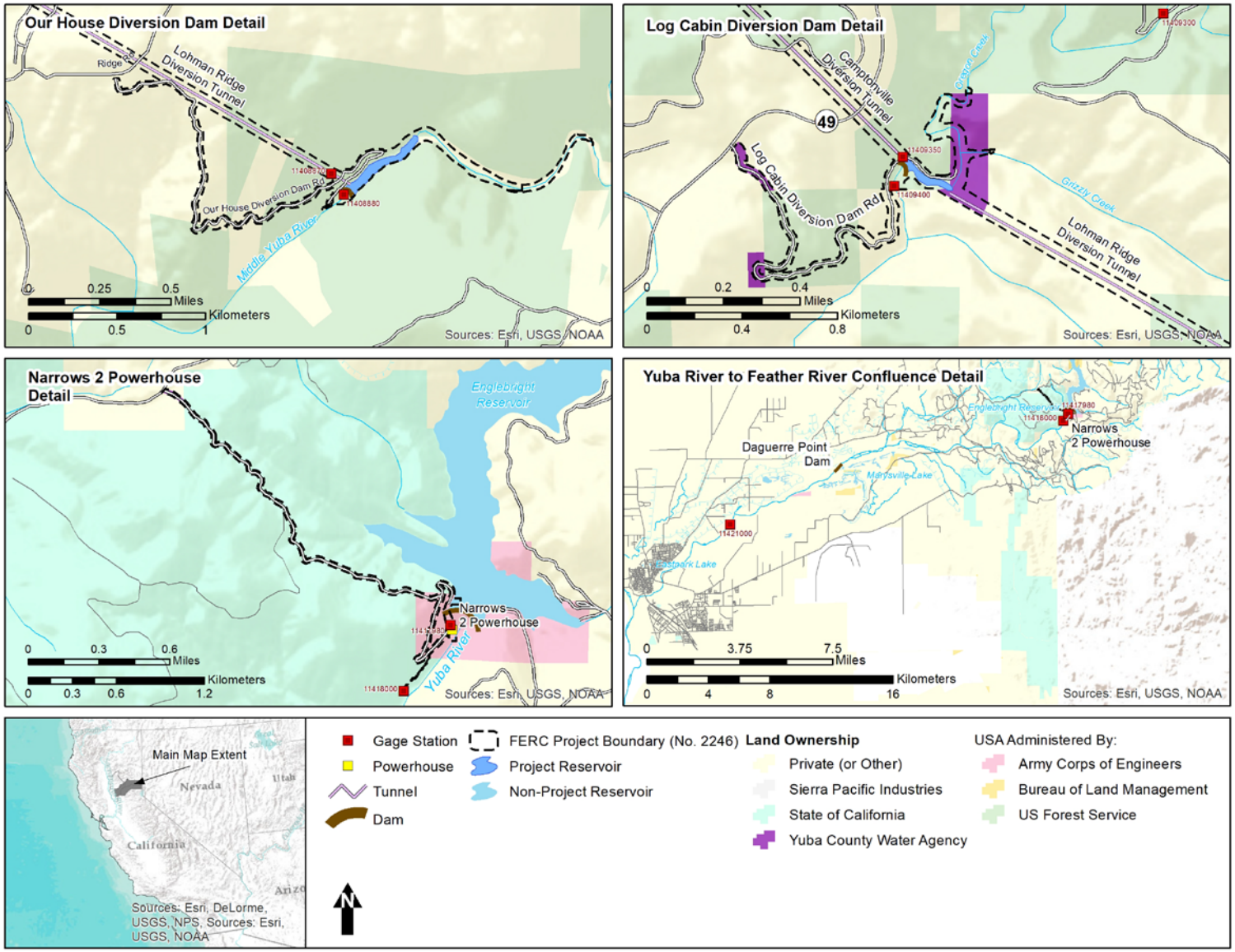

Figure 1-2. Project development details (Source: YCWA, 2017a, as modified by staff).

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Yuba River Development Project is to continue to provide a source of hydroelectric power and flood control and serve as a water supply for both domestic and irrigation purposes. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to YCWA for the Yuba River Development 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 recreation opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing a new license for the Yuba River Development Project would allow YCWA to generate electricity at the project for the term of a new license, making electrical power from a renewable resource available to its customers.

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

In this final EIS, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by the applicant; (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. Important issues that are addressed include the effects of continued project operation on instream flows, shoreline erosion and sediment transport, water quality, fishery resources and fish passage, terrestrial resources, threatened and endangered species, recreation and land use, and cultural resources.

1.2.2 Need for Power

The Yuba River Development Project provides hydroelectric generation to meet part of California's power requirements, resource diversity, and capacity needs. The project has an installed capacity of 361.9 MW and generates approximately 1,418,044 MWh per year under existing conditions since the Lower Yuba River Accord (Yuba Accord). YCWA first implemented flows associated with the Yuba Accord in 2006 when it started a pilot project to study the effects of changes in flow on environmental resources. YCWA and stakeholders signed the Yuba Accord in 2007 and incorporated by the California State Water Resources Control Board (Water Board) into

the YCWA water right permits in 2008. YCWA estimates that average generation would be reduced to 1,374,003 MWh per year and the installed capacity would be unchanged if its proposed flow releases are implemented.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Yuba River Development Project is located in the California/Mexico subregion of the Western Electricity Coordinating Council region of the NERC. According to NERC's 2016 forecast, net internal demand is expected to decline from 38,665 MW to 38,154 MW over the period 2017 to 2026 (NERC, 2016). NERC projects anticipated resource capacity to decline from 49,628 MW to 47,210 MW over the same period; however, adequate reserve capacity would still be available.

We conclude that power from the Yuba River Development Project would help meet a need for power in the California/Mexico subregion in both the short and long term. The project provides power that displaces generation from non-renewable resources. 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 new license for the Yuba River Development Project would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission must require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the U.S. Department of the Interior (Interior). Interior, by letter filed on August 25, 2017, requests that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation must be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. The Forest Service filed final conditions on September 27, 2018 (appendix D), pursuant to section 4(e) of the FPA. These conditions are described under section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions.*

1.3.1.3 Section 10(j) Recommendations

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

On August 25, 2017, Interior, the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), and the California Department of Fish and Wildlife (California DFW) filed timely recommendations under section 10(j). These recommendations are summarized in table 5-1. In letters dated July 27, 2018, and July 30, 2018, NMFS, California DFW, and the U.S. Department of the Interior, Fish and Wildlife Service (FWS) requested a meeting to resolve inconsistencies. Commission staff conducted a meeting with NMFS, California DFW, and FWS on August 29, 2018, in Sacramento, California.[15] In section 5.3.1, *Fish and Wildlife Agency Recommendations*, we 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, the Commission may not issue a license for a hydroelectric project unless a license applicant obtains certification from the appropriate state pollution control agency verifying compliance with the act, or the state agency waives certification by failing to act on the request within a reasonable time, not to exceed one year. On August 24, 2017, YCWA applied to the Water Board for a section 401 water quality certification (certification) for the Yuba River Development Project. The Water Board received this request on August 24, 2017. The applicant withdrew and refiled its request on August 3, 2018 (received by the Water Board on the same day). On August 28, 2017, the Water Board filed preliminary certification

[15] A transcript of the meeting was filed to the record on October 22, 2018, and a meeting summary was filed to the record on November 19, 2018. Following the meeting, YCWA filed additional information on costs associated with agency-recommended minimum flow measures on October 1, 2018, and a response to the meeting discussions on November 2, 2018. California DFW filed a response to YCWA's additional cost information on November 11, 2018. YCWA responded to the California DFW cost filing on November 14, 2018.

conditions (appendix E). These conditions are described under section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*.

Under section 404 of the Clean Water Act, the Corps reviews permits for projects proposing to deposit or discharge dredge or fill material into waters of the United States, including wetlands, and projects must receive authorization for any such activities. Applicable discharges include return water from dredged material disposed on upland property and generally any fill material, such as rock, sand, or dirt. YCWA's proposed project would likely include construction of a tailwater depression at the New Colgate Powerhouse, construction of a new auxiliary flood control outlet at New Bullards Bar Dam, and sediment management activities associated with implementation of the proposed Log Cabin and Our House Diversion Dams Sediment Management Plan. A section 404 permit is not a prerequisite for the Commission's licensing determination; however, the Commission's expectation is that its licensees will comply with all other federal, state, and local permitting processes, as appropriate.

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. Our analyses of project impacts on threatened and endangered species are presented in section 3.3.2, *Aquatic Resources*, and section 3.3.4, *Threatened and Endangered Species*, and our recommendations are provided in section 5.1, *Comprehensive Development and Recommended Alternative*.

Eleven federally listed species are known to occur in the Yuba River Development Project vicinity: the threatened Central Valley steelhead (*Oncorhynchus mykiss*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), North American green sturgeon (*Acipenser medirostrus*), Layne's ragwort (*Packera layneae*), California red-legged frog (*Rana draytonii*), vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and the endangered Hartweg's golden sunburst (*Pseudobahia bahiifolia*), Pine Hill flannelbush (*Fremontodendron californicum* ssp. *decumbens*), and Stebbin's morning-glory (*Calystegia stebbinsii*) (letters from K. Allen, Project Leader, FWS, Sacramento, California, dated August 22, 2017, filed on August 25, 2017,[16] and

[16] The updated species list (letter from FWS, Sacramento Fish and Wildlife Office, filed November 28, 2018) identified Delta smelt, California red-legged frog and its critical habitat, Sierra Nevada yellow-legged frog, giant garter snake, valley elderberry longhorn beetle, Layne's butterweed, and vernal pool fairy shrimp. However, the Delta smelt, Sierra Nevada yellow-legged frog, and giant garter snake have not been identified within the project area (YCWA, 2017a) and are not considered further.

from S. Edmondson, FERC Hydropower Branch Supervisor, NMFS, Sacramento Area Office, dated August 25, 2017, filed on August 25, 2017. There is also designated critical habitat for the Central Valley steelhead, Central Valley spring-run Chinook salmon, North American green sturgeon, and California red-legged frog in the project vicinity.

We conclude that relicensing the Yuba River Development Project, as proposed with staff-recommended measures and mandatory agency conditions (the proposed action), would have "no effect" on Layne's ragwort, Hartweg's golden sunburst, Pine Hill flannelbush, Stebbin's morning-glory, vernal pool fairy shrimp, or vernal pool tadpole shrimp and "may affect but is not likely to adversely affect" North American green sturgeon, California red-legged frog, and valley elderberry longhorn beetle. Considering the potential for incidental take of individuals associated with the proposed action,[17] we conclude that the proposed action is likely to adversely affect spring-run Chinook salmon and Central Valley steelhead in the lower Yuba River.

We also find that relicensing the project "may affect, but is not likely to adversely affect" designated critical habitat for Central Valley steelhead, spring-run Chinook salmon, North American green sturgeon, and California red-legged frog.

On May 31, 2018, we requested concurrence with our finding on the California red-legged frog and valley elderberry longhorn beetle from FWS. FWS concurred with our determination on June 22, 2018. We will request concurrence with our finding on North American green sturgeon from NMFS and formal consultation on spring-run Chinook salmon and Central Valley steelhead.

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, which extends no more than 5 miles inland from the sea.[18] On February 15, 2018, YCWA requested concurrence from the California Coastal Commission that the project is not located within the boundaries of the designated coastal zone, and relicensing the

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[17] If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made (FWS and NMFS, 1998).

[18] See https://www.coastal.ca.gov/maps/czb/ for a map of California's Coastal Management Zone.

project would not affect resources within the designated coastal zone. By letter dated February 20, 2018 (filed with the Commission on February 27, 2018), the California Coastal Commission concurred.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (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 operating and maintaining the Yuba River Development Project. The terms of the PA would ensure that YCWA addresses and treats all historic properties identified within the project's area of potential effects (APE) through the finalization of the existing draft Historic Properties Management Plan (HPMP). YCWA filed a draft HPMP (YCWA, 2016) with the Commission with its license application.

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 Yuba River Development Project, EFH consultation is required for Chinook salmon, because the geographic extent of Chinook salmon EFH in the Yuba River Basin includes project-affected areas.[19]

Based on our analysis in section 3.3.2, *Aquatic Resources,* and recommended measures in section 5.1, *Comprehensive Development and Recommended Alternative*, we conclude that the project would have only minor and, in most cases, beneficial effects on Chinook salmon EFH. We also conclude that staff-recommended measures would improve EFH overall during the long term. We request that NMFS provide any EFH conservation recommendations along with its biological opinion.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 Code of Federal Regulations [CFR], sections 5.1–5.16) 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

[19] Chinook salmon EFH in the Yuba River Basin is that portion of the basin within certain specific hydrologic units that "are currently, or were historically, accessible to the anadromous species." *See* 50 CFR § 660.412.

in complying with the Fish and Wildlife Coordination Act, the ESA, the 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 final 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 January 4, 2011. It was noticed in the *Federal Register* (FR) on January 11, 2011. An environmental site review was held on February 1, 2011. Two scoping meetings, both advertised in the Appeal Democrat, The Union, and The Mountain Messenger, were held on February 2, 2011, in Marysville, California, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments pertaining to SD1, the preliminary application document, and additional study needs:

Commenting Entity	**Date Filed**
Gold Country Fly Fishers	February 18, 2011
United Auburn Indian Community of the Auburn Rancheria	February 28, 2011
Cordua Irrigation District	February 23, 2011
Tom J., Janet M., Myles, and Peyton Scott	March 3, 2011
California DFW	March 3, 2011
E. Burton-McCone and C.W. Burton	March 4, 2011
National Park Service	March 4, 2011
Forest Service	March 4, 2011
Paul and Maggie Phillipson	March 7, 2011
Randy and Cathy Bodhaine	March 7, 2011
Paul and Lottie Dixon	March 7, 2011
Emerald Cove Marina	March 7, 2011
NMFS	March 7, 2011
Camptonville Community Partnership	March 7, 2011
FWS	March 7, 2011
Camptonville Community Service District	March 7, 2011
YCWA	March 7, 2011
Water Board	March 7, 2011
Yuba County Fish and Game Commission	March 7, 2011
Foothills Water Network	March 7, 2011
Terrence and Anita Hansen	March 7, 2011
Carl and Heidi Kurashewich	March 8, 2011
Gary Watts	March 8, 2011
Tom and Sue Gardner	March 8, 2011

Commenting Entity	Date Filed
Ron Fye	March 8, 2011
Lyman and Faye Gandy	March 9, 2011
Ray Byers and Family	March 9, 2011
Dalton and Katherine Collier	March 9, 2011
Keith Torgerson	March 9, 2011
Trout Unlimited Feather River Chapter	March 10, 2011
Dave Billings	March 11, 2011
Paul and Maggie Phillipson	March 17, 2011
Dick and Karen Hatfield	March 21, 2011

A revised scoping document (SD2), addressing these comments, was issued on April 18, 2011.

1.4.2 Interventions

On June 26, 2017, the Commission issued a notice that YCWA's application was accepted. This notice set August 25, 2017, as the deadline for filing protests and motions to intervene. The following entities filed motions to intervene:

Intervenor	Date Filed
Water Board	July 5, 2017
Forest Service	July 18, 2017
Interior[20]	August 17, 2017
Friends of the River	August 25, 2017
California DFW	August 25, 2017
Foothills Water Network et al.[21]	August 25, 2017
NMFS	August 25, 2017

1.4.3 Comments on the Application

The June 26, 2017, notice also stated that the application was ready for environmental analysis and solicited comments, recommendations, preliminary terms and conditions, and preliminary fishway prescriptions. The following entities commented:

[20] Includes FWS, Bureau of Land Management, and National Park Service.

[21] Includes Foothills Water Network, Adventure Connection, American Rivers, American Whitewater, California Outdoors, California Sportfishing Protection Alliance, Gold Country Fly Fishers, Nevada City Rancheria, Northern California Council Federation of Fly Fishers, Sierra Club, South Yuba River Citizens League, Tributary Whitewater Tours, and Trout Unlimited.

Commenting Entity	**Date Filed**
United Auburn Indian Community of the Auburn Rancheria	July 31, 2017
Yuba County Agricultural Commissioner	August 3, 2017
Association of California Water Agencies	August 7, 2017
Camptonville Unified Elementary School District	August 7, 2017
Camptonville Community Services District	August 7, 2017
David R. Anderson	August 7, 2017
California Water Service	August 8, 2017
Ken Zeal	August 8, 2017
Yuba County Assessor Office	August 10, 2017
County of Yuba Office of Treasurer and Tax Collector	August 11, 2017
Yuba County Sheriff's Department	August 11, 2017
County of Yuba	August 14, 2017
Yuba-Sutter Economic Development Corporation	August 14, 2017
Three Rivers Levee Improvement Authority	August 14, 2017
Linda Fire Protection District	August 14, 2017
Comfort Keepers	August 14, 2017
Yuba County Reclamation District 784	August 14, 2017
Linda County Water District	August 14, 2017
Loma Rica/Browns Valley Community Services District	August 14, 2017
Yuba Office of Education	August 14, 2017
Yuba County District Attorney's Office	August 15, 2017
Browns Valley Irrigation District	August 15, 2017
Gary R. Watts	August 15, 2017
Ronald Wilson	August 15, 2017
Lakeview Energy Services	August 16, 2017
Terrence Hansen	August 17, 2017
Olivehurst Public Utility District	August 18, 2017
San Luis and Delta-Mendota Water Authority	August 18, 2017
Camptonville Volunteer Fire Department	August 21, 2017
Camptonville Community Partnership	August 21, 2017
Frank M. Booth, Inc.	August 21, 2017
Tsi-Akim Maidu Tribe	August 21, 2017
Foothill Fire Protection District	August 21, 2017
Julietta and Raymond Forbes	August 23, 2017
Dry Creek Mutual Water Company	August 23, 2017
Brophy Water District	August 23, 2017
Reclamation District 817	August 23, 2017

Commenting Entity	Date Filed
Hallwood Irrigation Company	August 24, 2017
Emerald Cove Marina	August 24, 2017
Basset Family	August 24, 2017
Justin Black	August 24, 2017
Randy and Cathy Bodhaine	August 24, 2017
Tom and Cindy Browning	August 24, 2017
Rick and Patty Cassidy	August 24, 2017
Lanny Edwards	August 24, 2017
Jason Gretsch	August 24, 2017
Jack and Dora Harbour	August 24, 2017
Spencer Havner	August 24, 2017
Rolf and Karin Kleinhans	August 24, 2017
Kevin Maas	August 24, 2017
Dave McCombs	August 24, 2017
Frank and Jeanie Milano	August 24, 2017
Larry and Sandy Ryan	August 24, 2017
William Hemmerlin	August 24, 2017
Jarry and Donna Walton	August 25, 2017
John Schultz	August 25, 2017
Sandra Schultz	August 25, 2017
Howard Carte	August 25, 2017
Cindy Cook	August 25, 2017
Holton	August 25, 2017
Rory Low	August 25, 2017
Forest Service	August 25, 2017
NMFS	August 25, 2017
California DFW	August 25, 2017
Interior[22]	August 25, 2017
Foothills Water Network	August 25, 2017
Friends of the River et al.[23]	August 25, 2017
Ron Ratto	August 25, 2017

[22] Includes FWS, the Bureau of Land Management, and the National Park Service.

[23] Includes Friends of the River, South Yuba River Citizens League, The Sierra Fund, Northern California Council International Federation of Fly Fishers, Native Fish Society, Pacific Coast Federation of Fisherman's Associations, Institute for Fisheries Resources, Patagonia, and Stoecker Ecological.

Commenting Entity	Date Filed
Jonathan Watts	August 25, 2017
North Yuba Water District	August 25, 2017
Wheatland Fire Authority	August 25, 2017
Wheatland Water District	August 25, 2017
Cordua Irrigation District	August 25, 2017
Maryville Levee Commission	August 25, 2017
South Yuba River Citizens League	August 25, 2017
Water Board	August 28, 2017
City of Marysville	August 28, 2017
Rod and Susan Brock	August 28, 2017
Mark and Kathy Frazier	August 28, 2017
Andrew Harris	August 28, 2017
City of Wheatland	August 29, 2017
U.S. Environmental Protection Agency, Region 9	August 31, 2017

The applicant filed reply comments on October 10, 2017.

1.4.4 Comments on the Draft Environmental Impact Statement

The draft EIS was sent to the U.S. Environmental Protection Agency (EPA) and made available to the public on May 30, 2018. Written comments on the draft EIS were due July 30, 2018. In addition, oral testimony on the draft EIS was received during two public meetings held in Marysville, California, on July 10, 2018.[24] Appendix B lists the commenters who filed written comments, summarizes the substantive comments that were provided, includes staff responses to those comments, and indicates where we made modifications to this final EIS, as appropriate.

[24] The transcripts from the meetings were filed in the administrative record for the project on August 15, 2018.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license and the flow regime associated with the Yuba Accord,[25] and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative as the baseline environmental condition for comparison with other alternatives.

2.1.1 Existing Project Facilities

The project consists of three separate developments, generally upstream to downstream: (1) the New Colgate Development, which includes: (a) the Our House Diversion Dam on the Middle Yuba River with a diversion tunnel (Lohman Ridge Diversion Tunnel) that diverts water to Oregon Creek; (b) the Log Cabin Diversion Dam on Oregon Creek, located just downstream of the Lohman Ridge Diversion Tunnel outfall, with a diversion tunnel (Camptonville Diversion Tunnel) that diverts water from Oregon Creek (and the Middle Yuba River via the Lohman Ridge Diversion Tunnel) to the New Bullards Bar Reservoir on the North Yuba River; (c) the New Bullards Bar Dam and Reservoir; and (d) a power tunnel from the New Bullards Bar Reservoir to the New Colgate Powerhouse on the Yuba River; (2) the New Bullards Bar Minimum Flow Development, which includes a penstock and powerhouse that divert flow from the New Bullards Bar Reservoir through the powerhouse and back to the North Yuba River; and (3) the Narrows 2 Development, which includes a penstock and powerhouse that diverts

[25] In 2005, YCWA and 16 other interested parties signed memoranda of understanding that specify the terms of the Yuba Accord, a comprehensive, consensus-based program to protect and enhance aquatic habitat in the Yuba River downstream of Englebright Dam. In 2006, YCWA implemented the flows specified in the Yuba Accord to test the effects on environmental resources in the lower Yuba River. Following environmental review, YCWA and the parties executed the following four agreements in 2007, which together compose the Yuba Accord: (1) the Lower Yuba River Fisheries Agreement, which specifies the Yuba Accord's lower Yuba River minimum streamflows and creates a detailed fisheries monitoring and evaluation program; (2) the Water Purchase Agreement, under which the California Department of Water Resources (California DWR) purchases water from YCWA, some of which is provided by the Yuba Accord's minimum streamflows for CALFED's Environmental Water Account and State Water Project and Central Valley Project contractors; (3) the Conjunctive Use Agreements with 7 of YCWA's member units, which specify the terms of the Yuba Accord's groundwater conjunctive-use program; and (4) amendments to the 1966 Power Purchase Contract between YCWA and Pacific Gas and Electric (PG&E).

water from the Englebright Reservoir (non-project facility) on the Yuba River back to the Yuba River. The primary features of the three developments are shown on figures 2-1 through 2-5, and the following sections provide more details about these facilities.

2.1.1.1 New Colgate Development

The New Colgate Development consists of the following existing facilities: (1) the 70-foot-high, 368-foot-long Our House Diversion Dam, a 130-foot-radius, double curvature, concrete arch dam with a 24-inch-diameter fish-release outlet with an estimated maximum capacity of 59 cubic feet per second (cfs), and a 60-inch-diameter low-level outlet, located on the Middle Yuba River, 12.6 miles upstream of its confluence with the North Yuba River, which impounds 280 acre-feet of water at a normal maximum water surface elevation (NMWSE) of 2,030 feet National Geodetic Vertical Datum of 1929;[26] (2) the 19,395-foot-long Lohman Ridge Diversion Tunnel (90 percent of the length is unlined and 12.5 feet wide by 12.5 feet high and 10 percent of the length is concrete-lined and 9.7 feet wide by 10.7 feet high), which conveys flows from the Middle Yuba River to Oregon Creek; (3) the 42.5-foot-high, 300-foot-long Log Cabin Diversion Dam, a 105-foot-radius, concrete arch dam with a 18-inch-diameter fish-release outlet with an estimated maximum capacity of 18 cfs, and a 60-inch-diameter low-level outlet, located on Oregon Creek about 4.3 miles upstream of its confluence with the Middle Yuba River, which impounds 90 acre-feet of water at a NMWSE of 1,970 feet; (4) the 6,121-foot-long Camptonville Diversion Tunnel (70 percent of the length is unlined and 14.5 feet wide by 14.5 feet high and 30 percent of the length is concrete-lined and 11.6-feet wide by 12.6 feet high), which conveys flows from Oregon Creek to the New Bullards Bar Reservoir on the North Yuba River; (5) the 645-foot-high, 2,323-foot-long, New Bullards Bar Dam, a 1,110-foot-radius, concrete arch dam located on the North Yuba River about 2.4 miles upstream of its confluence with the Middle Yuba River, which impounds the New Bullards Bar Reservoir, with a surface area of 4,790 acres and a usable storage capacity of 966,103 acre-feet at a NMWSE of 1,956 feet; (6) the New Bullards Bar Dam overflow-type spillway with a width of 106 feet, and three 30-foot by 53-foot Tainter gates; (7) a 72-inch-diameter, low-level outlet pipe in the dam with a 72-inch-diameter hollow jet valve that provides water to the New Bullards Bar minimum flow unit and/or to provide bypass flows downstream of the dam; (8) an intake tower upstream of the dam that contains an upper level intake opening (not used according to California DFW) and a low-level intake opening used to provide flows to the New Colgate Penstock and Powerhouse; (9) the 5.2-mile-long New Colgate Power Tunnel and Penstock (a portion is unlined and 26 feet wide by 26 feet high, and the rest is concrete-lined and 22.8 feet wide by 14.5 feet high), which conveys flows from the New

[26] All elevations are provided in National Geodetic Vertical Datum of 1929 unless otherwise noted.

Figure 2-1. Our House Diversion Dam (Source: YCWA, 2017a).

Figure 2-2. Log Cabin Diversion Dam (Source: YCWA, 2017a).

Figure 2-3. New Bullards Bar Dam and Minimum Flow Powerhouse (Source: YCWA, 2017a).

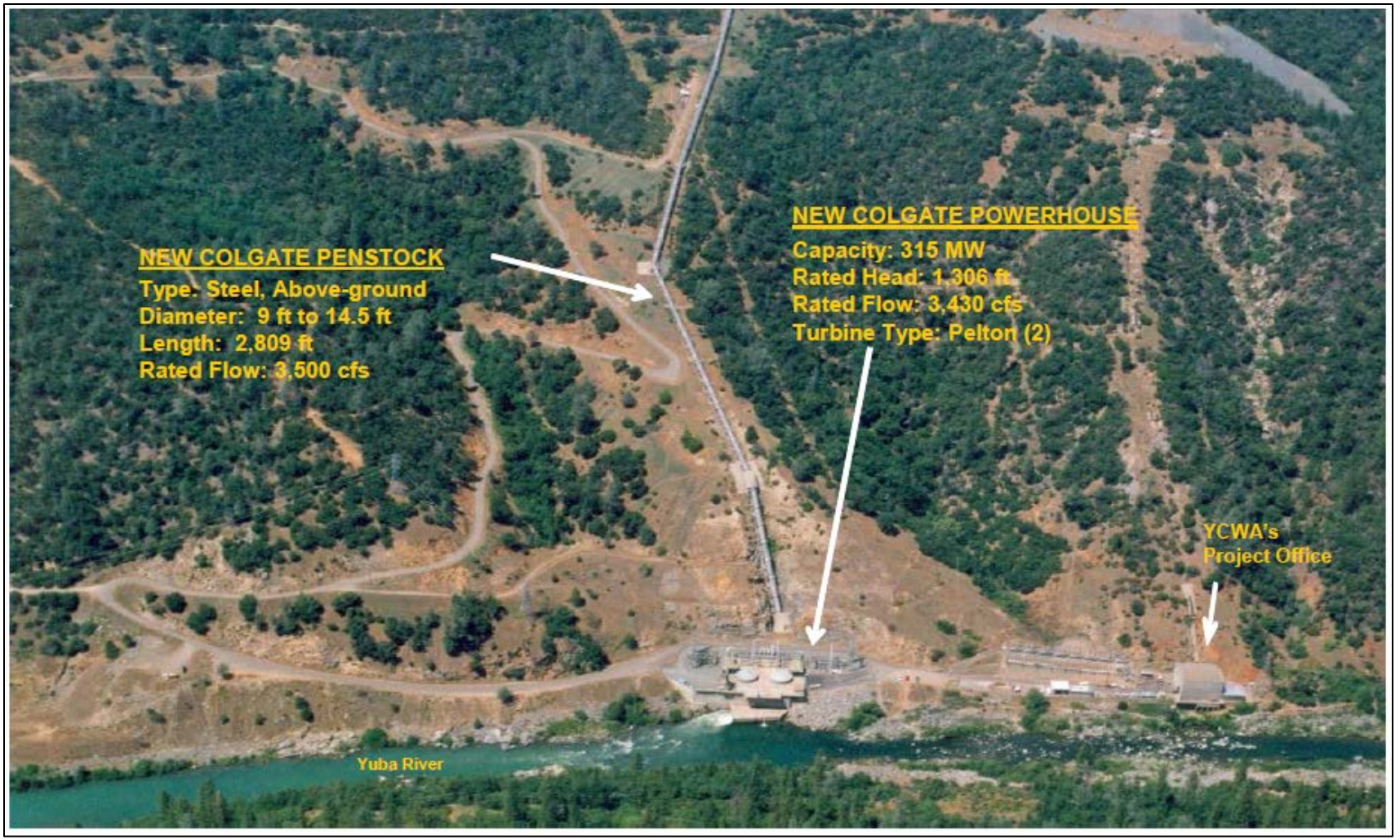

Figure 2-4. New Colgate Powerhouse (Source: YCWA, 2017a).

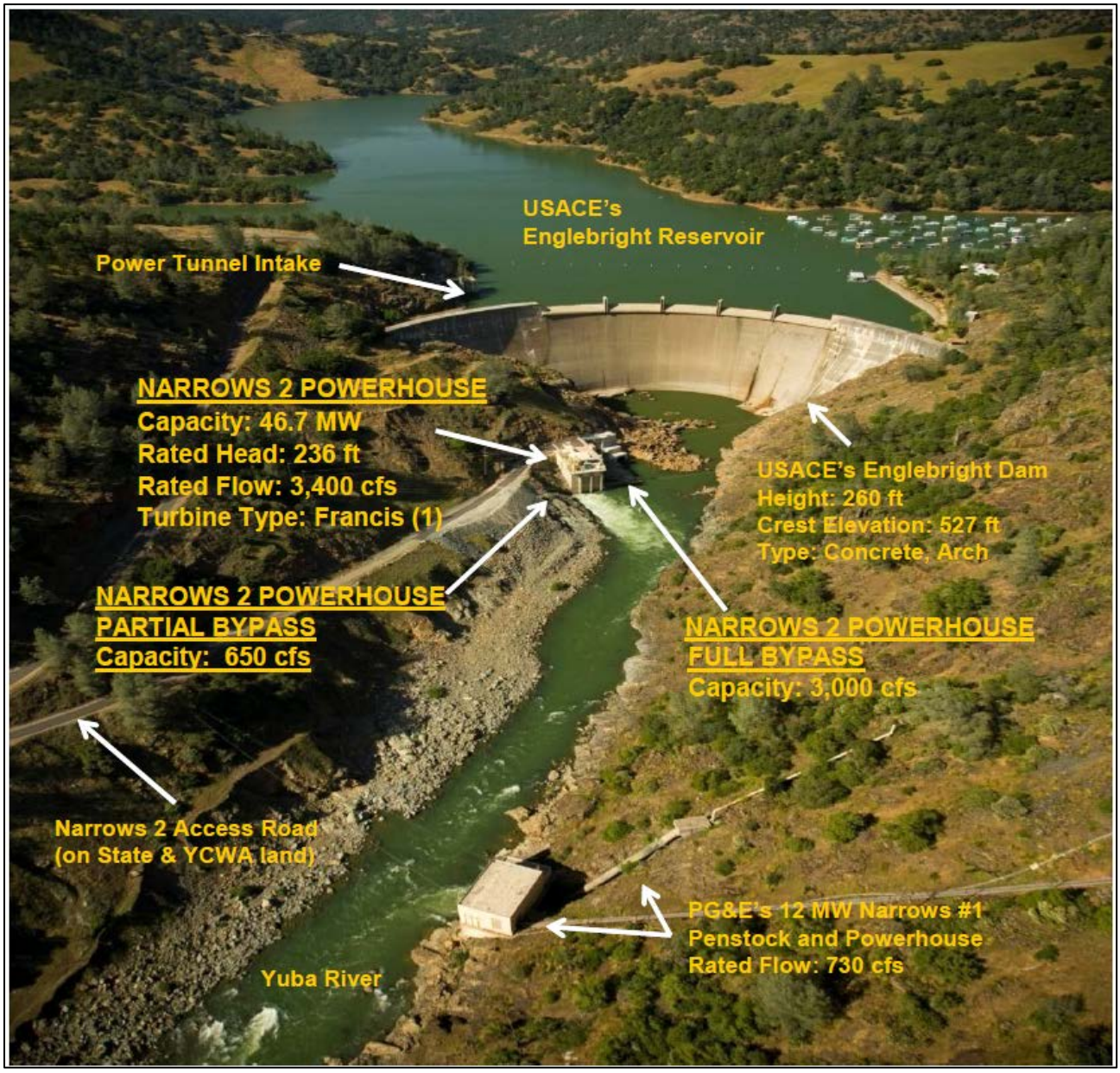

Figure 2-5. Narrows 2 Powerhouse, partial bypass, and full bypass and Englebright Reservoir and PG&E's Narrows 1 Powerhouse (Source: YCWA, 2017a).

Bullards Bar Reservoir to the New Colgate Powerhouse; (10) the New Colgate Powerhouse, a 98.5-foot-wide by 144-foot-long, aboveground, steel-reinforced, concrete powerhouse located at river mile (RM) 34.2[27] adjacent to the Yuba River containing two 159-MW Pelton-type turbines, each with a 175,000 kilovolt-ampere (kVA), 157.5-MW generator for a total installed capacity of 315 MW; (11) the New Colgate Switchyard, located adjacent to the New Colgate Powerhouse; and (12) appurtenant facilities and features including access roads. No project transmission lines are associated with the development.

YCWA maintains several recreation facilities on New Bullards Bar Reservoir, including: (1) Hornswoggle Group Campground; (2) Schoolhouse Campground; (3) Dark Day Campground; (4) Cottage Creek Picnic Area; (5) Garden Point Campground; (6) Madrone Cove Boat-in Campground; (7) Frenchy Point Boat-in Campground; (8) Dark Day Picnic Site; (9) Sunset Vista Observation Site; (10) Dam Overlook Observation Site; (11) Moran Road Boating Site; (12) Cottage Creek Boat Launch; (13) Dark Day Boat Launch, including the overflow parking area; (14) Schoolhouse Trail; (15) Bullards Bar Trail; and (16) floating comfort stations.[28]

2.1.1.2 New Bullards Bar Minimum Flow Development

The New Bullards Bar Minimum Flow Development, located downstream of the New Bullards Bar Dam on the North Yuba River, consists of the following existing facilities: (1) a 70-foot-long, 12-inch-diameter steel penstock, which begins at a bifurcation in a 72-inch-diameter low-level outlet pipe and conveys flows from the New Bullards Bar Reservoir to the New Bullards Bar Minimum Flow Powerhouse; (2) the

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[27] To resolve an apparent conflict in YCWA's description of the river mile for New Colgate Powerhouse, staff used Google Earth to measure the distance between the New Colgate Powerhouse and Dobbins Creek confluence with the Yuba River. Based on the measured distance of approximately 0.25 mile (about 1,300 feet), we conclude that the New Colgate Powerhouse is located at RM 34.2 (as indicated on pages E3-13 and E3-16 of the amended final license application, exhibit E). This differs from YCWA's statement that the Dobbins Creek terminus is a few hundred feet downstream of the New Colgate Powerhouse (page E3.3.1-17 of the amended final license application, exhibit E).

[28] YCWA's revised RR1 revises the names of several of the recreation sites, notably, the Dark Day Picnic Area becomes the Dark Day Picnic Site; Sunset Vista Point becomes Sunset Vista Observation Site; Dam Overlook becomes Dam Overlook Observation Site; and Moran Road Day Use Area becomes Moran Road Boating Site. YCWA indicates that the names have been changed to be consistent with the Forest Service's current facility naming guidelines based on the amenities provided at each facility. To avoid confusion and maintain consistency, the names of the above-mentioned facilities have been changed in the final EIS.

New Bullards Bar Minimum Flow Powerhouse, containing a single, 150.75-kilowatt (kW) Pelton turbine with a 187.5 kVA, 168.75-kW generator; (3) a 225-kVA transformer, located adjacent to the powerhouse; and (4) appurtenant facilities and features, including access roads. No project transmission lines are associated with the minimum flow development.

2.1.1.3 Narrows 2 Development

The Narrows 2 Development, located on the Yuba River, consists of the following existing facilities: (1) the Narrows 2 Penstock, composed of a 349-foot-long, 18-foot-4-inch-diameter, concrete-lined tunnel section; a 368-foot-long, 14-foot-diameter, steel-lined tunnel; and a 20-foot-long transition between them that conveys flows from the Englebright Reservoir to the Narrows 2 Powerhouse; (2) a partial bypass and full bypass used to pass flow during powerhouse shutdowns; (3) the Narrows 2 Powerhouse, a concrete powerhouse located at the base of the Corps' Englebright Dam, housing one 52.5-MW vertical axis Francis turbine with a 55,000 kVA, 46,750-kW generator; (4) the Narrows 2 Switchyard, located adjacent to the powerhouse; and (5) appurtenant facilities and features, including access roads. No project transmission lines are associated with the Narrows 2 Development.

2.1.2 Project Safety

The project has been operating for more than 50 years under the existing license. During this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the project has been inspected and evaluated every 5 years by an independent consultant and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, Commission staff would evaluate the continued adequacy of the proposed project facilities under a new license. Special articles would be included in any license issued, as appropriate. Commission staff would continue to inspect the project during the new license term to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.3 Existing Project Operation

Operation of YCWA's reservoirs, dams, and powerhouses are described below for the three project developments: New Colgate, New Bullards Bar Minimum Flow, and Narrows 2. Although the Narrows 2 Powerhouse uses flows from the Englebright Reservoir, the Corps owns and maintains the Englebright Dam and Reservoir. However, with the exception of emergencies, YCWA makes reasonable efforts to operate the project to avoid fluctuations in the flow of the lower Yuba River downstream of Englebright Dam. Under the existing license, YCWA maintains the following at the

Englebright Reservoir: (1) flow releases required by the Corps' flood control criteria, (2) flow releases required to maintain a flood control buffer or for other flood control purposes, (3) bypasses of uncontrolled flows into Englebright Reservoir, (4) uncontrolled spilling, and (5) uncontrolled flows of tributary streams downstream of Englebright Reservoir. Neither the Englebright Dam nor Reservoir are licensed as part of the Yuba River Development Project. PG&E also uses flows from the Englebright Reservoir to operate and maintain its Narrows 1 Powerhouse under a separate license.

The Our House Diversion Dam is used to divert up to 860 cfs from the Middle Yuba River through the Lohman Ridge Diversion Tunnel to Oregon Creek just upstream of the Log Cabin Diversion Dam. In addition to the Lohman Ridge Diversion Tunnel, there are two outlets from the Our House Diversion Dam, with an estimated combined capacity of 463 cfs. The fish-release outlet is adjusted each day to ensure minimum flow in the Middle Yuba River downstream of the diversion dam. The low-level outlet is rarely used under current operations.

The Log Cabin Diversion Dam is used to divert up to 1,100 cfs from Oregon Creek (including flows contributed from the Middle Yuba River via the Lohman Ridge Diversion Tunnel) through the Camptonville Diversion Tunnel to the New Bullards Bar Reservoir on the North Yuba River. In addition to the Camptonville Diversion Tunnel, there are two outlets from the Log Cabin Diversion Dam, with an estimated combined capacity of 348 cfs. The low-level outlet is rarely used under normal operations.

The New Bullards Bar Reservoir is the principal storage facility for the project, with a gross storage capacity of approximately 966,103 acre-feet and a usable capacity of 736,103 acre-feet available for project operation. The reservoir is also used for flood control and to store water supply for downstream users. YCWA delivers up to 436,760 acre-feet of water annually to eight member units to satisfy consumptive-use water-right permits. A portion of the usable capacity, 170,000 acre-feet, must be available for flood management from November 1 through March 31; flood control storage requirements ramp up to this level between September 15 and October 31 and ramp down between April 1 and May 30. The full usable capacity of the reservoir is available for water supply storage and generation between June 1 and September 15.

Releases from New Bullards Bar Reservoir are made: (1) through the intake tower and New Colgate Power Tunnel to the New Colgate Powerhouse on the Yuba River; (2) through the low-level outlet at the base of the dam to either: (a) the Yuba River downstream of the dam, or (b) to the New Bullards Bar Minimum Flow Powerhouse at the base of the dam; and/or (3) through the gated spillway (table 2-1). The intake tower has an upper level intake opening and a lower intake opening that is used to provide flows to the New Colgate Penstock and Powerhouse. The New Colgate Powerhouse has a maximum flow capacity of 3,430 cfs, and the New Bullards Bar Minimum Flow Powerhouse has a maximum flow capacity of 5 cfs. The low-level outlet at the base of the New Bullards Bar Dam has a maximum capacity of 1,250 cfs but is rarely used except to provide flow to the minimum flow powerhouse. The New Bullards Bar

Spillway has a crest elevation of 1,902 feet and a maximum capacity of 160,000 cfs at full pool elevation. Minimum flow on the North Yuba River downstream of the New Bullards Bar Dam is met through a combination of releases from the New Bullards Bar Minimum Flow Powerhouse and seepage through the dam.

Table 2-1. Flow pathways out of New Bullards Bar Reservoir (Source: YCWA, 2017a, as modified by staff).

Inlet	Inlet Elevation	Flow Capacity	Condition
Spillway with three radial Tainter gates	1,902 to 1,956 feet	160,000 cfs to dam crest	Existing, operable
New auxiliary flood control outlet	Approximately 1,870 to 1,900 feet	45,000 cfs at elevation 1,918 feet (bottom of flood pool) 60,000 cfs at elevation 1,956 feet (NMWSE)	Proposed
Upper intake for New Colgate Powerhouse	1,808 feet at centerline	3,430 cfs maximum rated flow at New Colgate Powerhouse	Existing, not used since 1993
Lower intake for New Colgate Powerhouse	1,627.5 feet at centerline		Existing, operable
Low-level outlet, which supplies:	1,444.5 feet at invert of intake[a]		Existing, operable
New Bullards Bar Minimum Flow Powerhouse		5 cfs design capacity	Existing, operable
72-inch hollow jet valve		1,250 cfs release capacity because of vibrations at greater release rates	Existing, operable
Cottage Creek Water Treatment Plant		Pumping to the treatment plant averages approximately 6 acre-feet per year	Existing, operable

Notes: NMWSE – normal maximum water surface elevation

[a] The invert elevation of the intake for the low-level outlet provided in exhibit A is inconsistent with figure 2.1-3 of exhibit E, which provides an invert elevation of 1,447.5 feet.

Normal maximum and normal minimum operating elevations for the New Bullards Bar Reservoir are 1,956 feet and 1,730 feet, respectively. The reservoir's gross storage of 966,103 acre-feet is the volume of water between the NMWSE of 1,956 feet and the bottom of the reservoir, at approximately elevation 1,320 feet. The reservoir's usable storage of 961,103 acre-feet (which includes storage below the lower level powerhouse intake) is based on the volume of water between the NMWSE and the intake elevation at the low-level outlet (1,395 feet). The surface area at the NMWSE of 1,956 feet is 4,790 acres.

The New Colgate Powerhouse is used for a combination of peaking, ancillary services, and some baseload generation. Depending on energy demand, the New Colgate Powerhouse generation can ramp up (or down) from a minimum of 1 MW with only one unit operating to the nameplate capacity of 315 MW with both units operating in less than 10 minutes. The ability to rapidly fluctuate generation, together with substantial storage available in New Bullards Bar Reservoir, makes the project unique to Northern California and important to grid stability.

The New Bullards Bar Minimum Flow Powerhouse is operated as a baseload facility, where flows are set at a constant rate to provide 5 cfs downstream of the dam.

As discussed above, the Narrows 2 Powerhouse uses flows from the Corps' Englebright Reservoir. The powerhouse is operated as a baseload facility, with flow established as part of the Yuba Accord, which is discussed in more detail in section 2.1.4, *Existing Environmental Measures*, seasonal irrigation demands, and license terms for ramping and flow fluctuation.

YCWA and PG&E coordinate releases from the Narrows 2 Powerhouse, the Narrows 2 partial bypass, and PG&E's Narrows 1 Powerhouse (Narrows Project, FERC No. 1403) in accordance with the streamflow requirements in Article 33 of YCWA's existing license for the Yuba River Development Project to ensure compliance with downstream minimum flows on the Yuba River and to manage inflows into Englebright Reservoir.[29]

2.1.4 Existing Environmental Measures

YCWA operates the project in accordance with the current license requirements and operating agreements discussed below.

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[29] On October 17, 2018, PG&E and YCWA filed a joint application for approval to transfer the license for the Narrows Project (with the exception of the Narrows 1 Transmission Line and Substation) from PG&E to YCWA (accession no. 20181017-5077).

2.1.4.1 Articles Included in the Existing License

The existing license includes 60 articles, of which only 4 are germane to project operation. These articles are presented below as they appear in the license order.

Article 33. The licensee shall maintain the following minimum streamflow schedules for maintenance of fish life in the several streams listed:

(a)

	Flow (cfs)[1]	
Stream	April 15 to June 15	June 16 to April 14
Middle Yuba (Below Our House Diversion Dam)	50	30
Oregon Creek (Below Log Cabin Diversion Dam)	12	8
North Yuba (Below New Bullards Bar Dam)	5	5

[1] Or natural inflow, whichever is less. Maximum 24-hour fluctuations of plus or minus 10 percent are permitted for flows in Middle Yuba below Our House Diversion Dam and in Oregon Creek below Log Cabin Diversion Dam.

(b)

	Flow (cfs)[1]			
Stream	Jan. 1 to June 30	July 1 to Sept. 30	Oct. 1 to Dec. 31	Measurement Point
Yuba River (Below Daguerre Point Dam)	245	70	400	Over the crest of Daguerre Point Dam and through fishway

[1] Provided that these flows shall be in addition to releases made to satisfy existing downstream water rights.

(c)

Water releases for fish life as specified in paragraphs (a) and (b) of this article shall be subject to the following reduction in any critically dry year, defined as a water year for which the April 1 forecast of the California Department of Water Resources (California DWR) predicts that streamflow in the Yuba River at Smartsville will be 50 percent or less of normal:

Yuba River at Smartsville Streamflow Forecast Percent Of Normal	Reduction in Water Releases for Fish Life (Percent)
50	15
45	20
40 or less	30

However, in no event shall releases for fish life below Daguerre Point Dam be reduced to less than 70 cfs. The critically dry year provisions herein shall be effective from the time the aforesaid forecast is available until the April 1 forecast of the following year.

(d)

In addition to maintaining winter minimum water releases for fish life in Yuba River below Daguerre Point Dam, as specified in paragraphs (b) and (c) of this article, the licensee shall maintain uniform and continuous releases from Englebright Dam within the limits of the following schedule:

Period	Release (cfs)[1]	Measurement Point
October 16 to 31	600–1,050	New gaging station to be built downstream from the two Narrows powerhouses
November	600–700	
December	600–1,400	
January 1 to 15	1,000–1,850	
January 16 to March 31	600	

1 Provided that:

a. Variations from this schedule are permissible during emergencies, uncontrollable flood flows, and critically dry year curtailments.

b. With the exception of emergencies, releases required by the Corps' flood control criteria, releases required to maintain a flood control buffer or for other control purposes, bypasses of uncontrolled flows into Englebright Reservoir, uncontrolled spilling, or uncontrolled flows of tributary streams downstream of Englebright Dam, the licensee shall make reasonable efforts to operate the New Bullards Bar Reservoir and Englebright Reservoir to avoid fluctuations in the flow of the lower Yuba River downstream of Englebright Dam, and daily changes in project operations affecting releases or bypasses of flow from Englebright Dam shall be continuously measured at the U.S. Department of the Interior, Geological Survey (USGS), gage at Smartsville, and shall be made in accordance with the following conditions:

i. Project releases or bypasses that increase streamflow downstream of Englebright Dam shall not exceed a rate of change of more than 500 cfs per hour.
ii. Project releases or bypasses that reduce streamflow downstream of Englebright Dam shall be gradual and over the course of any 24-hour period and shall not be reduced below 70 percent of the prior day's average flow release or bypass flow.
iii. Once the daily project release or bypass level is achieved, fluctuation in the streamflow level downstream of Englebright Dam due to changes in project operations shall not vary up or down by more than 15 percent of the average daily flow.
iv. During the period from September 15 to October 31, the licensee shall not reduce the flow downstream of Englebright Dam to less than 55 percent of the maximum 5-day average release or bypass level that has occurred during that September 15 to October 31 period or the minimum streamflow requirement that would otherwise apply, whichever is greater.
v. During the period November 1 to March 31, the licensee shall not reduce the flow downstream of Englebright Dam to less than the minimum streamflow release or bypass established under (iv) above, or 65 percent of the maximum 5-day average flow release or bypass that has occurred during that November 1 to March 31 period, or the minimum streamflow requirement that would otherwise apply, whichever is greater.

Article 34. The licensee shall maintain a minimum pool in New Bullards Bar Reservoir at elevation 1,730 feet.

Article 40. Consistent with the primary purpose of the power intakes in the New Bullards Bar Dam,[30] the licensee shall operate, within limits of the project, the multiple-level power intakes in New Bullards Bar Dam to provide water of suitable quality in the Yuba River downstream from the New Narrows Power Plant for the production of anadromous fish as may be prescribed by the Commission upon the recommendation of the Director of the California Department of Fish and Game (now California DFW) and FWS.

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[30] New Bullards Bar Dam has three intakes: the intake for the low-level outlet with an invert elevation of 1,447.5 feet supplies the New Bullards Bar Minimum Flow Powerhouse, and the upper and lower intakes for the New Colgate Powerhouse have centerline elevations of 1,808 feet and 1,620 feet, respectively. Since 1993, YCWA has operated the New Colgate Powerhouse using only the lower intake to meet California DFW and FWS recommendations for water releases and temperature from New Bullards Bar Reservoir.

Article 46. The licensee shall operate the project reservoirs for flood control in accordance with rules prescribed by the secretary of the Army, such rules to be specified in a formal agreement between the licensee and the District Engineer, U.S. Army Engineers District, Sacramento, California. Said agreement shall be subject to review from time to time at the request of either party; provided, however, that a different procedure of review may be prescribed by formal agreement.

For Article 46, YCWA operates New Bullards Bar Reservoir from September 16 through May 31 to comply with Part 208 "Flood Control Regulations, New Bullards Bar Dam and Reservoir, North Yuba River, California," pursuant to section 7 of the Flood Control Act of 1944 (58 Stat. 890). Under the contract between the United States and YCWA that was entered into on May 9, 1966, control in accordance with rules and regulations enumerated in appendix C of the Report on Reservoir Regulation for Flood Control. The seasonal flood storage space allocation schedule is presented in table 2-2 (specified values are for the end of each month).

Table 2-2. New Bullards Bar Reservoir flood storage space allocation in thousands of acre-feet (Source: YCWA, 2017a).

Month	Storage Allocation (thousand acre-feet)
October	170
November	170
December	170
January	170
February	170
March	170
April	70
May	0
June	0
July	0
August	0
September	56

In addition to reservation of flood control space in New Bullards Bar Reservoir, the flood control regulations include rules governing ramping rates and target maximum flows in the Yuba River downstream of Englebright Dam and in the Feather River downstream of the confluence with the Yuba River.

YCWA also coordinates operation with PG&E's Narrows 1 Powerhouse downstream of Englebright Dam to use storage in Englebright Reservoir to capture winter storm freshets and reduce storm flows on the Yuba River. This operation is accomplished by evacuating storage space in Englebright Reservoir in anticipation of storm peak flows.

2.1.4.2 Lower Yuba River Accord

In addition to the current license requirements, YCWA has operated the project consistent with the Yuba Accord since 2006 when it started a pilot project to study the effects of changes in flow on environmental resources. The Yuba Accord was signed in 2007 and incorporated by the Water Board into the YCWA water right permits in 2008. The flows specified by the Yuba Accord are currently being implemented by YCWA and therefore are part of the environmental baseline for this EIS.

The Yuba Accord was developed by a multi-agency resource team, including representatives from NMFS, FWS, California Department of Fish and Game (now California DFW), and a group of non-governmental organizations. Yuba Accord flow schedules 1 and 2 were developed to optimize habitat conditions for anadromous fish during high-flow years. Schedule 6 flow schedules were developed to create the best habitat conditions possible for these fish during very low-flow years, considering available water supplies and competing demands. For other water years, the Yuba Accord specifies flows consistent with schedules 3, 4, and 5 to improve habitat conditions during more typical water years. The Yuba Accord also specifies requirements for "conference years," which are the very driest years, and are predicted to occur approximately 1 percent of the time.

YCWA has been operating the project to implement the Yuba Accord since 2006. The 2006, 2007, and early 2008 operations were part of a pilot program that were approved by the Water Board through Water Right (WR) 2006-0009, WR 2006-0010, WR-2007-0002, and WR 2007-0012-DWR. Since 2008, YCWA has been operating the project to implement the Yuba Accord according to the authorizations and requirements in the Water Board's corrected order WR 2008-0014. The Water Board's corrected order WR 2008-0014 does not outline specific water surface elevations in Englebright Reservoir that YCWA must maintain.

The Yuba Accord includes a specific set of flow schedules for the Yuba River. The flow schedule that is in effect at any particular time is determined by the North Yuba Index, a hydrologic index that was developed as part of the Yuba Accord. The flow schedules are listed in table 2-3. The water year hydrologic classification for the Yuba River to determine the flow requirements of YCWA's water rights permits are based on the North Yuba Index (table 2-4).

Table 2-3. Yuba Accord flow schedules (Source: YCWA, 2017a).

Schedule	Oct 1-15	Oct 16-30	Nov 1-30	Dec 1-31	Jan 1-31	Feb 1-29	Mar 1-31	Apr 1-15	Apr 16-30	May 1-15	May 16-31	Jun 1-15	Jun 16-30	Jul 1-31	Aug 1-31	Sep 1-30	Total Annual Vol. (acre-feet)
Marysville Gage (11421000) (cfs)																	
1	500	500	500	500	500	500	700	1,000	1,000	2,000	2,000	1,500	1,500	700	600	500	574,200
2	500	500	500	500	500	500	700	700	800	1,000	1,00	800	500	500	500	500	429,066
3	500	500	500	500	500	500	500	700	700	900	900	500	500	500	500	500	398,722
4	400	400	500	500	500	500	500	600	900	900	600	400	400	400	400	400	361, 944
5	400	400	500	500	500	500	500	500	600	600	400	400	400	400	400	400	334,818
6	350	350	350	350	350	350	350	350	500	500	400	300	150	150	150	350	232,155
Smartsville Gage (11418000) (cfs)																	
1	700	700	700	700	700	700	700	700	--	--	--	--	--	--	--	700	--
2	700	700	700	700	700	700	700	700	--	--	--	--	--	--	--	700	--
3	700	700	700	700	700	700	700	700	--	--	--	--	--	--	--	700	--
4	700	700	700	700	700	700	700	700	--	--	--	--	--	--	--	700	--
5	600	600	600	550	550	550	550	600	--	--	--	--	--	--	--	500	--
6	600	600	600	550	550	550	550	600	--	--	--	--	--	--	--	500	--

Notes:

Marysville gage flows represent average volumes for the specified period. Actual flow may vary from the indicated flows according to established criteria.
Marysville gage schedule 6 flows do not include an additional 30,000 acre-feet that the Water Board's corrected order WR 2008-0014 requires YCWA to make available through groundwater substitution transfers. These additional flows will be allocated during schedule 6 years.
Smartsville gage schedule A is used with Marysville schedules 1, 2, 3, and 4.
Smartsville gage schedule B is used with schedules 5 and 6.

Table 2-4. Flow schedule year types based on the North Yuba Index for establishing required flows in the Yuba Accord (Source: YCWA, 2017a).

Flow Schedule Year Type	North Yuba Index (Thousand acre-feet)
Schedule 1	Equal to or greater than 1,400
Schedule 2	Equal to or greater than 1,040 and less than 1,400
Schedule 3	Equal to or greater than 920 and less than 1,040
Schedule 4	Equal to or greater than 820 and less than 920
Schedule 5	Equal to or greater than 693 and less than 820
Schedule 6	Equal to or greater than 500 and less than 693
Conference year	Less than 500

During conference years, which are defined as years when the North Yuba Index is less than 500,000 acre-feet and which are expected to occur approximately 1 percent of the time, YCWA is required to: (1) maintain minimum instream flows in the Yuba River at the levels specified in Article 33 of YCWA's existing license without the reductions authorized by subsections (c) and (d) of that article; (2) release any supplemental flows recommended by the Lower Yuba Accord River Management Team (RMT)[31] and approved by the Water Board's Deputy Director for Water Rights or, if no recommended flows are effective by April 11 of such a conference year, then to release any supplemental flows ordered by the Water Board, after a hearing under California Code of Regulations, title 23, section 767; and (3) limit total water supply diversions at Daguerre Point Dam to 250,000 acre-feet.

As stated above, YCWA has operated the project consistent with flows defined in the Yuba Accord since 2006.

[31] The RMT was established to provide a forum for dispute resolution, input into lower Yuba River operations, and oversight of studies and monitoring work under the terms of the Yuba Accord. The RMT includes representatives of YCWA, NMFS, FWS, California DFW, PG&E, California DWR, and non-governmental organizations (i.e., Friends of the River, The Bay Institute, The South Yuba River Citizens League, and Trout Unlimited); the duties of each are spelled out in the Fisheries Agreement component of the Yuba Accord.

2.2 APPLICANT'S PROPOSAL

YCWA proposes some new facilities and some modifications to existing project features. YCWA proposes to modify the project boundary by adding or removing lands. It also proposes to modify project operation and several environmental measures to protect and enhance project resources and/or mitigate for project effects. These proposals are presented below.

2.2.1 Proposed Facility Modifications

YCWA proposes the following modifications to existing facilities:

- Add a tailwater depression system at the New Colgate Powerhouse that would inject compressed air into the turbine discharge chamber to lower the tailwater elevation and allow continued turbine operation during high flows in the Yuba River.
- Install a new auxiliary flood control outlet on New Bullards Bar Dam (figure 2-6) to improve flood management, which would require construction of:
  - An excavated approach channel to the intake structure, with right and left wing walls.
  - A reinforced-concrete intake control structure at the end of the approach channel containing intake gates and hydraulic hoists. The intake would be a 70-foot-wide reinforced concrete structure extending from the approach channel invert at elevation 1,865 feet to a deck at elevation 1,970 feet. It would be located in a rock excavation at the downstream end of the approach channel. The intake structure would have three 17-foot-wide, 30-foot-high gate openings separated by 4.5-foot-wide concrete piers. The gates would be roller-type gates operated by hydraulic cylinders. The gates would be operated using hydraulic cylinders installed on the top deck.
  - Intake area site works, including a fenced, paved parking area adjacent to the intake structure deck, access to Marysville Road, and riprap erosion protection of the finished slopes.
  - A 540-foot-long concrete-lined conveyance tunnel that would be horseshoe-shaped, with net opening dimensions of 25-feet-high by 26-feet-wide.

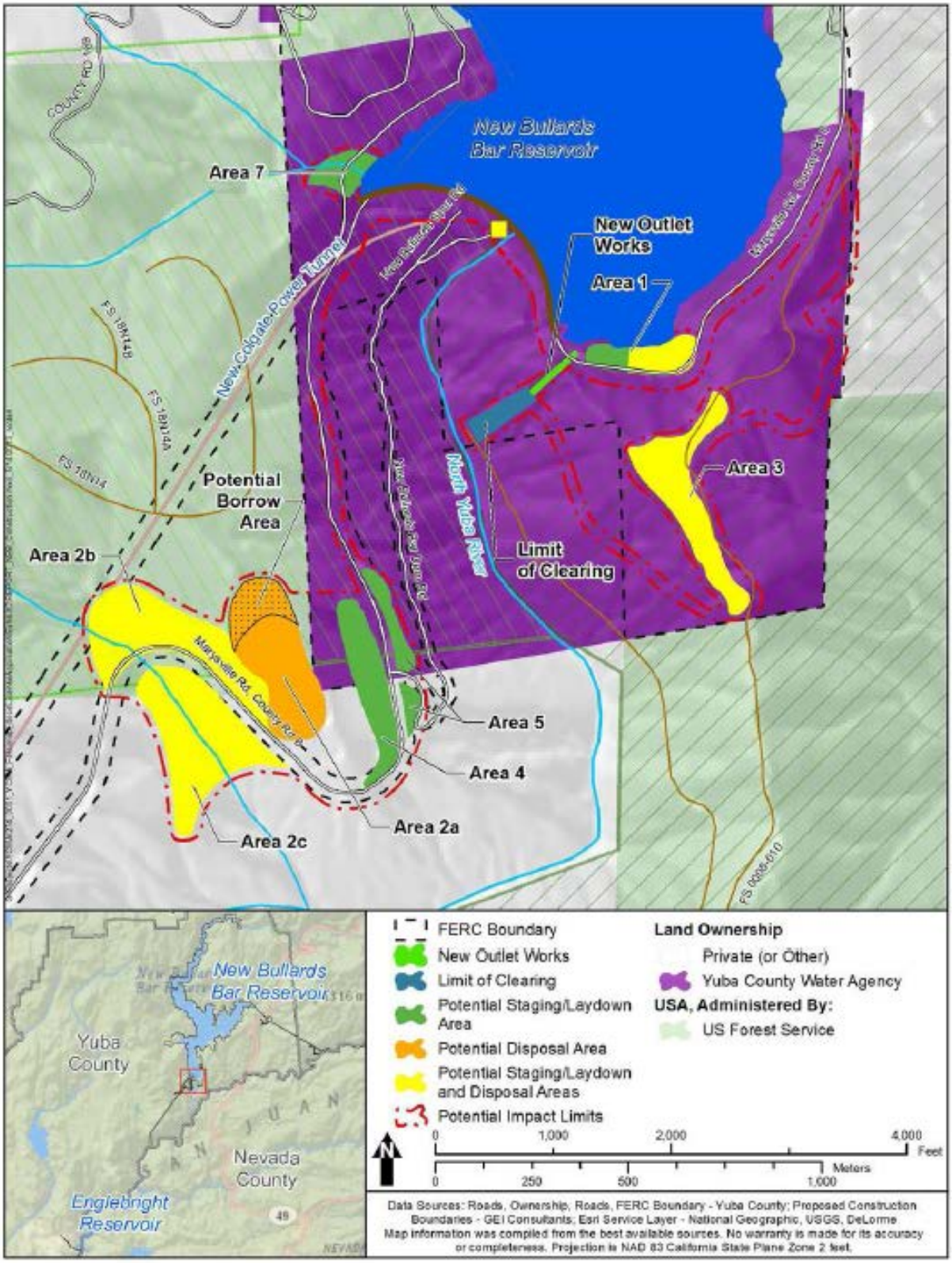

Figure 2-6. New Bullards Bar proposed new auxiliary flood control outlet construction area (Source: YCWA, 2017a).

- A concrete outlet structure including the tunnel outlet portal, a 60-foot-long open channel and 27-foot-long flip-bucket energy dissipater at the end of the open channel, which would deflect the discharging water jet away from the foundation area and toward the river canyon. The flip-bucket structure would be founded and bolted to rock to resist the hydrodynamic forces and vibrations. A cutoff would be provided to protect the flip bucket foundation from scour. The area between the flip bucket and the river would be cleared of all vegetation, overburden, and loose weathered rock down to sound rock.
- A 2,900-foot-long construction access road from an existing forest road to the outlet structure.
- Power supply to the intake for operation and control of the gates.

- Modify the Lohman Ridge Diversion Tunnel intake to allow it to be opened and closed during high flows on the Middle Yuba River to decrease fish entrainment. This would require (1) extending the deck and approach walls of the existing inlet upstream 4 to 5 feet; (2) constructing a hoist deck to achieve gate and bulkhead lift clearances; (3) modifying the existing bulkhead slot to accommodate a regulating gate; (4) constructing a new bulkhead slot within the new inlet extension; and (5) constructing a new trashrack and debris rake at the front of the extended inlet.
- Modify the Our House Diversion Dam fish release outlet to allow higher minimum flows from the current range of 30 to 50 cfs to a range of 40 to 120 cfs; install a 68-inch-diameter outlet pipe with control valve at the same invert elevation as the existing fish release outlet.
- Modify the Log Cabin Diversion Dam fish release outlet to allow higher minimum flows from the current range of 8 to 12 cfs to a range of 6 to 43 cfs; install a 38-inch-diameter outlet pipe with control valve at same invert elevation as the existing fish release outlet.
- Enhance existing recreation facilities, including campgrounds, picnic areas, boat launches, overlooks, and trails, and construct the following new facilities: Kelly Ridge and Shadow Ridge Campgrounds, Cottage Creek Picnic Site, Dark Day Recreation Vehicle (RV) Dump Station and Entrance Station, New Colgate Powerhouse Access, and West Shoreline Trail.
- Add some primary project roads as part of the project, add and remove recreation roads, and add some new recreation circulation roads.

2.2.2 Proposed Project Boundary

YCWA proposes to modify the existing project boundary. It categorizes these changes as follows:

- Add lands to the existing project boundary that are currently used with a preponderance of use related to the project operation and maintenance and remove lands from the project boundary that do not have project facilities and are not used or necessary for project operation and maintenance.[32]
- Change the existing project boundary around the project reservoir and impoundments from the surveyed coordinates to a contour located above the normal water surface elevation.[33]

For the New Colgate Development, YCWA proposes the following changes to the existing project boundary:

- Add the areas that encompass 100-foot rights-of-way (i.e., 50 feet on either side of the centerline) of nine separate primary project roads used to access and maintain the New Colgate Powerhouse. Lands in these proposed additions are owned by private landowners and YCWA.
- Remove land owned by PG&E to the east of New Colgate Powerhouse (Yuba County Assessor's Parcel Number 048270011000). This land is not used or needed for project operation and maintenance. PG&E owns and uses the land to maintain PG&E facilities located in the boundaries of that parcel.
- Add the area that encompasses USGS gage 11413517 (located at the Old Colgate Diversion Dam) and the primary project trail used to access the gage for project operation and maintenance purposes. YCWA owns the land in this proposed addition.
- Remove lands that encompasses a section of Marysville Road (County Road 8) that is in the existing project boundary. Marysville Road is commonly used for many purposes not related to the project and as such it is not considered a primary project road. Private landowners and YCWA own the land in the proposed removal area.
- Add the area that encompasses a 20-foot-right-of-way (i.e., 10 feet on either side of the centerline) around the primary project trail that is used to access USGS gage 11413517 downstream of the New Bullards Bar Minimum Flow Powerhouse. YCWA owns the land in this proposed addition.

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[32] These proposed changes are essentially making corrections to the existing project boundary.

[33] These changes are proposed because this is the preferred method of defining project boundaries as outlined in the FERC Drawing Guide (FERC, 2014) and because it is a better representation of lands required for project operation and maintenance around project reservoirs.

- Remove the area north of a 50-foot offset from the centerline of Cottage Creek Campground access road to the proposed boundary near New Bullards Bar Reservoir's edge, except the area surrounding the Cottage Creek Campground. Land parcels in this region are not currently used for project operation and maintenance. Land in this proposed removal is a combination of lands owned by YCWA and federal land managed by the Forest Service as part of the PNF.
- Add the area that encompasses a 100-foot right-of-way (i.e., 50 feet on either side of the centerline) of the section of road that connects Cottage Creek Campground access road to Cottage Creek Campground. YCWA and private landowners own the land in this proposed addition.
- Remove the area that encompasses the administration site north of Sunset Vista Observation Site used for non-project related activities by the Forest Service with the exception of the water supply that provides water to project recreation sites, which includes a 25-foot offset from water distribution tanks and 20-foot right-of-way (i.e., 10 feet on either side of the centerline) of water distribution pipe alignments. The Forest Service manages this federal land as part of the TNF.
- Add the area that encompasses a 20-foot-right-of-way (i.e., 10 feet on either side of the centerline) around the project portion of the Bullards Bar Trail that follows along the southeast side of the New Bullards Bar Reservoir. Land in this proposed addition is a combination of federal land managed by the Forest Service as part of the TNF and land owned by YCWA.
- Add the area that encompasses a 20-foot-right-of-way (i.e., 10 feet on either side of the centerline) around the Schoolhouse Trail that provides access to the Bullards Bar Trail from Schoolhouse Campground. Land in this proposed addition is a combination of federal land managed by the Forest Service as part of the TNF, Yuba County road right-of-way, and private landowners.
- Add the area that encompasses a 20-foot-right-of-way (i.e., 10 feet on either side of the centerline) around the water distribution pipe alignments that parallel both Marysville Road (County Road 8) and Dark Day Road. The water distribution system provides water to project recreation sites and is considered a project facility. The Forest Service manages this federal land as part of the TNF.
- Add the area that encompasses the leach field that is part of the Hornswoggle Group Campground. The Forest Service manages this federal land as part of the TNF.
- Add the area that encompasses a 100-foot right-of-way (i.e., 50 feet on either side of the centerline) of the non-county-maintained portion of Dark Day access road, which provides access to Dark Day Boat Launch, Picnic Area, and Campground. The non-county-maintained road starts approximately 0.33 mile

from Marysville Road. The Forest Service manages this federal land as part of the TNF.

- Add the area that encompasses a 100-foot right-of-way (i.e., 50 feet on either side of the centerline) of the non-county-maintained portion of Garden Valley Road, which provides project maintenance for the annual removal of debris and maintenance past the gate located approximately at the road's intersection with the township line common between Section 5, T18N, R8E, and Section 32, T19N, R8E. The Forest Service manages this federal land as part of the TNF.
- Add the area that encompasses a 100-foot right-of-way (i.e., 50 feet on either side of the centerline) around the primary project road that is used to access USGS gage 11408880, located downstream from Our House Diversion Dam. The Forest Service manages this federal land as part of the TNF.

For the New Colgate Development, YCWA proposes the following to redefine the boundary around the project reservoir and impoundments from the surveyed coordinates to a contour above the NMWSE. A contour 30 feet above the NMWSE or 200 horizontal feet from the NMWSE was chosen to define the project boundary for each of the project impoundments in areas where the project boundary is not already defined to encompass project facilities and recreation sites. The project boundary would encompass between 50 and 200 horizontal feet from the reservoir NMWSE except where slopes exceed 60 percent, in which case the boundary would encompass less than 50 horizontal feet. As such, the project boundary would provide shoreline access from the reservoir of at least 50 feet for all areas where slopes are unsafe.

- Add and remove land such that the project boundary around New Bullards Bar Reservoir where the project boundary is not encompassing project facilities is defined by the lesser (closer to the reservoir NMWSE) of either the topographic contour 1,985 feet, which is 30 feet above the NMWSE, or 200 horizontal feet from the NMWSE. Lands included in these proposed changes are a combination of lands owned by private landowners and by YCWA, and federal land managed by the Forest Service as part of the PNF and TNF.
- Add and remove land such that the project boundary around Log Cabin Diversion Dam impoundment where the project boundary is not encompassing project facilities is defined by the topographic contour 2,000 feet, which is 30 feet above the NMWSE. Lands in these proposed changes are a combination of federal land managed by the Forest Service as part of the TNF, lands owned by YCWA, and a small area within a Yuba County road right-of-way.
- Add and remove land such that the project boundary around Our House Diversion Dam impoundment where the project boundary is not encompassing project facilities is defined by the topographic contour 2,060 feet, which is 30 feet above the NMWSE. Lands in these proposed changes are a combination

of federal land managed by the Forest Service as part of the TNF and land owned by private landowners.

For the Narrows 2 Development, YCWA proposes the following changes to the existing project boundary:

- Add the area that encompasses a 20-foot right-of-way (i.e., 10 feet on either side of centerline) around the primary project trail that is used to access USGS gage 11418000 located downstream of the Narrows 2 Powerhouse and the gage building itself. Private landowners own the lands in this proposed addition.
- Remove the area that extends south beyond a 100-foot right-of-way (i.e., 50 feet on either side of centerline) along the Narrows 2 Powerhouse access road, which is a project road. These lands are not used for project operation and maintenance and do not have any project facilities. Lands in this proposed deletion are a combination of federal land managed by the Corps, land owned and managed by the State of California, and land owned by private landowners.
- Remove the area that is between a 50-foot offset from the centerline of Narrows 2 Powerhouse access road, a 50-foot offset from the centerline of Narrows 2 Powerhouse intake access road, and a 10-foot offset from the westernmost extent of either the communication line between the Narrows 2 Powerhouse and powerhouse intake structure, or the Narrows 2 Penstock. These land parcels are not used for project operation and maintenance and do not have any project facilities. The Corps manages these federal lands.

The modifications to the project boundary described above would reduce the amount of federal land administered by the Forest Service by 1,096.4 acres (from 4,416.7 acres to 3,320.3 acres) and would reduce the amount of federal land administered by the Corps by 5.0 acres (from 16.1 acres to 11.1 acres).

Based on staff recommendations in the draft EIS, YCWA (July 30, 2018, comments on draft EIS) also proposes to modify the proposed project boundary to enclose the following parcels of project land: (1) lands adjacent to New Bullards Bar Dam necessary for operating and maintaining the proposed auxiliary flood control outlet, and (2) lands necessary for the construction of the proposed trail along the west shoreline of New Bullards Bar Reservoir between Cottage Creek Campground and Madrone Cove Boat-in Campground. These changes would add 183.9 acres of land, managed by the Forest Service, to the project boundary.

2.2.3 Proposed Project Operation

The project would continue to be operated in the same manner as it has since the flows associated with the Yuba Accord were implemented in 2006, with minor changes associated with YCWA's proposed environmental measures listed below.

Proposed measure AR1 includes minimum flow requirements for Middle Yuba River downstream of Our House Diversion Dam. The proposed AR1 requirement would increase minimum flows from 30–50 cfs under the existing license to 40–120 cfs. Measure AR1 would also change minimum flows on Oregon Creek downstream of Log Cabin Diversion Dam from 8–12 cfs under the current license to 6–43 cfs.

Proposed measure AR2 would control the rate of spill cessation at Our House Diversion Dam by releasing up to 600 cfs through the dam's low-level outlet, and proposed measure AR12 would control the rate of spill cessation at Log Cabin Diversion Dam by releasing up to 100 cfs through the dam's low-level outlet. The proposed flows would exceed the capabilities of the existing fish release outlets, so YCWA would modify the outlets to support higher controlled spills. Also, under proposed measure GS2, YCWA would open the low-level outlet valves at both diversion dams during high-flow events to move sediment trapped behind the diversion dams to the Middle Yuba River and Oregon Creek. Proposed measure AR10 includes new flow requirements for the North Yuba River downstream of New Bullards Bar Dam, which currently provides a minimum flow of 5 cfs from the New Bullards Bar Minimum Flow Powerhouse. The proposed new minimum flow would range from 5 cfs to 13 cfs, depending on the season and water year. Proposed measure AR4 would implement a spill cessation operation at New Bullards Bar Dam, where spills of 2,000 cfs or less from May 1 through July 31 would be reduced at a rate of 250 cfs per day until the spill has ceased.

Under proposed measure AR11, YCWA would close the Lohman Ridge Diversion Tunnel from October 1 through 31 if the water year is wet, above normal, or below normal and New Bullards Bar Reservoir storage is 600,000 acre-feet or more. All water would flow down the Middle Yuba River during closures. YCWA would also close the Lohman Ridge Diversion Tunnel if the forecast is for a wet water year and storage at New Bullards Bar Reservoir storage is 775,000 acre-feet or more at the end of March. When the Lohman Ridge Diversion Tunnel is closed, YCWA would open the low-level outlet and fish release valves at Log Cabin Diversion Dam.

Under proposed measure RR3, YCWA would provide weekend boating days from October 1 and March 31 with flows of between 600 cfs and 2,000 cfs, in the Middle Yuba River downstream of Our House Diversion Dam. Flow and the number of releases would be governed by the water year and other criteria.

Under proposed measure AR3, YCWA would make minor modifications to the flow downstream of Englebright Dam during very dry years (referred to as conference years in the Yuba Accord). During these years, minimum flow measured at the Smartsville gage (11418000) would be set at 500 cfs from October through March, whereas it currently varies between 500 and 600 cfs. At the Marysville gage (11421000), proposed minimum flow would range from 150 to 350 cfs, whereas it currently ranges from 150 to 500 cfs depending on the time of year.

Under proposed measure AR9, YCWA would manage fluctuations in the flow of the Yuba River downstream of the Englebright Dam by coordinating operation with PG&E's Narrows 1 Powerhouse. Changes in flow would not increase at a rate of more than 500 cfs per hour, or decrease at a rate in excess of 200 cfs per hour. Also, YCWA would cap daily flow change to 15 percent of the average daily flow.

The proposed tailwater depression system would increase New Bullards Bar Reservoir release capacity during flood events and allow the New Colgate Powerhouse to continue to operate by injecting compressed air into the turbine discharge chamber to lower the tailwater elevation when the stage of the Yuba River would otherwise prevent generation. Operating the tailwater depression system throughout a flood event would allow for increased releases from New Bullards Bar Reservoir, thus reducing New Bullards Bar Reservoir storage during the flood event and ultimately reducing the peak flood release.

The proposed auxiliary flood control outlet would allow releases from New Bullards Bar Dam when the water surface elevation is below the existing New Bullards Bar spillway in anticipation of large storm events and would increase New Bullards Bar Dam's existing release capacity during high-flow events. Operation of the proposed flood control outlet is discussed in detail in section 3.3.2.2, in the subsection *Flood Control*.

2.2.4 Proposed Environmental Measures

YCWA proposes the following environmental measures:

General Measures[34]

- Organize an ecological group comprising various stakeholders and host meetings at least once a year to facilitate consultation between YCWA and resource agencies and present results of any annual monitoring (GEN1).
- Annually review special-status species lists and assess new species on National Forest System (NFS) land that might be affected by project operation. Develop and implement study plans to evaluate potential project effects for newly added species that occur on NFS lands (GEN2).

[34] YCWA also proposes measures GEN5 (preparation of a biological evaluation for actions that may affect Forest Service special-status species or critical habitat) and GEN6 (review of improvements) related to future development of NFS lands. Any development of facilities not included in the license application would require a license amendment. Therefore, we consider GEN5 and GEN6 to be administrative in nature and do not analyze them as environmental measures.

- Provide environmental training to employees to help them identify special-status and noxious weed species and familiarize them with known locations of sensitive habitats in the project boundary (GEN3).
- Develop and implement a coordinated operations plan to assure YCWA's compliance with the new license flow requirements (GEN4).

Geology and Soils

- Implement the Erosion and Sediment Control Plan (GS1), filed on October 27, 2016, that includes measures to control sedimentation and erosion when stabilizing slopes affected by the project, and prepare a stormwater pollution prevention plan (SWPPP) to prevent stormwater from carrying pollutants to project waters.
- Implement the updated Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2), filed on July 27, 2018, that includes measures for the removal and transport of sediment from behind Log Cabin and Our House Dams.
- Implement the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan (GS3), filed on April 12, 2018, that includes measures for the collection, storage, and disposal of woody material from project reservoirs.

Water Quantity

- Determine water year types for flow requirements in the Middle Yuba River downstream of Our House Diversion Dam, in Oregon Creek downstream of Log Cabin Diversion Dam and in the North Yuba River downstream of New Bullards Bar Dam using the Smartsville Hydrologic Index (WR2).
- Determine water year types for related measures pertaining to Narrows 2 Powerhouse and Narrows 2 full bypass using the North Yuba Index. Additionally, when the current water year type is a schedule 5, 6, or conference year and the total volume of New Bullards Bar Reservoir from October 1 through January 31 is less than 220,000 acre-feet, YCWA would not reevaluate the applicable water type in February of the following water year (WR3).
- Implement the Streamflow and Reservoir Level Compliance Monitoring Plan (WR4) included in the amended final license application).

- Maintain New Bullards Bar Reservoir at a minimum pool elevation of 1,730 feet,[35] except when drawdowns below this elevation are necessary to meet minimum streamflow requirements (WR5).
- Operate New Bullards Bar Reservoir for flood control in accordance with the rules prescribed by the Corps in the 1972 agreement (WR6).
- Implement the proposed Drought Management Plan (WR9) included in the amended final license application that includes a mechanism to address drought conditions.

Water Quality

- Implement the proposed Hazardous Materials Management Plan (WR1) included in the amended final license application and modified on July 30, 2018, to include (1) primary and secondary containment of hazardous materials; (2) protocols to be used for addressing spills; (3) an appropriate time limit to access cleanup materials from project facilities on non-NFS lands; and (4) the addition of FWS's FERC Coordinator to the notification contact list.
- Implement the Water Temperature Monitoring Plan (WR7), filed on October 27, 2016, that includes installation of continuous water temperature recorders at 12 stream locations and collection of water temperature profiles in New Bullards Bar and Englebright Reservoirs.
- Implement the Water Quality Monitoring Plan (WR8), filed on October 27, 2016, that includes sampling *in situ*, general, and recreation water quality and bioaccumulation data at 15 stream locations and New Bullards Bar and Englebright Reservoirs.

Aquatic Resources

- Maintain minimum streamflows (depending on time of year and water year type) of 40 to 120 cfs in the Middle Yuba River below Our House Diversion Dam, 6 to 43 cfs below Log Cabin Diversion Dam (AR1), and 5 to 13 cfs below New Bullards Bar Dam (AR10).
- Limit the rate of flow reductions in the Middle Yuba River downstream of Our House Diversion Dam to a maximum of 50 cfs every 3 days for spills under 200 cfs; 100 cfs every 3 days for spills between 200 and 300 cfs; and 100 cfs every 2 days for spills between 300 and 600 cfs (AR2) to protect resident fish populations and foothill yellow-legged frogs.

[35] All elevations are provided in National Geodetic Vertical Datum of 1929 unless otherwise noted.

- Maintain minimum flows of 500 to 700 cfs (as measured at Smartsville) and from 150 to 2,000 cfs (as measured at Marysville) in the Yuba River, depending on time of year and water year type, from the Narrows 2 Powerhouse and the Narrows 2 full bypass (AR3) to protect anadromous fish populations.
- Reduce flows of 2,000 cfs or less from New Bullards Bar Dam between May 1 and July 31 at a rate of 250 cfs per day to protect resident fish populations until the spill has ceased (AR4).
- Implement the Aquatic Invasive Species Management Plan (AR5), filed on October 27, 2016, that includes measures to prevent the introduction and spread of aquatic invasive species.
- Implement the New Bullards Bar Reservoir Fish Stocking Plan (AR6), filed on December 2, 2016, that includes measures to maintain the rainbow trout and kokanee recreational fisheries.
- Implement the Upper Yuba River Aquatic Monitoring Plan (AR7) included in the amended final license application that includes monitoring aquatic and riparian resources in the North Yuba, Middle Yuba, and Yuba Rivers and Oregon Creek.
- Implement the Lower Yuba River Aquatic Monitoring Plan (AR8), filed on December 2, 2016, that includes measures to develop information regarding aquatic resources in the Yuba River downstream of Englebright Dam in response to flow conditions in the new license.
- Reduce the rate of flow fluctuations in the Yuba River downstream of Englebright Dam associated with hydroelectric project operation to minimize salmonid fry and juvenile stranding and redd dewatering and enhance riparian seedling recruitment. Specifically, from September 1 through December 1, maximum flow reductions, depending on base flow, would range from 200 to 750 cfs per day. From January 1 through May 31, maximum flow reductions, depending on base flow, would range from 200 to 950 cfs per day. To enhance riparian seedling recruitment, maximum daily flow reduction would range from 79 to 200 cfs from April 1 through July 15 and would be target rates from July 16 through September 30 (AR9; revised April 27, 2018).
- Close the Lohman Ridge Diversion Tunnel from mid-April through September 30 in wet water years when end-of-March New Bullards Bar Reservoir storage is equal to or greater than 775,000 acre-feet and from October 1 through December 31 if May is a wet, above normal, or below normal water year and the subsequent end of September New Bullards Bar Reservoir storage is 600,000 acre-feet or greater (AR11) to decrease fish entrainment.

- Reduce flows in Oregon Creek downstream of Log Cabin Diversion Dam by a maximum of 20 cfs every 4 days (AR12) to protect aquatic resources by reducing the potential for fish stranding.

Terrestrial Resources

- Implement the Integrated Vegetation Management Plan (TR1), filed on October 27, 2016, that includes measures for controlling non-native plant species, protecting special-status species, and revegetating disturbed areas.
- Implement the Bald Eagle and American Peregrine Falcon Management Plan (TR2), filed on October 27, 2016, that includes measures protecting eagles and falcons from disturbance.
- Implement the Ringtail Management Plan (TR3), filed on October 27, 2016, that includes measures excluding ringtails from project facilities.
- Implement the Bat Management Plan (TR4), filed on October 27, 2016, that includes measures excluding bats from project facilities.

Recreation Resources

- Implement the Recreation Facilities Plan (RR1), updated on September 19, 2018.
- Provide recreation flow information and monthly flow forecasts for the Yuba, North Yuba, and Middle Yuba Rivers and Oregon Creek and reservoir levels at New Bullards Bar to the public on a real-time basis (RR2).
- Provide whitewater boating flows of 600 to 2,000 cfs below Our House Diversion Dam on weekends between October 1 and March 31, with the frequency and flow amount determined by water year type (RR3).

Land Use

- Implement the Transportation System Management Plan (LU1) included in the amended final license application that provides guidance for the rehabilitation and maintenance of primary project roads and trails.
- Implement the Fire Prevention and Response Plan (LU2) included in the amended final license application that provides measures for preventing, reporting, and investigating wildfires.

Aesthetics

- Implement the Visual Resource Management Plan (VR1), filed on October 27, 2016, that includes measures to reduce the visual contrast of some project facilities.

Cultural Resources

- Revise the Historic Properties Management Plan (HPMP) included in the amended final license application (CR1) that provides specific actions and processes to manage historic properties.

2.2.5 Modifications to Applicant's Proposal—Mandatory Conditions

Section 4(e) Land Management Conditions

The Forest Service filed final terms and conditions on September 27, 2018, under section 4(e) and are included in appendix D. We consider conditions 1, 3 through 20, and 23 through 27 to be administrative; therefore, they are not analyzed in this EIS. The remaining conditions are resource-specific and are analyzed in this EIS.

- Condition 2: Establish an ecological group and host annual meetings to discuss YCWA's compliance with license conditions and measures that YCWA has implemented that have implications for ecological resources.
- Condition 21: Implement the Hazardous Materials Management Plan for locations on NFS lands.
- Condition 22: Restrict the use of pesticides[36] on public lands managed by the Forest Service (National Forest System lands [NFS lands]) without the prior written approval of the Forest Service.
- Condition 28: Provide annual employee environmental awareness training for hydropower operation and maintenance staff.
- Condition 29: Prepare a biological evaluation prior to taking any action to construct new project features on NFS land that may affect Forest Service special-status species or their critical habitat.
- Condition 30: Annually review special-status species lists and assess, in consultation with the Forest Service, potential for project-related effects on newly listed species or special-status species detected during project construction, operation, or maintenance.

[36] Pesticides are any substance or mixture of substances intended to prevent, destroy, repel, or mitigate for any pest or used as a plant regulator, defoliant, or desiccant. The term pesticide includes many types, broadly classified by the type of pest they control for (e.g., herbicides are intended to kill plants) (Forest Service, 2013).

- Condition 31: Determine the water type year for minimum streamflow compliance based on the California DWR (Bulletin 120) Forecast of Total Unimpaired Runoff in the Yuba River at Smartsville or California DWR Full Natural Flow near Smartsville for the Water Year.
- Condition 32: Meet the minimum streamflows in specified reaches by month and water year type, as shown in appendix D, condition 32, table 1.
- Condition 33: Control project spills at Our House Diversion Dam based on USGS gage 11408880.
- Condition 34: Control project spills at Log Cabin Diversion Dam based on USGS gage 11409400.
- Condition 35: Periodically close Lohman Ridge Diversion Tunnel under specific conditions in spring and fall to avoid risk of fish entrainment.
- Condition 36: Implement the Streamflow and Reservoir Level Compliance Monitoring Plan for streamflow gages on NFS lands.
- Condition 37: Implement the Log Cabin and Our House Diversion Dams Sediment Management Plan for locations, on, or directly affecting, NFS lands.
- Condition 38: Implement the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan for locations, on, or directly affecting, NFS lands.
- Condition 39: Implement the Aquatic Invasive Species Management Plan for locations, on, or directly affecting, NFS lands.
- Condition 40: Implement the Integrated Vegetation Management Plan for locations, on, or directly affecting, NFS lands.
- Condition 41: Implement the Bald Eagle and American Peregrine Falcon Management Plan for locations, on, or directly affecting, NFS lands s.
- Condition 42: Implement the Bat Management Plan for locations, on, or directly affecting, NFS lands.
- Condition 43: Implement the Upper Yuba River Aquatic Monitoring Plan for locations, on, or directly affecting, NFS lands.
- Condition 44: Implement the Water Temperature Monitoring Plan for locations, on, or directly affecting, NFS lands.
- Condition 45: Implement the Water Quality Monitoring Plan for locations, on, or directly affecting, NFS lands.
- Condition 46: Implement the updated Recreation Facilities Plan for locations for locations, on, or directly affecting, NFS lands.

- Condition 47: Make streamflow and reservoir elevation information available to the public.
- Condition 48: Provide whitewater boating flows of between 600 and 2,000 cfs, as measured at the USGS gage 11408880, on weekends between October 1 and March 31, from at least 10:00 a.m. to 5:00 p.m. (Pacific Time Zone).
- Condition 49: Implement the Visual Resource Management Plan for locations, on, or directly affecting, NFS lands.
- Condition 50: Implement the HPMP for locations, on, or directly affecting, NFS lands.
- Condition 51: Implement the Transportation System Management Plan for locations, on, or directly affecting, NFS lands.
- Condition 52: Implement the Erosion and Sediment Control Plan for locations, on, or directly affecting, NFS lands.
- Condition 53: Implement the Fire Prevention and Response Plan for locations, on, or directly affecting, NFS lands.
- Condition 54: Develop a drought management plan in consultation with the Forest Service, the Water Board, and other government agencies, that includes: (1) an appropriate definition of a drought specific to the Yuba River Development Project; (2) YCWA's process for notification of a drought concern; (3) YCWA's proposed drought response measures; (4) potential impacts on resources (i.e., fish and wildlife species, water quality, vegetation, and recreation); (5) monitoring that would be conducted by YCWA to identify the impacts of any drought-related variance; (6) a description of how and when YCWA's drought variance would expire; (7) YCWA's process for discussing drought conditions, potential license variances, and related drought response measures with the Forest Service and other parties; (8) the process by which YCWA would obtain approval from the TNF and PNF supervisors for any variances from Forest Service 4(e) conditions in any future license; and (9) YCWA's plan revision process throughout the license term.

Water Quality Certification Conditions

The Water Board has not yet acted on YCWA's request for a certification. However, by letter filed August 25, 2017, the Water Board provided 47 preliminary conditions under section 401 of the Clean Water Act. We consider preliminary conditions 9 and 29 through 47 to be administrative; therefore, they are not analyzed in this EIS. The remaining preliminary conditions of the certification (appendix E) specify the following:

- Condition 1: Provide minimum flows based on water year type.

- Condition 2: Provide ramping rates that limit artificial flow fluctuations in project-affected reaches, including the Yuba River between the Narrows 1 and Narrows 2 Powerhouses.
- Condition 3: Develop a restoration plan that includes the total area to be restored, restoration method, performance metrics, maintenance, and implementation and effectiveness monitoring.
- Condition 4: Implement a system for determining water year type based on California DWR Bulletin 120 water forecasts.
- Condition 5: Provide instream flow recession rates for spill events at New Bullards Bar Dam, Log Cabin Diversion Dam, and Our House Diversion Dam.
- Condition 6: Develop a streamflow and reservoir level compliance plan.
- Condition 7: Periodically close the Lohman Ridge Diversion Tunnel and the Camptonville Diversion Tunnel based on water year type.
- Condition 8: Operate the upper and lower intakes for the New Colgate Powerhouse to provide year-round favorable water temperature for aquatic biota downstream of New Colgate Powerhouse and Englebright Dam.
- Condition 10: Develop a plan to mitigate for project-related effects on beneficial uses in the Middle Yuba River and Oregon Creek from the Log Cabin and Our House Diversion Dams and the Lohman Ridge and Camptonville Diversion Tunnels.
- Condition 11: Develop a plan to: (1) allow mobile large woody material (LWM) to pass over Our House and Log Cabin Diversion Dams; (2) collect, store, and dispose of LWM in New Bullards Bar Reservoir on the North Yuba River; and (3) mitigate for the reduction of LWM downstream of New Bullards Bar Dam.
- Condition 12: Develop a plan for managing the sediment behind Log Cabin and Our House Diversion Dams and mitigating for the reduction in sediment transport past New Bullards Bar Dam in the North Yuba River.
- Condition 13: Develop a plan to monitor water quality at project reservoirs and locations throughout project-affected stream and river reaches.
- Condition 14: Develop a plan to monitor potential project effects on water temperature in project impoundments and affected stream and river reaches.
- Condition 15: Develop a plan to monitor the distribution, abundance, and condition of aquatic resources in project-affected creeks, rivers, and reservoirs upstream of Englebright Dam.

- Condition 16: Develop a plan to monitor the distribution, abundance, and condition of aquatic resources in the Yuba River downstream of Englebright Reservoir.
- Condition 17: Develop a plan to reduce fish stranding in the Yuba River from immediately below Englebright Dam to the Narrows 1 Powerhouse.
- Condition 18: Develop a plan to manage aquatic invasive species.
- Condition 19: Develop a plan to protect bald eagles and American peregrine falcons in all areas within and outside the project boundary where bald eagle and American peregrine falcon are affected or have the potential to be affected by the project.
- Condition 20: Develop a plan to supplement the fishery at New Bullards Bar Reservoir.
- Condition 21: Develop a plan for the release of whitewater boating flows below Our House Diversion Dam in the Middle Yuba River.
- Condition 22: Develop a plan to provide public access to the North Yuba River below New Bullards Bar Dam for REC-1[37] designated beneficial uses.
- Condition 23: Develop a plan that outlines overarching guidance for operations during multi-year drought conditions.
- Condition 24: Develop a plan to minimize undesirable erosion or sedimentation conditions near streams and reservoirs caused from project operation and maintenance.
- Condition 25: Develop a plan for storage, use, transportation, and disposal of hazardous materials in the project area.
- Condition 26: Organize an ecological group and host annual meetings to inform stakeholders of project activities and elements affected by the project.
- Condition 27: Provide general awareness training on compliance with water quality certification requirements to hydropower operation and maintenance staff each year.
- Condition 28: File with the Water Board a coordinated operations plan for the project and Narrows Project (FERC No. 1403).

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[37] Water Board REC-1 beneficial uses are recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and uses of natural hot springs.

2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would include most of YCWA's proposed measures, with the exception of the proposed annual ecological group meeting (GEN1), annual review of special-status species lists (GEN2), annual employee training (GEN3), the coordinated operations plan for PG&E's Narrows 1 Powerhouse (Narrows Project No. 1403) and YCWA's Narrows 2 Powerhouse (Yuba River Development Project No. 2246) (GEN4), the Water Temperature Monitoring Plan (WR7), the Water Quality Monitoring Plan (WR8), and the Upper Yuba River Aquatic Monitoring Plan (AR7) as part of any license issued for the project. We do not recommend organizing an ecological group meeting because standard Commission practices would require YCWA to consult with agencies during the preparation of monitoring reports that are components of Commission-approved management plans, and annual meetings alone would not provide additional benefits to environmental resources to warrant the cost.

Additionally, we do not recommend annual review of special-status species because YCWA is required to adhere to state and federal regulations pertaining to sensitive wildlife. We do not recommend a license condition requiring annual employee training, because licensees are expected to train their employees to the extent needed for the licensee to maintain compliance with a license. We also do not recommend the coordinated operations plan because it is not needed to implement the other proposed measures and because any conflicts between YCWA's Yuba River Development Project and PG&E's Narrows Project would be addressed through standard Commission practices.

We do not recommend a Water Temperature Monitoring Plan because YCWA's proposed flow-related measures are expected to generally maintain or reduce water temperatures in project-affected waters and support resident and anadromous coldwater fishes, similar to what has occurred under existing operation. There appears to be little basis for requiring water temperature monitoring to verify the status quo or the probable improvements in water temperature that would occur. There would be no value, from a license compliance perspective, to a comprehensive, long-term water temperature record that would result from YCWA's proposal and the Water Board's specification.

We also do not recommend a Water Quality Monitoring Plan because YCWA's operation of the project with the facility modifications and proposed flow-related measures are not expected to adversely affect water quality or bioaccumulation in aquatic organisms. There would be no value, from a license compliance perspective, to monitor water quality or bioaccumulation to identify unexpected water quality issues under a new license.

Finally, we do not recommend an Upper Yuba River Aquatic Monitoring Plan because the proposed plan includes monitoring but does not provide any mechanisms for isolating project effects from non-project effects on monitored resources. Additionally, the plan does not identify how monitoring results would affect project operations. Further, the best available science indicates YCWA's proposed measures for increasing

sediment transport and LWM at the Our House and Log Cabin Diversion Dams would provide net benefits to aquatic resources in Oregon Creek and the Middle Yuba River. Monitoring to quantify these benefits is not needed because it would not provide additional benefits.

The staff alternative also includes the following recommended modifications of YCWA's proposal and some additional measures.

Water Quantity

- Modify the proposed Drought Management Plan (WR9), to change the definition of drought conditions based on available data specific to the proposed project, including current storage in New Bullards Bar Reservoir, watershed snowpack and soil moisture conditions, current and projected operating requirements for instream flows and water supply deliveries, weather forecasts, and other project operation limitations, rather than basing plan implementation on state-wide conditions.

Aquatic Resources

- Maintain summer water temperatures in the lower Yuba River in schedule 6 years by modifying proposed minimum flows from the Narrows 2 Powerhouse and the Narrows 2 full bypass (AR3) to include minimum flows of 350 cfs, from June 1 through August 31.
- Modify the proposed Aquatic Invasive Species Management Plan (AR5) to include monitoring Asian clams at Cottage Creek, Dark Day Boat Launch, and Emerald Cove.
- Modify the proposed New Bullards Bar Reservoir Fish Stocking Plan (AR6) to include annual consultation with California DFW to determine species of fish appropriate for stocking for recreational purposes.
- Modify the proposed Lower Yuba River Aquatic Monitoring Plan (AR8) to remove: (1) benthic macroinvertebrate monitoring in the lower river; (2) upstream fish passage monitoring at Daguerre Point Dam; (3) weekly Chinook salmon and steelhead spawning surveys in the lower river; and (4) general monitoring of riparian vegetation cover and community structure.
- Develop a Narrows Reach fish stranding prevention plan for the lower Yuba River, downstream of the Narrows 1 and Narrows 2 Powerhouses, to include conducting fish rescues when stranding is observed, reporting estimates of the number and species of fish stranded and the number of fish rescued, recording any evidence of harm caused by project facilities or operation, identifying potential operational and/or structural measures that could be implemented to reduce stranding, and reporting requirements for unplanned flow reductions.

- Revise minimum streamflows below New Bullards Bar Dam (AR10) to use YCWA flows in October through May and agency flow recommendations in June through September.
- Develop a comprehensive LWM enhancement plan that: (1) identifies sources of LWM in the project reservoirs; (2) includes provisions for storing and transporting collected LWM; (3) identifies suitable LWM size classes for placement; (4) identifies locations for placement in the lower Yuba River; (5) details a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests; and (6) contains a monitoring and mapping process to provide an indication of the stability of these enhancements and inform the need for future placement activities.

Terrestrial Resources

- Modify the proposed Integrated Vegetation Management Plan (TR1) to: (1) include treatment and monitoring plans for target non-native invasive species on all lands in the project boundary; (2) apply revegetation measures (sections 4.1 through 4.5 of the plan) to all lands in the project boundary; (3) implement best management practices (BMPs) to protect foothill yellow-legged frog and California red-legged frog habitat when vegetation management activities occur within 300 feet of streams; (4) define BMPs for any pesticide use that is deemed necessary within the project boundary and within 500 feet of known locations of foothill yellow-legged frogs that avoid adverse effects on individuals and their habitats; (5) prohibit the use of pesticides within a 260-foot buffer around the mean high-water mark of aquatic features, unless necessary to ensure project safety; (6) avoid stockpiling and subsequent removal of any fuels, slash,[38] or debris related to hazard tree removal within 1,000 feet of wetlands or aquatic features; and (7) prior to any activities that would result in vegetation disturbance, conduct surveys for elderberry plants within 165 feet of the activity area and consult with FWS if elderberry plants are found to determine if additional protective measures are necessary.
- Develop a lower Yuba River riparian restoration plan, in consultation with FWS, California DFW, NMFS, and the South Yuba River Citizen's League (SYRCL) that includes: (1) planting riparian vegetation on 100 acres of floodplain in the lower Yuba River, including no fewer than four separate planting sites; (2) a species list for plantings that includes, at a minimum, cottonwood and willow species; (3) a description of planting methods

[38] Slash is the debris left after logging, pruning, thinning, or brush cutting, and includes logs, chips, bark, branches, stumps, and broken understory trees or brush.

consistent with methods used at the Hammon Bar restoration site, including planting to ground water depth; (4) success criteria based on survivorship of plantings; (5) monitoring methods and a schedule for determining success; (6) provisions for additional plantings if success criteria are not met; (7) a process and schedule for identifying planting sites; and (8) a reporting schedule.

- Modify the proposed Bald Eagle and American Peregrine Falcon Management Plan (TR2) to include surveys for American peregrine falcon eyries every year or until a new eyrie is documented.
- Monitor water temperature continuously from April 1 through September 15 for 3 years at two foothill yellow-legged frog breeding sites in the Middle Yuba River downstream from Our House Diversion Dam and at two sites in Oregon Creek downstream of Log Cabin Diversion Dam. Monitoring sites should be selected to represent the upstream and downstream limit of breeding sites in each reach. After 3 years, file a summary report that: (1) summarizes the results of the temperature monitoring; (2) evaluates how often water temperatures fall below 16 degrees Celsius (ºC) during the tadpole development period; and (3) describes any changes in flow releases from Our House and Log Cabin Diversion Dams that may be warranted to address adverse effects on foothill yellow-legged frog reproduction.
- Ensure procedures for decontaminating field equipment to prevent the spread of aquatic pests and disease between waterbodies, as described in the Aquatic Invasive Species Monitoring Plan, are applied for activities where equipment is transported from one body of water to another.

Cultural Resources

- Revise the HPMP included in the amended final license application (CR1) to include: (1) cultural resources information and consultation results developed after preparation of the 2016 draft HPMP; (2) updated determinations of National Register of Historic Places (National Register) eligibility of six historic sites (CA-YUB-1751H, CA-YUB-1760H, CA-YUB-1762H, CA-YUB-1768H, CA-YUB-1770H and CA-YUB-1736H) and the New Colgate Penstock; (3) clarification of the description of site CA-SIE-1849H (previously CA-YUB-1733H); and (4) the results of YCWA's final supplemental TCP report.

2.4 STAFF ALTERNATIVE WITH MANDATORY CONDITIONS

We recognize that the Commission is required to include valid section 4(e) and section 401 conditions in any license issued for the project. Thus, the staff alternative with mandatory conditions includes staff-recommended measures along with the following mandatory conditions that are not included in the staff alternative: (1) organize

an ecological group and hold annual meetings (4(e) condition 2, preliminary 401 condition 26); (2) provide annual employee environmental awareness training for hydropower operation and maintenance staff (4(e) condition 28); (3) prepare a biological evaluation prior to the construction of new project features on NFS land (4(e) condition 29); (4) consult annually on current special-status species (4(e) condition 30); (5) implement the Upper Yuba River Aquatic Monitoring Plan for locations on NFS lands (4(e) condition 43); (6) monitor water temperature (preliminary 401 condition 14 and 4(e) condition 44); (7) implement the Water Quality Monitoring Plan for locations, on, or directly affecting, NFS lands (4(e) condition 45); (8) develop a restoration plan (preliminary 401 condition 3); (9) operate the upper and lower intakes for the New Colgate Powerhouse to provide year-round favorable water temperature for aquatic biota downstream of New Colgate Powerhouse and Englebright Dam (preliminary 401 condition 8); (10) develop a plan to mitigate for project-related effects on beneficial uses in the Middle Yuba River and Oregon Creek from the Log Cabin and Our House Diversion Dams and the Lohman Ridge and Camptonville Diversion Tunnels (preliminary 401 condition 10); (11) develop a water quality monitoring plan (preliminary 401 condition 13); (12) develop a plan to monitor the distribution, abundance, and condition of aquatic resources in project-affected creeks, rivers, and reservoirs upstream of Englebright Dam (preliminary 401 condition 15); (13) develop a plan to monitor the distribution, abundance, and condition of aquatic resources in the Yuba River downstream of Englebright Reservoir (preliminary 401 condition 16); (14) develop a plan to provide public access to the North Yuba River below New Bullards Bar Dam (preliminary 401 condition 22);and (15) provide general awareness training on compliance with water quality certification requirements to hydropower operation and maintenance staff each year (preliminary 401 condition 27).

Incorporating these mandatory conditions into a new license would cause us to eliminate one environmental measure that we include in the staff alternative: monitor water temperatures downstream from Our House and Log Cabin Diversion Dams and file a summary report that evaluates how often water temperatures fall below 16ºC during the tadpole development period and describes any changes in flow releases that may be warranted to address adverse effects on foothill yellow-legged frog reproduction.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We considered several alternatives to the applicant's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are: (1) issuing a non-power license and (2) retiring the project.

2.5.1 Issuing a Non-Power License

A non-power license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this

point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider issuing a non-power license a reasonable alternative to relicensing in this circumstance.

2.5.2 Retiring the Project

Project retirement could be accomplished with or without dam removal. Either alterative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. The project dams are used for hydroelectric power generation, and provide critical flood-control and water supply functions, as well as important environmental (coldwater pool) and recreation opportunities. Thus, dam removal is not a reasonable alternative to relicensing the project with appropriate protection, mitigation and enhancement measures.

The second project retirement alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and would be used for historical flood-control, consumptive-use, environmental and recreational water management, or other purposes. This would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the project is needed, replacement power from some other source, providing comparable ancillary benefits without adding air pollutants would have to be provided. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable 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. Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, 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*.[39]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The project is located in the Yuba River Basin and drains approximately 1,339 square miles of the western slope of the Sierra Nevada Mountains, including portions of Sierra, Placer, Yuba, and Nevada Counties. The Yuba River is a tributary of the Feather River, which in turn is a tributary of the Sacramento River. The basin rises from an elevation of about 88 feet to about 8,590 feet. From 1922 through 2011, the annual unimpaired flow at the Smartsville gage on the Yuba River has ranged from a high of 4,926,000 acre feet in 1982 to a low of 369,000 acre-feet in 1977, with an average of about 2,292,000 acre-feet per year (table 3-1).[40] In general, basin runoff is nearly equally divided between runoff from rainfall during October through March and runoff from snowmelt during April through September.

[39] Unless otherwise indicated, our information is taken from the amended application for license for this project (YCWA, 2017a; YCWA, 2018a,b,c,d).

[40] The forecast seasonal unimpaired flow at Smartsville is estimated each year by California DWR and reported monthly in Bulletin 120, Water Conditions in California. The unimpaired flow at Smartsville controls YCWA contractual delivery obligations to senior water right holders on the Yuba River downstream of Narrows 2 Powerhouse, and is used to calculate the Yuba River Index, defined in RD-1644, and the North Yuba Index, defined in the Yuba Accord.

Table 3-1. Average unimpaired runoff for the Yuba River at Smartsville for water years 1922 through 2011 (Source: California DWR, 2016).

Period of Record	Average of Unimpaired Flow at Smartsville (thousand acre-feet)	% of Total Period of Record (1922–2011) Average
1922–1931	1,882	82
1932–1941	2,181	95
1942–1951	2,307	101
1952–1961	2,338	102
1962–1971	2,630	115
1972–1981	2,089	91
1982–1991	2,406	105
1992–2001	2,576	112
2002–2011	2,220	97
1922–2011	**2,292**	--

Upper basins of the Middle Yuba and South Yuba Rivers have been extensively developed for hydroelectric power generation and consumptive uses by the Nevada Irrigation District and PG&E. Total storage capacity of about 307,000 acre-feet on the Middle Yuba and South Yuba Rivers and associated diversion facilities enable both the Nevada Irrigation District and PG&E to export approximately 410,000 acre-feet per year from the Yuba River Basin to the Bear River and American River Basins.

In addition, the South Feather Water and Power Agency exports an average of about 70,000 acre-feet per year from Slate Creek (a tributary to the North Yuba River) to the Feather River Basin. While these upper basins lie outside the project study area, their operations can significantly reduce the water supply available to the project, particularly during dry and critically dry water years.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing National Environmental Policy Act (40 CFR, section 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 impacts can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we identified geology and soils, water and aquatic resources (including anadromous fish), riparian vegetation, and mule deer as having potential to be cumulatively affected by the proposed project in combination with other past, present, and foreseeable future activities. The project developments represent one part of numerous historical industrial uses and other human activities in the Yuba River Basin, which have separated biotic communities, introduced non-native species, altered river flow, and changed river channel morphology. Changes to project operation could have effects on environmental resources outside the project boundary.

3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effects on the resources. During the scoping process, we determined that the 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 in the Yuba River Basin. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary.

For water and aquatic resources (with the exception of anadromous fish), riparian vegetation, and geology and soils, we define the geographic scope to encompass the North Yuba River extending downstream from the confluence of Slate Creek, the Middle Yuba River extending downstream from the high water line of Our House Diversion Dam impoundment, Oregon Creek extending downstream from the Lohman Ridge Diversion Tunnel, and the entire mainstem Yuba River extending downstream to the mixing zone of the Yuba River and the Feather River.

We have determined a cumulative geographic scope for anadromous fish and EFH that includes the Yuba River Basin downstream to the confluence with the Feather River, the lower Feather River to the lower Sacramento River, and through the Sacramento-San Joaquin Delta to the San Francisco Bay.

For mule deer, the scope for the cumulative analysis is the range of the migratory Downieville/Nevada City and Bucks Mountain/Mooretown Deer herds.

3.2.2 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and reasonable foreseeable future actions and their effects on geology and soils, water and aquatic resources (including anadromous fish), riparian vegetation, and mule deer. Based on the term of a license, we will look 30 to 50 years into the future, concentrating on the effect on water quality and fisheries from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information. We identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

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

The analysis in this EIS is focused on the resources that would be affected by the applicant's proposal, or about which comments have been received. Based on this, we have determined that geology and soils, aquatic, terrestrial, threatened and endangered species, recreation and land use, aesthetic, cultural and socioeconomic resources may be affected by the proposed action and action alternatives. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

Geologic and Physiographic Setting

The bedrock geology in the project region is composed primarily of Paleozoic and Mesozoic igneous rocks (gabbro, granodiorite), volcanic rocks, and metamorphosed sediments and volcanic rocks. In addition, volcanic eruptions in the Tertiary period deposited lava, mudflows, pyroclastic flows, and ash throughout the Yuba River Basin. The bedrock of the New Bullards Bar Dam flood control structure consists of volcanic deposits from the Jurassic period. Gold deposits in the region formed in the Mesozoic period when hot magma intruded and metamorphosed the folded sedimentary rocks. Uplift of the region during the Tertiary period led to erosion and exposed these gold veins.

The major physiographic feature within the project vicinity is the Sierra Nevada Range, which is approximately 400 miles long and runs south-southeast to north-northwest in eastern California. The Sierra Nevada crest forms the eastern limit of the Yuba River Basin. Downfaulting of the eastern Sierra face has affected drainage evolution by capturing headwater streams and creating channels that now have east-facing headwaters.

Uplifting and tilting of the Sierra block reorganized drainage networks and initiated a period of sustained channel incision; many of the modern channels have elevations below the ancestral (Tertiary period) channels. These ancestral deep channels drained north-northwest across modern drainages. The ancient channels were filled with gold-rich material that was heavily mined in the late 1800s.

Tertiary channels/gravels were buried first by rhyolitic and then by andesitic volcanic rocks and then severely eroded and exposed by deep fluvial incision. The modern Yuba River began incising 5 million years ago, and modern foothill channels

strike perpendicular to ancient channels, leaving the deposits of these ancient channels as upland gravels. The Yuba River Basin was also affected by extensive glacial erosion over the last 2 million years.

The current Yuba River Basin drains the northwestern Sierra Nevada through a series of deep canyons cut by mountain streams, separated by high, steep-sided ridges and a parallel drainage network. The parallel drainage network results in narrow valleys, small tributary contributing areas, and low tributary sediment loads under natural conditions. Prehistoric debris fans at tributary junctions did not commonly form. Stratigraphic evidence indicates the presence of stepped terraces resulting from glaciation, similar to piedmont channels flowing from the Sierra Nevada, but most of these terraces are buried by mining sediment.

Faulting and Seismicity

Plate-tectonic collisions in the Paleozoic and Mesozoic periods resulted in faults in the project vicinity. The New Bullards Bar Reservoir is transected by the Big Bend Wolf Creek fault zone that trends north-northwest to south-southeast through the reservoir area. Additional faults lie to the east of this fault zone. Faults within the project area are inactive. Potentially active faults closest to the New Bullards Bar Dam are the Little Grass Valley fault and the Cleveland Hill fault, located 18 miles and 19 miles from the dam, respectively. Of these potential seismic sources, the controlling fault is the Little Grass Valley fault with a maximum credible earthquake magnitude of 6.75 at a distance of approximately 15 miles from the dam that is estimated to occur once in 2,500 years. The estimated median (50th percentile) horizontal peak bedrock acceleration at the site from a maximum credible earthquake on this source is 0.12 gram. A random "minimum earthquake" would have a magnitude of 6.25 with a duration of 14 seconds and a peak horizontal acceleration of 0.15 grams at the median level and 0.2 grams at the 84th percentile.

Mineral Resources

Gold mining has been the dominant mineral resource activity and the primary reason people settled in the area. Gold mining started in the mid-1800s with lode mining (i.e., hardrock mining) and the exploitation of surface gold deposits in river beds and alluvial gravels. Deep mines and extensive hydraulic operations followed as the more-easily accessed deposits were depleted. Many abandoned and active mines are scattered throughout the Yuba River Watershed, and damage from historic hydraulic mining[41] for gold is visible throughout the river corridor. The use of high-pressure jets to erode

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[41] Hydraulic mining is a form of mining that uses high-pressure jets of water to dislodge rock material or move large volumes of sediment. In gold or tin placer mining, the resulting water-sediment slurry is directed through sluice boxes to remove the gold.

gold-bearing rock and soil transported material into local river channels, affecting the stream channel morphology. Mercury, which was used for gold extraction at the time, remains sequestered in sediments within the project region and continues to be a potential source of pollution to Yuba River (e.g., USGS, 2006).

Aside from gold, more than 20 other minerals were mined between 1900 and 1960, including chromium, copper, manganese, molybdenum, and tungsten. Chrysotile (i.e., white asbestos) is found in veins of serpentinized ultramafic rocks, which are generally found along fault zones such as the Big Bend Wolf Creek fault zone in the project area. By 1994, sand and gravel mining of deposits in the lower parts of the Yuba River Basin exceeded gold mining in economic importance.

Soils

Soil associations in the existing project boundary consist predominantly of the Musick-Holland-Hoda-Chaix series, followed by the Woodleaf-Surnuf-Sites-Mariposa series. The parent material of soils in these two associations consists of granite, granodiorite, and other types of igneous rocks. Soils are generally well drained and moderately to very deep.

Erosion hazard within a soil series strongly depends on slope. In general, the steeper the slope, the more erosive the soil, although erosion potential on steeper slopes may be moderated by coarse-grained, well-drained soils. Most of the slopes adjacent to New Bullards Bar Reservoir are characterized by Yuba County as “very severe” erosion hazard (Yuba County, 2008). The highest erosion hazards along the Yuba River are located between Smartsville and the northeast boundary of Yuba County. Soil erosion along the impoundments of the Log Cabin and Our House Diversion Dams is minimal because of the small size of the respective impoundments and the presence of predominantly bedrock and coarse-grained deposits along the respective channels.

Sediment Processes at Dams

Six dams in the project vicinity affect sediment processes in project-related rivers:

- Our House Diversion Dam, located on the Middle Yuba River, is a passive-spillway dam that spills regularly. The dam traps mostly coarse-grained sediment (cobble, gravel, and sand) stored in a 1,500-foot-long delta and a terrace along the southern margin of the impoundment. A small amount of finer sediment is stored within the low-water pool. The areal extent of the sediment deposit in the impoundment is approximately 11.4 acres. Coarse- and fine-grained sediment passes downstream during large flood events. During a 1986 flood event, YCWA estimates that between 7,300 and 15,000 cubic yards of sediment were transported through the low-level outlet in the dam. YCWA has removed sediment from the impoundment on several occasions, usually in response to large flood events. Specifically, YCWA removed sediment in 1986 (unknown volume), 1992 (28,000 cubic

yards), 1997 (68,000 cubic yards), 2006 (80,000 cubic yards), and 2017 (41,100 cubic yards).

- Log Cabin Diversion Dam, located along Oregon Creek, is a passive-spillway dam that spills regularly. The areal extent of the sediment deposit in the impoundment is approximately 3 acres. The Log Cabin Diversion Dam intercepts sediment transported in the creek, except the fine sediment fraction (e.g., washload). YCWA removed sediment from the impoundment in 1972 (40,000 cubic yards), 1988 (32,000 cubic yards), 1997 (unknown volume), 2014 (11,000 cubic yards), and 2017 (7,440 cubic yards).
- Slate Creek Diversion Dam is a diversion dam, located 9.1 river miles upstream from the creek's confluence with the North Yuba River. The dam is owned and operated by the South Feather Water and Power Agency. The dam diverts an average of 70,000 acre-feet per year to the watershed of Sly Creek Reservoir. The impoundment of the Slate Creek Diversion Dam is filled with cobble, gravel, sand, and silt, mostly related to past hydraulic mining in the upstream source area. Prior to 1986, the South Feather Water and Power Agency regularly passed bedload and suspended load sediment from upstream sources through a low-level outlet in the Slate Creek Diversion Dam during high flows. However, this practice was discontinued in 1986 because of concerns regarding the potential transport of contaminated fine-grained sediment to downstream reaches. Subsequent efforts to move any significant amount of sediment past the dam were mostly unsuccessful.
- New Bullards Bar Dam was constructed in 1970, inundating the smaller Bullards Bar Dam that was constructed from 1923 to 1924. New Bullards Bar Dam traps all of the sediment supplied by the North Yuba River. North Yuba River was not heavily disturbed by hydraulic mining and therefore has a much lower sediment production rate compared to the Middle and South Yuba Rivers (Stillwater Sciences, 2013). High-flow events combined with a high water surface elevation in New Bullards Bar Reservoir have resulted in a deposit of approximately 0.6 acre at the confluence of Slate Creek with the reservoir, although information on the volume of sediment accumulated in the entire reservoir was not available.[42] New Bullards Bar Reservoir has never

[42] A rough estimate of sediment trapped by New Bullards Bar Dam is 350,000 tons per year, using the drainage area at the dam of 489 square miles and an average total sediment yield of 250 metric tons/square kilometer/year based on Snyder et al. (2004). Assuming further that 15 percent of the total sediment load constitutes bedload, the rough estimate of the trapped bedload volume is 52,000 tons per year.

been dredged. The base of the spillway at New Bullards Bar Dam has been eroded to bedrock.

- Englebright Dam, located on the Yuba River, was constructed from 1935 to 1941 by the California Debris Commission to trap sediment derived from mining operations in the Yuba River Watershed. When first constructed, the reservoir had a gross storage capacity of 70,000 acre-feet; trapped sediment has reduced this capacity to approximately 50,000 acre-feet (USGS, 2003). Based on the estimated accumulation rate behind Englebright Dam, the sediment yield in the Yuba River Basin is between 160 and 340 metric tons/square kilometer/year (Snyder et al., 2004). The spillway below Englebright Dam has also been eroded to bedrock. Englebright Dam is outside the project boundary but adjacent to the Narrows 2 Powerhouse.
- Daguerre Point Dam is a diversion dam located on the mainstem Yuba River downstream of Englebright Dam. Daguerre Point Dam is approximately 25 feet high and 575 feet long and has no storage capacity or hydropower facilities. The dam was constructed by the California Debris Commission in 1906 to relocate the river and prevent hydraulic mining debris from the Yuba River Watershed from flowing into the Feather and Sacramento Rivers. The Corps administers the dam; the dam is not part of the project.

Sediment Processes in Yuba River Upstream of Englebright Reservoir

Most river channels upstream of Englebright Reservoir are transport-dominated[43]; only a few response reaches exist where sediment is deposited within or adjacent to the channel. The rivers generally flow through resistant parent material with lateral and vertical control provided by bedrock. Gradients range from 1 to 3 percent, and project dams reduce the sediment supply to the respective downstream reaches to varying extents.

Nevertheless, adequate sources of sediment occur to create gravel bars, floodplains, and enhance riparian growth in some areas along the river channels. Processes that supply sediment include bank erosion, surface erosion, debris flows and

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[43] A transport-dominated reach is defined as part of the river characterized as having the ability to convey the incoming sediment through the reach with only limited storage and additional erosion. Conversely, response reaches are characterized as parts of the river where stream energy drops, creating areas of deposition. Several factors affect sediment transport versus sediment deposition in a reach, including, but not limited to, flow velocity, sediment supply, and channel morphology. The gradient in transport-dominated channels is usually high enough to supply the energy to transport available sediment. As a result, sediment does not accumulate in such reaches, but is transported through them over time.

landslides, side channel development, and channel erosion during flood events. Sediment is also supplied by eroding current and residual historic mining deposits and by local placer mining that disturbs the bed and mobilizes previously stored gravel and finer-grained material (e.g., observed on the Middle Yuba River upstream of its confluence with Oregon Creek). Sediment deposition is greater where downstream control is provided by a channel constriction through bedrock that leads to backwater deposition of sand and gravel. Fine-grained sediment storage in the river channels is limited because of the generally low sediment supply and narrow gorge character.

Bedload contributed by tributaries to the North, Middle, and mainstem Yuba River appears to rapidly disperse, as indicated by the absence of alluvial fans near the confluences. Exceptions include Dobbins Creek, Moonshine Creek, Studhorse Canyon, and Nevada Creek that form alluvial fans and bars composed of sand, gravel, cobbles, and boulders at their confluence.

Most sediment transport occurs during large flood events, such as the 1986 and 1997 floods. These high energy flow events disturb and rework floodplain deposits, mid-channel bars, and historical mining material in project-affected reaches. These events also scour sediment from the impoundments of the diversion dams. For example, the 1997 flood exceeded a flow of 20,000 cfs in the Middle Yuba River, scouring some of the sediment from behind Our House and Log Cabin Diversion Dams and transporting the sediment farther downstream.

Following is a summary of sediment processes for each river reach potentially affected by the project:

- Middle Yuba River has a coarse-grained and resistant bed and banks along most of its length, with few possibilities of lateral or vertical shifting. Some sediment deposition occurs on the upstream side of bends and within and downstream of long-term depositional areas, but sediment transport is still high, and particles move with high frequency through the river system. Sediment is available to the channel from upstream and side-channel sources and is generally transported at a higher rate than it is replaced.
- North Yuba River and Yuba River upstream of the New Colgate Powerhouse have conditions similar to conditions in the Middle Yuba River (i.e., coarse-grained bed and banks resistant to movement, with storage of sediment in small areas in deep pools, in velocity shadows, and on lateral bars). Mid-channel bars exist but are rare.
- Oregon Creek also has a higher transport capacity than sediment availability. It also contains sediment storage areas and mobile sediment forming and reforming bedforms, bars, and floodplains.
- Yuba River downstream of the New Colgate Powerhouse has stable river banks, consisting mostly of bedrock and boulders, with only a minor amount of bank erosion, and appears to be accumulating sediment. The long-term bars in

this reach (e.g., Rice's, French, and Condemned bars) seem stable, although the channel may shift laterally across the Rice's and French bars as a result of flood flows.

Sediment Processes in Yuba River Downstream of Englebright Dam

The Yuba River downstream of Englebright Dam to the Feather River confluence is a single-thread channel approximately 24 miles long. The river corridor is confined in a bedrock canyon in the uppermost 2 miles, then transitions to a wider bedrock valley and, finally, to a wide alluvial valley for the remaining 19 miles. The river has an average channel gradient of 0.16 percent and a mean substrate size of 97 millimeters (i.e., cobble-size material).

Englebright Dam traps nearly all sediment from upstream sources, except for the finest grain sizes (clay, silt) that may remain in suspension during high-flow events. Upland sources of sediment to the Yuba River, downstream of Englebright Reservoir, consist of smaller tributaries and rock from the embankment of the river. Tributaries include Deer Creek that enters Yuba River approximately 0.8 mile downstream of Englebright Dam. Rock from the embankment partially originated from the construction of the power facilities, such as the Englebright Dam, and access roads. In addition, since November 2007, the Corps has been placing gravel in the Yuba River below Englebright Dam to enhance Chinook spawning habitat; to date, approximately 53,000 short tons of gravel have been placed.

Historical hydraulic mining is the source for the majority of the modern alluvium, and the tailings were used to create training berms for much of the lower river corridor. Between 1852 and 1906, an estimated 367 million cubic yards of hydraulic mining debris moved downstream from the upland mining areas of the greater Yuba River Watershed and was deposited in the Yuba River downstream of Englebright Dam, causing aggradation of 26 to 85 feet (Adler, 1980). This massive sedimentation in the channel and floodplains transformed the river into a braided, unstable stream system. Even prior to mining, the river had already been highly altered by sedimentation, agriculture, and engineering projects. Adler (1980) states that by 1906, the supply of hydraulic mining debris from upland areas was mostly depleted and the river channel attained equilibrium by 1940 to a channel morphology similar to its pre-1849 channel configuration (i.e., single stable channel and similar channel elevation). The primary difference between the pre- and post-mining stream channel is that it is now bordered by large cobble berms that constrain the channel width in many sections. Almost 90 percent of the hydraulic mining debris deposited in the Yuba River downstream of Englebright Dam remains today as deposits in the floodplains.

The channel and floodplain of the Yuba River downstream of Englebright Dam are highly connected, resulting in high flows regularly spilling onto the floodplain. The valley corridor is wide and the river meanders, cutting into the berms and potentially allowing re-incorporation of mining sediment into surface water. Overall, sediment is

both eroded and deposited throughout the lower river valley in a complex spatial pattern, with a net outflux that is large compared to other rivers in the region.

The effects of historical hydraulic mining are particularly significant where the Feather and Yuba Rivers converge near the City of Marysville. At the mouth of the Yuba River at the south edge of Marysville, more than 70 feet of sediment eventually filled the river channel. Upstream of Marysville, historical floods buried entire communities under more than 40 feet of silt and gravel. Sacramento River Flood Control Project levees were constructed along the Feather and Yuba Rivers and their tributaries to prevent flooding of valley communities as well as burial of the communities by sediments washed down from the mountains. The levees were built even higher and designed to confine the floodwaters to a relatively narrow channel that would maintain sufficiently high velocities to efficiently convey sediment through the system, reducing the amount of dredging necessary to maintain navigation. As a result of the levees, Marysville, Olivehurst, and Linda are now many feet below the floodwater levels of the Feather and Yuba Rivers.

3.3.1.2 Environmental Effects

Erosion during Construction and Project Operation

The proposed project includes the construction of several facilities with varying local and short-term effects on geology and soils:

- **New Bullards Bar Dam Auxiliary Flood Control Outlet:** Construction of the outlet would require excavation in the upper left abutment area of the New Bullards Bar Dam site. YCWA would construct an access road from the left abutment area down to the outlet area. A natural cofferdam consisting of in-situ soil and rock would be left in place in the inlet approach channel to protect the construction work and prevent uncontrolled release of reservoir water through the excavation area and tunnel. YCWA would implement stabilization and buttressing measures at the natural cofferdam, if needed, to ensure the site is adequately protected from the reservoir. YCWA would clear the slope from the concrete outlet to the channel of vegetation and soil down to rock. Following the construction of the concrete intake structure, YCWA would backfill the over-excavated areas with structural fill, and place riprap on the slopes that may be exposed to wave erosion. Approximately 300,000 cubic yards of soil and rock would be excavated. YCWA identifies five sites for potential use as spoil placement sites. Three of these sites are located along Marysville Road near the old quarry, approximately 2 miles from the construction area. The two additional sites consist of the visitor parking area adjacent to the spillway and an area along a dirt forest road, located approximately 300 yards and 4 miles, respectively, from the construction area.
- **New Colgate Powerhouse Tailwater Depression System:** Short-term construction activities would utilize existing available space within the New

Colgate Powerhouse for laydown and staging of materials and equipment. The work would be confined to the powerhouse, yard, and immediate vicinity, and would involve limited soil disturbance.

- **Modifications to Our House Diversion Dam and Log Cabin Diversion Dam Fish Release Outlets:** YCWA's proposed modification of the fish release outlets at Our House Diversion Dam and Log Cabin Diversion Dam would occur during the summer when precipitation rates are low and, contemporaneously, when the minimum flow releases from each dam are low and equal to inflow into the impoundments. Construction work would occur at the intake site and no material would be allowed to enter the impoundments.
- **Modifications to Lohman Ridge Diversion Tunnel Intake:** YCWA's proposed modification of the Lohman Ridge Diversion Tunnel intake would also occur during the summer when flows in the river are low and water is not diverted into the tunnel. Construction work would be limited to the intake site and no material would be allowed to enter the impoundment.
- **Recreation Facilities Rehabilitation and Enhancements:** Recreation facilities at the project include developed campgrounds, day use areas, boat launches, trails and facility access and circulation roads at New Bullards Bar Reservoir; as well as river access facilities at Our House Diversion Dam impoundment and New Colgate Powerhouse. YCWA would rehabilitate and upgrade all existing recreation facilities and would construct several new recreation facilities.

During project operation, erosion of soil may occur during stormwater runoff from exposed surfaces such as dirt roads, trails, and other unpaved areas. Project operation may also result in shoreline erosion and localized landslides along the New Bullards Bar Reservoir.

In addition to the construction-specific erosion control measures above, YCWA proposes to implement its Erosion and Sediment Control Plan (GS1) filed on October 27, 2016. The purpose of this plan would be to minimize erosion and sedimentation related to the project, with special emphasis on NFS land. The plan includes existing YCWA and Forest Service BMPs to control site-specific erosion and sedimentation impacts during routine operations, maintenance, new construction, and reconstruction of project facilities, including emergency erosion control measures and protocols to control sedimentation during or after severe storm events. BMPs would also integrate local, state, and federal permit requirements. As part of its Erosion and Sediment Control Plan, YCWA would prepare and implement an SWPPP during development of detailed construction plans and drawings and prior to initiating erosion control measures for each site larger than 1 acre. YCWA would also notify California DFW prior to implementing any non-emergency erosion control activities that may be inconsistent with California Fish and Game Code Section 1602; this notification would be required for activities that would substantially divert or obstruct the natural flow of any river, substantially change

or use any material from the river, or deposit debris or other material in the river. YCWA would adhere to Forest Service BMPs for any routine maintenance activities on NFS land during project operation to minimize soil disturbance and reduce delivery of sediment to the river and reservoirs. YCWA would be prepared to monitor after any unexpected emergency erosion control events (e.g., storms and wildfires). YCWA's erosion control measures would include documentation of specific erosion threats, appropriate agency notifications, and short- long-term actions to stabilize each site and address public safety.

YCWA would monitor implemented erosion and sediment control measures to document their proper installation and effectiveness. YCWA would also conduct a reservoir shoreline survey periodically and would invite the Forest Service and California DFW to participate. As part of these shoreline surveys, YCWA would identify active unstable areas that could adversely affect resources on NFS lands.

YCWA's proposed Transportation System Management Plan (LU1) also includes erosion control measures. As part of this plan, YCWA would conduct routine inspection and maintenance of road drainage features in the project boundary, such as culverts, drainage ditches, trails, rock falls, and landslides. As needed, YCWA would conduct repairs to mitigate erosion effects, stabilize hillslopes, and restore proper function of any impaired drainage features.

Monitoring results and potential corrective actions of the Erosion and Sediment Control Plan (GS1) and the Transportation System Management Plan (LU1) would be discussed with the Forest Service during the annual meetings, which are part of proposed measure GEN1 (Forest Service 4(e) condition 2). YCWA proposes to revise these plans when significant changes in existing conditions occur, in consultation with the Forest Service and California DFW. YCWA would submit any revised plans to the Commission for approval.

The Forest Service concurs with YCWA's proposed Erosion and Sediment Control Plan (GS1) filed on October 27, 2016, and specifies its implementation in 4(e) condition 52 and 10(a) recommendation 25. California DFW (10(j) recommendation 2.16), the Water Board (preliminary 401 condition 24), and Foothills Water Network (FWN) also support implementation of GS1. The Forest Service concurs with YCWA's proposed Transportation System Management Plan (LU1) filed on June 5, 2017, and specifies its implementation (4(e) condition 51).

Our Analysis

Proposed construction for the project, including instream construction, are prone to erosion effects if a control plan is not in place and properly implemented. Effects from erosion could include the following: loss of sediment into New Bullards Bar Reservoir and the North Yuba River during construction of the New Bullards Bar Dam auxiliary flood control outlet; loss of excavated rock, soil, and sediment during transport and after placement at the disposal sites; and erosion of soil, sediment, and any contaminants in

them during rain storms that could increase turbidity and contaminant concentrations in streams and New Bullards Bar Reservoir.

We find that YCWA's proposed Erosion and Sediment Control Plan (GS1) would limit the potential for impacts from soil erosion and sedimentation during construction. YCWA's proposed erosion prevention and control measures would be based on local, state, and federal permit requirements; these measures include, for example, Forest Service BMPs and preparation of an SWPPP. Scheduling instream construction to occur during low-flow conditions would help minimize potential erosion in the streambed and thereby reduce instream erosion. In addition, monitoring of installed erosion control measures would enable any needed corrective measures to be implemented and ensure their effectiveness.

We find further that implementation of BMPs as part of the Erosion and Sediment Control Plan (GS1) would limit the potential for erosion during project operation. Similarly, the proposed Transportation System Management Plan (LU1) would minimize potential erosion of upland soils through appropriate maintenance measures of roads, trails, and drainage systems. Monitoring the work affecting NFS land would be consistent with the Forest Service Handbook. YCWA's proposed measures would also include monitoring for unexpected, emergency erosion that develops in response to events such as storms or wildfires. YCWA would be prepared to conduct emergency repair work, following notification to California DFW.

Effects from project operation on shoreline erosion rates would be small, particularly because much of the shoreline consists of rock outcrop and shallow soil. While the erosion hazard on the slopes around the reservoir is considered "very severe" based on slope and soil type, there are few landslides or other erosional areas as a result of current operations. Erosion from waves on the reservoir is also limited because the irregular shaped reservoir keeps the fetch relatively short and wave heights relatively low. YCWA does not propose any activities that would likely increase shoreline erosion or deposition of sediment in the New Bullards Bar Reservoir. However, as part of the proposed Erosion and Sediment Control Plan (GS1), YCWA would periodically monitor shoreline stability. If unstable areas are identified, YCWA would document these areas and consult with the Forest Service on the need for any corrective actions. We find that these measures would appropriately address potential impacts from shoreline erosion, soil erosion and failure of slopes, and sediment deposition in New Bullards Bar Reservoir during project operation.

Sediment Transport in Middle Yuba River and Oregon Creek

High-flow events mobilize sediment in the watershed, including sediment that originates from deposits that were left in or near the river channel from historical hydraulic mining operations. Coarser-grained sediment is trapped in the impoundments of the Log Cabin and Our House Diversion Dams, which limits the recruitment of coarse sediment downstream of these two dams.

YCWA proposes to implement the Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2). The purpose of the plan is to provide for dam safety and proper functioning of project facilities, especially the fish release and low-level outlet valves, and to maintain the health of the aquatic environment downstream of the dams by allowing the passage of sediments that accumulate behind the dams. Following issuance of the draft EIS, YCWA updated the plan, in consultation with the Forest Service, FWS, California DFW, FWN, and other interested relicensing participants and filed the updated plan on July 27, 2018 (YCWA, 2018e).[44] Specifically, the plan includes five components to manage sediment:

1. YCWA would maintain a minimum pool to facilitate sediment deposition at the upstream end of the impoundments to avoid blockage of the outlets at the dams.
2. YCWA would open the low-level outlet valves at the dams during one or multiple periods of high flow to pass sediment. Passage would typically occur between October 1 and March 21, allowing high spring flows to mobilize and redistribute the sediment below the dam.
3. YCWA would clear blocked valves or outlets by using air and/or water nozzles to blow sediment out of the valves, and/or a suction dredge to remove, at each dam, up to 250 cubic yards of accumulated sediment. The sediment would be pumped around the dam and discharged directly to the river downstream of the dam. If needed, these clearing activities would be performed between October 1 and March 31, although a provision for completion by April 10 is included in both the 2017 and 2018 plans. The terms of this provision have changed since the draft EIS was issued. When the draft EIS was prepared, this provision would allow all activities related to suction dredging to occur until April 10 if a sediment passage event occurs between March 21 and March 31. Under the updated plan, this provision would allow suction-dredging until April 10 if high flows preclude staff access.
4. YCWA would mechanically remove sediment, if large storms resulted in extensive accumulations of sediment in the impoundments. YCWA would place excavated sediment at two potential disposal sites, located at a distances between 5 to 15 miles from the impoundments. The sediments would be tested for metals prior to sediment removal, and if sediments were determined to be hazardous, they would not be removed until an alternate plan is in place.

[44] Accession no. 20180727-5007.

5. If needed, YCWA would conduct emergency work after large storms for repair and protection of facilities and resources. Where possible, the nature of emergency work, with the exception of permitting, would follow the measures for mechanical removal of sediment.

As part of the sediment monitoring proposed in the Upper Yuba River Aquatic Monitoring Plan (AR7); see detailed discussion in section 3.3.2.2, in the subsection *Upper Yuba River Aquatic Monitoring*, YCWA would assess the channel morphology in the diversion dam impoundments by surveying the bottom topography along cross sections in the two impoundments. Additionally, YCWA would monitor sedimentation in a pool below the weir, located downstream of Our House Diversion Dam, by assessing its bathymetry.[45] YCWA, in consultation with the Forest Service, California DFW, and the Water Board would assess the effectiveness of the Log Cabin and Our House Diversion Dams Sediment Management Plan after 3 years of monitoring and submit proposed revisions to the plan to the Commission for approval.

In 4(e) condition 37 and 10(a) recommendation 22, the Forest Service specifies implementation of the Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2). California DFW (10(j) recommendation 2.17) and the Water Board (preliminary 401 condition 12) make recommendations consistent with the Forest Service's 4(e) condition 37; FWN indicates that it supports the measure.

The Forest Service, FWS, and California DFW support YCWA's plan, filed on July 27, 2018.

Our Analysis

Intense storms occur periodically in the Middle Yuba River and Oregon Creek Watersheds. Such storms can move large amounts of sediment in these streams. If not trapped in impoundments, this sediment could form gravel bars that provide viable spawning and rearing habitat for salmonids. However, the channels of both streams are transport-dominated, where the capacity of the channels to move sediment is greater than the amount of sediment entering the channels. Bedrock and boulder control on much of the bed and banks limits the lateral or vertical movement of the stream channels. Local, short channel segments with small and localized depositional features could respond to the changes in sediment supply and hydrology, but overall changes in coarse sediment storage or channel shape are unlikely. Therefore, sediment is eventually removed from the channels unless it is constantly resupplied from upstream sources.

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[45] YCWA measures streamflow in the Middle Yuba River by monitoring flows approximately 400 feet downstream from Our House Diversion Dam. The gage, installed in 1987, was built with a concrete dam to create a stable control for a gage pool. A 12-foot sharp-crested weir was installed within the concrete dam in 1990. YCWA owns and operates this facility.

YCWA's proposed Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2) would increase the volume of sediment that is passed through the dams. The plan includes various management scenarios that would maximize sediment passage. Maintaining a minimum pool would allow for upstream sediment deposition, reducing the frequency of clogging of the low-level outlets, while using high-flow events during the fall and winter for sediment passage through the outlets, would provide for the periodic recruitment of both fine and coarse sediments to the downstream stream reaches. Excavation of sediment after impoundments are filled during large flood events (both as a scheduled measure and as an emergency measure) would unclog the outlets and maintain appropriate functionality of the dams and impoundments. Although recent testing indicates metal concentrations in sediments from the two impoundments did not exceed their respective total threshold limit concentration (YCWA, 2018f),[46] the proposed testing of sediments for metal concentrations and development of an alternative plan for placement of contaminated sediments would provide further assurance of minimizing any adverse effects on environmental resources. We address the need for sediment monitoring and agency comments to the Upper Yuba River Aquatic Monitoring Plan (AR7) in section 3.3.2.2, in the subsection *Upper Yuba River Aquatic Monitoring*.

The added sediment would create localized sediment deposits in these streams. Sediment that passes the two diversion dams would be distributed down the Middle Yuba River and Oregon Creek streambeds primarily by flood events. These floods would also continue to transport cobble and finer-grained sediment downstream of the dams, shift and restructure cobble/gravel bars and local floodplains, and result in deposition of sediment in vegetated riparian zones. Nevertheless, the channels would remain stable because they are controlled by bedrock and large boulders and are transport-dominated.

Sediment Transport in North Yuba River

Sediment transport is controlled primarily by sediment supply, grain size, and stream transport capacity. Similar to the Middle Yuba River and Oregon Creek, the North Yuba River is transport-dominated, where the capacity of the channels to move sediment is greater than the amount of sediment entering the channels. Sediment transported by the river upstream of New Bullards Bar Reservoir would continue to be trapped by the reservoir. YCWA proposes modifications in the release of floodwaters through the construction and operation of the new auxiliary flood control outlet at New Bullards Bar Dam. This modification would reduce peak spill releases under certain conditions by allowing more water to be released earlier in anticipation of high flood control releases, thereby reducing the stream transport capacity within the reach.

[46] Title 22 of the California Code of Regulations sets the total threshold limit concentrations.

FWS recommends (10(j) recommendation 9) that YCWA develop a North Yuba River LWM and sediment enhancement plan. For the sediment component, FWS recommends that YCWA: (1) conduct a baseline survey in the North Yuba River downstream of the New Bullards Bar Dam spillway no more than 1 year prior to gravel/cobble placement; (2) place 5,000 tons of mixed gravel/cobble, 0.25 inch to 6 inches in diameter, between August and September in this reach within the first 5 years of the new license, using truck, helicopter, or other means deemed safe and feasible by YCWA; (3) take photos and describe the spatial area of the gravel/cobble pile and document the location with GPS immediately following placement; and (4) establish permanent transects and photo points for gravel/cobble monitoring within the first 2.4 miles of the bypassed reach downstream of New Bullards Bar Dam to the confluence with the Middle Yuba River at the two sites. FWS recommends that YCWA monitor up to three times in each 10-year period of the new license, as triggered by a flow event of 8,000 cfs or more; if fewer than two of these events occur within the 10-year period, then YCWA would monitor during year 10. FWS also recommends that YCWA replenish the gravel/cobble pile to approximately 5,000 tons following each monitoring event. In addition, FWS recommends that YCWA file reports describing the implementation of gravel/cobble placement and the results of baseline monitoring by March 15 of the year following initial gravel/cobble placement and the results of monitoring and any replenishment in subsequent years. FWS also recommends that YCWA present to the ecological group (GEN1) the results and an evaluation of the gravel/cobble enhancement effort following completion of each 10-year monitoring period. The presentation is to include the amount of gravel/cobble replenished, monitoring triggers and frequency, monitoring methods, and/or discontinuing the replenishment of gravel/cobble. FWS recommends that YCWA, the Forest Service, FWS, California DFW, and the Water Board collectively agree to any changes to the plan prior to YCWA filing a revised plan with the Commission for approval.

California DFW 10(j) recommendation 2.19, Bureau of Land Management (BLM) 10(a) recommendation 3, Forest Service 10(a) recommendation 5, and FWN recommendation VIII are identical to FWS's 10(j) recommendation 9.

The Water Board's preliminary 401 condition 12 (Sediment Management Plans) states that the Water Board would likely require YCWA, in consultation with other agencies, to develop and implement a plan to mitigate for the reduction in sediment transport past New Bullards Bar Dam in the North Yuba River to improve downstream habitat. Mitigation potentially required by the Water Board may include, but would not be limited to, sediment augmentation below New Bullards Bar Dam. The Water Board may also require YCWA to monitor implementation and effectiveness of the sediment augmentation.

In their comments on the draft EIS from July 27, 2018, the Forest Service, FWN, and the Water Board suggest additional approaches for sediment augmentation, including using the gravel pit as a staging area for helicopter placement, expanding the road to be built for the auxiliary flood control outlet down to the river, or using a modified version

of the gravel injection method currently implemented in the Lower Yuba River below Englebright Dam.

Our Analysis

New Bullards Bar Reservoir would continue capturing all sediment carried into the reservoir by the North Yuba River, except for some of the finest size fractions that remain in suspension (clay/silt). Sediment sources in the 2.4-mile-long North Yuba River reach from New Bullards Bar Dam to the confluence of the North Yuba and Middle Yuba Rivers consist only of nonpoint source runoff from the steep slopes of the river valley; no tributaries enter this reach. The channel of the North Yuba River is dominated by large boulders, with only small patches of gravel either behind large boulders in the wet channel or out of the water, high on the channel banks. YCWA (2013a) mapped on-the-ground habitat along 1.1 miles of the North Yuba River below the dam and found 511 square feet of trout spawning-sized gravel.

The North Yuba River downstream of the dam has a steep gradient (2 percent on average, with sections as steep as 5.5 percent) and is transport-dominated. The North Yuba River would likely also be transport-dominated without the project because of its similar geomorphological conditions to the Middle Yuba River; the Middle Yuba River is considered transport-dominated with and without the project (YCWA, 2013b). However, because of sediment capture by New Bullards Bar Dam, far less sediment is being transported through the North Yuba River reach below the dam than would occur without the project. Transport domination implies that sediment placed into the river channel as part of an enhancement plan would eventually be flushed out by high flows. The 2-year, 5-year, and 10-year return flows under existing conditions are approximately 350 cfs, 8,800 cfs, and 48,600 cfs, respectively. Between 1970 and 2010, the dam spilled on 761 days, with flows ranging from 1 cfs to a maximum of 53,633 cfs (figure 3-1); this frequency did not include the required minimum flows. The median flow during spill days was 2,000 cfs; the 75th and 25th percentile flows[47] were 4,255 cfs and 1,000 cfs, respectively. Flows during the flood on February 10, 2017, reached 40,000 cfs. YCWA's model results indicate that the added release capacity of the proposed auxiliary flood control outlet would only be needed during very large storm events, or in roughly 8 of 41 years; any pre-emptive releases using the outlet would occur in even fewer occurrences. YCWA considers the capacity of the existing outlet adequate for all low-to-medium intensity storm events; therefore, future releases from the dam during such storms could be made through either outlet. YCWA's model results suggest that the number of total days with spill releases per year would increase slightly, but the peak

[47] The 75th percentile represents the flow rate at which 75 percent of flows during the period of record are lower than this value. The 25th percentile represents the flow rate at which 25 percent of flows during the period of record are lower than this value.

flows associated with very large storms would decrease because the peaks would be spread over a longer period.

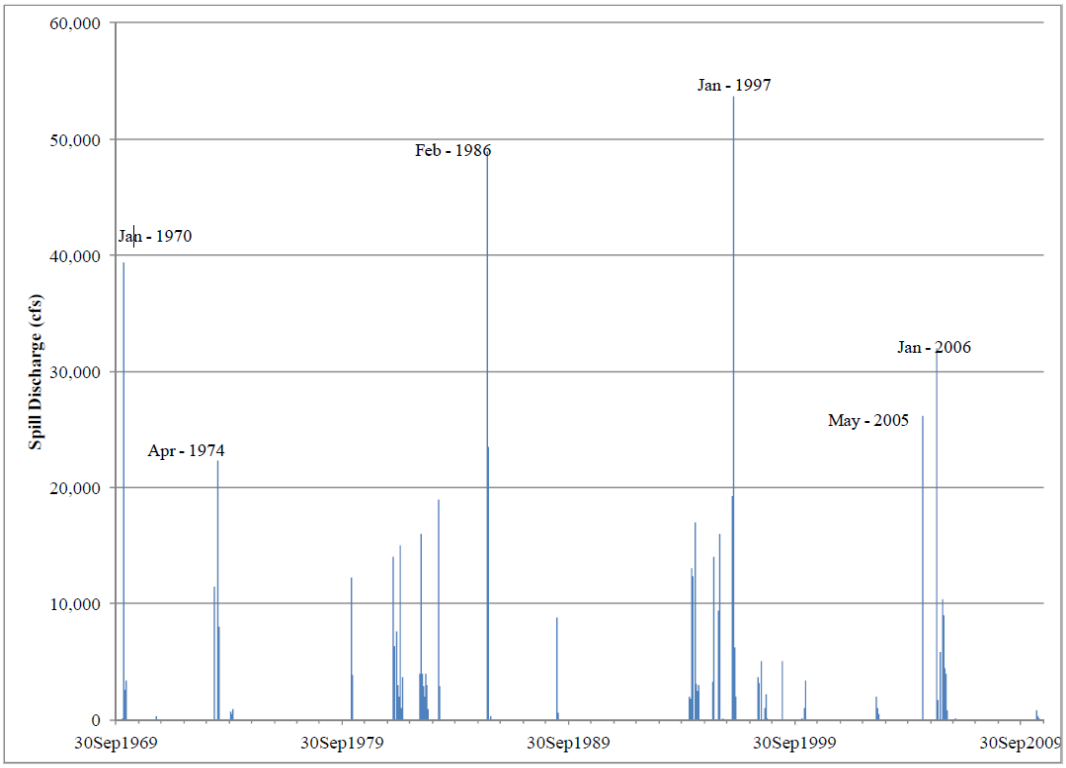

Figure 3-1. Spill events through New Bullards Bar spill gates for water years 1970–2010 (YCWA, 2013b).

The steep gradient and narrow channel of North Yuba River result in high-flow velocities during high-flow events. As part of its instream flow study (YCWA, 2013a), YCWA calculated flow velocities at 20 transects in the bypassed reach between New Bullards Bar Dam and the confluence with the Middle Yuba River, based on cross section profiles and at a range of simulated river discharges (calibration flows). The highest calibration flow simulated by this study was 2,880 cfs, which is less than 5-year return flow of 8,800 cfs, and would not be considered a major spill event at the dam. However, even at this flow (2,880 cfs), the estimated maximum velocities were between 5 and 21 feet per second (table 3-2). Higher spillage flows would undoubtedly result in higher velocities across more of the river channel. Kondolf and Wolman (1993) determined a median diameter of suitably sized spawning gravel for salmonids (trout and salmon) ranging between 0.2 to 3.0 inches (based on 135 sediment analyses), with 50 percent of the median diameters falling between 0.6 and 1.4 inches. These grain sizes would be mobilized in the river at flows between approximately 60 and 700 cfs; such flows have return frequencies between about 1.5 and 2.3 years. Cobble would be mobilized at higher flows; YCWA estimated a critical discharge of up to 2,000 cfs for

particles with a diameter of 10 inches for North Yuba River study sites. Spills in the North Yuba River have a return period of 3 years.

Table 3-2. Maximum predicted flow velocities at 20 transects on the North Yuba River from downstream of New Bullards Bar Dam to the confluence with the Middle Yuba River during 2,880 cfs discharge (Source: YCWA, 2013a).

Transect Number[a]	Maximum Predicted Flow Velocity (Feet per Second)	Transect Number[a]	Maximum Predicted Flow Velocity (Feet per Second)
20	9	10	10
19	11	9	14
18	15	8	21
17	6	7	16
16	20	6	19
15	9	5	6
14	8	4	8
13	9	3	12
12	13	2	13
11	16	1	5

[a] Transects are listed from upstream to downstream.

The presence of boulders and the variability in the channel configuration result in a wide range of velocities during peak flows. However, gravel and cobble patches that may form behind boulders are expected to be small. Similarly, turbid flows during peak flow events are expected to mobilize much of the gravel and cobbles that may have settled upstream or downstream of anchored LWM (see section 3.3.2.2, in the subsection *Managing Sediment and Large Woody Material in the North and Middle Yuba River and Oregon Creek*, for further discussion). In addition, some of the gravel mobilized by peak flow events would settle high on the river bank, outside the wetted river channel once flood flows recede.

We expect that the existing return frequencies of spill events through New Bullards Bar spill gates would not change appreciably, because operational changes with the auxiliary flood control outlet in place would only affect flows during very large storm events. Although operation of the proposed new auxiliary flood control outlet at New Bullards Bar Dam would reduce peak flows during spill releases under certain conditions

by allowing more water to be released earlier in anticipation of high flood control releases, high scouring flows would continue to occur in the North Yuba River.

California DFW and other agencies recommend transporting and placing sediment (gravel/cobble) in the North Yuba River below New Bullards Bar Reservoir by truck, helicopter, or other means deemed safe and feasible by YCWA. YCWA in its response to agency comments evaluated placement of sediment by truck and helicopter. Transport to the placement location in the river by truck would require upgrading the maintenance access road and extending the road by 0.5 mile along the steep cliff face. Even with an upgrade, the road would likely remain steep (i.e., approximate grade of 15 percent). Using helicopters to place sediment may require many flights. Assuming a Chinook helicopter carries a load of 14 tons of gravel per trip and an average of 3 hours per trip from the sediment stockpile area to the deposit site, YCWA estimates that it would take approximately 350 trips over 134 days for the helicopter to place 5,000 tons of sediment in the river. Both the number of trips and the cost would be high. Other approaches suggested by the Forest Service, FWN, and the Water Board in their comments on the draft EIS may be less costly but would not change the anticipated need for intermittent sediment replenishment.

Gravel augmentation management to improve downstream habitat would benefit from baseline monitoring and performance monitoring of placed gravel by informing any need for adjustments to maximize any benefits for aquatic resources.

See section 3.3.2.2, in the subsection *Managing Sediment and Large Woody Material in the North and Middle Yuba River and Oregon Creek,* for additional discussion on the need for and benefits of placing LWM along with gravel and cobble for the purpose of enhancing aquatic habitat. This section also discusses the success of potential gravel augmentation given the high flows.

Sediment Transport in Lower Yuba River Downstream of Englebright Dam

The Narrows 2 Powerhouse is operated as a baseload facility, with flow established as part of the Yuba Accord. YCWA proposes to continue to operate the development as it has been operated since the Yuba Accord went into effect in 2006, except for minor changes in minimum flows. As part of the Lower Yuba River Aquatic Monitoring Plan (AR8), YCWA would assess the effect of revised project operation on the channel substrate. Proposed monitoring components would include characterization of the spatial distribution of substrate in the lower Yuba River and determination of the location and distribution of areas of fine sediment suitable for riparian recruitment for anadromous salmonid spawning. A detailed discussion of this proposed monitoring is included in section 3.3.2.2, in the subsection *Lower Yuba River Habitat Restoration and Large Woody Material Management.*

Our Analysis

Effects on sediment transport downstream of Englebright Dam would be a function of sediment supply and changes in flow conditions that mobilize sediment.

YCWA does not propose to supply sediment to the Yuba River reach below Englebright Dam. Sediment transported in the North Yuba River, Middle Yuba River, and Oregon Creek below their respective dams would continue to be trapped behind the Corps' Englebright Dam, except for some of the finest size fractions that may remain in suspension within the reservoir (clay/silt).

YCWA does not propose any changes in project operation that would affect sediment mobilization in the Yuba River downstream of Englebright Dam with the exception of changes in the release of floodwaters through the new auxiliary flood control outlet at New Bullards Bar Dam. This modification would reduce peak spill releases at New Bullards Bar Dam under certain conditions, by allowing more water to be released earlier in anticipation of high flood control releases. Depending on the available storage capacity in Englebright Reservoir at the time of the release (which could store some of the flood waters), this proposed modification at New Bullards Bar Dam could result in slightly reduced peak flow magnitude but a correspondingly longer peak flow period below Englebright Dam.

Overall, finer sediment, such as sand and fine gravel, would continue to be mobilized at flows lower than bankfull conditions, with coarser particles becoming mobile as flows increase. These processes would remain unchanged from existing conditions, and as result, there would be no need for detailed monitoring over the term of any new license for the project.

3.3.1.3 Cumulative Effects

The proposed sediment management measures would result in a net increase in project-related sediment releases compared to current operations. The current license does not require any specific sediment management measures for new construction, and YCWA's proposal would provide clear guidelines for new construction and project operation. Sediment would continue to be trapped by New Bullards Bar Dam and temporarily by the diversion dams. In addition, a net sediment export out of the project-affected reaches to Englebright Reservoir would continue.

The Jackson Meadow Dam, located about 30 miles upstream of Our House Diversion Dam, would continue trapping the sediment bedload that is transported by the Middle Yuba River into the Jackson Meadow Reservoir during high-flow events. Our House Diversion Dam would also continue trapping the bedload entering its impoundment during operation; however, periodically opening the low-flow outlet valves during high flow events, as proposed in the Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2) would increase bedload transport to the downstream reach of the Middle Yuba River compared to existing conditions.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Resources

Water Quantity

Water Storage—The project includes two diversion dams and one storage reservoir. Water impounded by the 70-foot-high Our House Diversion Dam on the Middle Yuba River is conveyed to Oregon Creek through the Lohman Ridge Diversion Tunnel. From there, water impounded by the 42.5-foot-high Log Cabin Diversion Dam is conveyed to the New Bullards Bar Reservoir on the North Yuba River through the Camptonville Diversion Tunnel. Average monthly and yearly flow diversions via the Lohman Ridge and Camptonville Diversion Tunnels are shown in table 3-3.

Table 3-3. Mean of monthly and yearly flow diversions (cfs) through the Lohman Ridge and Camptonville Diversion Tunnels (2005–2015) (Source: USGS, 2017a,b).

Project Facility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Yearly Flow
Lohman Ridge Diversion Tunnel	205	277	395	416	337	169	49	8	4	12	37	151	172
Camptonville Diversion Tunnel	280	372	523	499	386	180	51	6	2	12	41	193	212

New Bullards Bar Reservoir is located on the North Yuba River between RM 2.4 and 17.8, has a NMWSE of 1,956 feet, a maximum surface area of 4,790 acres, and a drainage area of 466.6 square miles at the dam. The reservoir has a gross storage capacity of 966,400 acre-feet with a minimum pool of 230,000 acre-feet. Figure 3-2 shows the operational rule curves for New Bullards Bar Reservoir. The minimum pool and maximum storage curves are defined under YCWA's existing license. The top of conservation curve is defined by the Corps for YCWA's flood management operations, and the storage curve represents average monthly storage levels for the period of record 2005–2015.

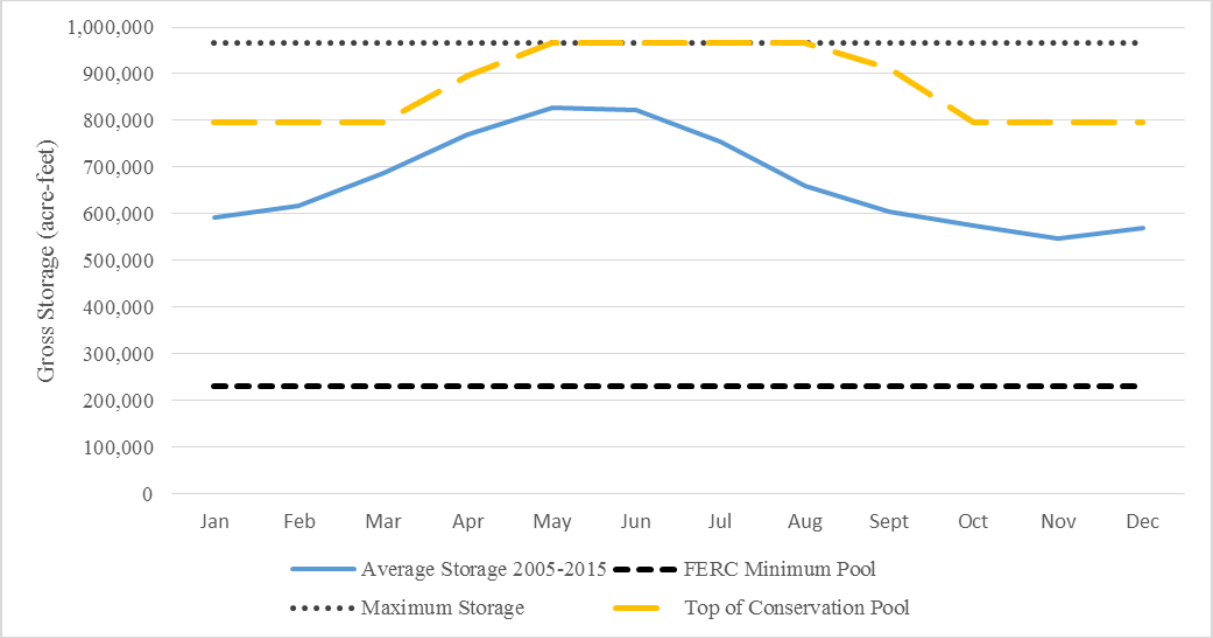

Figure 3-2. New Bullards Bar Reservoir rule curves (Source: USGS, 2017c; YCWA, 2014a).

North Yuba River inflow into New Bullards Bar Reservoir is augmented by diversions from the project diversion facilities described above.[48] New Bullards Bar Reservoir typically reaches its usable storage capacity of 966,103 acre-feet at the end of the spring runoff season and is gradually drawn down to its minimum operating elevation of 1,730 feet in early to mid-winter. The reservoir does not undergo significant daily changes in elevation.

New Bullards Bar Reservoir also acts as the main flood control facility for the lower Yuba River Watershed, with 170,000 acre-feet of usable capacity held in reserve for flood storage from October through April.

Project-Affected Stream Reaches

Project operation affects streamflows in the Middle Yuba River, Oregon Creek, North Yuba River, and mainstem Yuba River. Table 3-4 shows average annual and monthly flow statistics for these stream reaches, and table 3-5 shows the 10, 50, and 90-percent flow exceedances for each stream reach. Compliance with existing minimum flow requirements in each reach is monitored via 10 USGS gages shown in figure 1-1.

[48] The average total inflows to New Bullards Bar Reservoir from the North Yuba River and diversions from the Middle Yuba River and Oregon Creek are about 1.2 million acre-feet per year, and annual inflow has ranged from a low of 163,000 acre-feet in 1977 to a high of 2.8 million acre-feet in 1982.

Table 3-4. Mean annual and monthly flow (cfs) of project-affected stream reaches for the period of record (2005–2015) (Source: USGS, 2017d,e,f,g,h,i).

USGS Gage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Yearly Flow
New Colgate Development													
1141300 North Yuba River below Goodyears Bar, California	532	688	968	1,280	1,610	929	337	166	133	154	222	775	649
11413517 North Yuba River low-flow release below New Bullards Bar Dam, California	6	6	6	6	7	7	7	6	6	6	6	6	6
11408880 Middle Yuba River below Our House Dam, California	98	120	146	236	303	91	35	32	30	33	41	199	114
11409400 Oregon Creek below Log Cabin Dam near Camptonville, California	19	17	27	41	22	12	8	5	4	6	10	29	17
Narrows 2 Development													
11418000 Yuba River below Englebright Dam near Smartsville, California	2,060	1,600	2,320	3,030	3,880	2,910	2,280	1,740	814	899	951	2,230	1,690
11421000 Yuba River near Marysville, California	2,300	1,920	2,880	3,170	3,410	2,170	1,540	1,180	612	604	628	2,250	1,891

Table 3-5. 10, 50, and 90-percent flow exceedances of project-affected stream reaches for the period of record (2005–2015) (Source: USGS, 2017d,e,f,g,h,i).

	Percent Exceedance (cfs)		
USG Gage	**10**	**50**	**90**
New Colgate Development			
1141300 North Yuba River below Goodyears Bar, California	1,590	270	108
11413517 North Yuba River low-flow release below New Bullards Bar Dam, California	7	6	5
11408880 Middle Yuba River below Our House Dam, California	73	35	25
11409400 Oregon Creek below Log Cabin Dam near Camptonville, California	17	10	2
Narrows 2 Development			
11418000 Yuba River below Englebright Dam near Smartsville, California	4,160	1,140	708
11421000 Yuba River near Marysville, California	4,230	856	517

North Yuba River above New Bullards Bar Reservoir—The North Yuba River originates at Yuba Pass and flows westward for about 43 miles before it enters New Bullards Bar Reservoir at RM 17.8. USGS gage 1141300 (North Yuba River below Goodyears Bar, California), is located 22 miles upstream of the New Bullards Bar Reservoir and captures a drainage area of 250 square miles.

North Yuba River below New Bullards Bar Reservoir—From New Bullards Bar Dam, the North Yuba River flows southwest another 2.4 miles to converge with the Middle Yuba River to form the main stem of the Yuba River. USGS gage 11413517 (North Yuba River low-flow release below New Bullards Bar Dam, California), is located immediately downstream of the dam and captures a drainage area of 489 square miles. The total drainage area of the North Yuba River at its confluence with the Middle Yuba River is 491 square miles.

Middle Yuba River above Our House Diversion Dam—The Middle Yuba River originates at an elevation of 7,200 feet and flows west for 41 miles to the project's Our House Diversion Dam at RM 12.6. The Our House Diversion Dam captures drainage from an area of 144.8 square miles.

Middle Yuba River below Our House Diversion Dam—Below Our House Diversion Dam, the Middle Yuba River flows west 12.6 miles to where it converges with the North Yuba River. USGS gage 11408880 (Middle Yuba River below Our House Dam, California), is located immediately downstream of the dam and captures a drainage area of 145 square miles. The total drainage area of the Middle Yuba River at its confluence with the North Yuba River is 210 square miles.

Oregon Creek above Log Cabin Diversion Dam—Oregon Creek, a tributary to the Middle Yuba River, originates at an elevation of 5,600 feet and flows southwest for about 17 miles to the project's Log Cabin Diversion Dam at RM 4.3.

Oregon Creek below Log Cabin Diversion Dam—Below the Log Cabin Diversion Dam, Oregon Creek flows southwest for another 4.3 miles to converge with the Middle Yuba River. USGS gage 11409400 (Oregon Creek below Log Cabin Dam near Camptonville, California), is located immediately downstream of the dam and captures a drainage area of 29.1 square miles. The total drainage area of Oregon Creek at its confluence with the Middle Yuba River is about 36 square miles.

Yuba River between New Bullards Bar Dam and Englebright Dam—The confluence of the North and Middle Yuba Rivers, below New Bullards Bar Reservoir, forms the main stem of the Yuba River. Flowing southwest for 40 miles to its confluence with the Feather River, this stretch of the Yuba River includes the New Colgate Powerhouse at RM 34.2, and the non-project Corps' Englebright Dam located at RM 24.3. The South Yuba River enters the Yuba River above Englebright Reservoir.

Yuba River below Englebright Dam—The lower Yuba River extends 24.3 miles from Englebright Dam to the river's confluence with the Feather River. Deer Creek (RM 23.4) and Dry Creek (RM 13.9) contribute flow to the lower Yuba River, draining areas of 89 square miles and 108 square miles, respectively. Diversions for irrigation throughout this portion of the Yuba River are common.

The lower Yuba River includes the project's Narrows 2 Powerhouse and PG&E's Narrows 1 Powerhouse at RM 24.2 and the non-project Corps' Daguerre Point Dam at RM 11.6. USGS gage 11418000 (Yuba River below Englebright Dam near Smartsville, California) captures a drainage area of 1,108 square miles. The gage measures flow in the Yuba River downstream from both the Narrows 1 and Narrows 2 Powerhouses, and includes both spills from the dam and powerhouse releases. USGS gage 11421000 (Yuba River near Marysville, California), is located 6.2 miles upstream from the Yuba River's confluence with the Feather River and captures a drainage area of 1,339 square miles.

Water Rights and Water Supply Deliveries

YCWA is a major water-right holder on the Yuba River. YCWA holds pre-1914 appropriative rights dating from 1897 and post-1914 appropriative water rights confirmed by water-right licenses.

Within the project area, YCWA pumps an average of 6 acre-feet per year from New Bullards Bar Reservoir to supply water to the Cottage Creek Treatment Plant for domestic and recreational uses adjacent to the reservoir. Downstream of the project, water is diverted under YCWA's consumptive-use water-right permits to eight water users, collectively referred to as the YCWA member units. Water rights for these users are summarized in table 3-6.

Table 3-6. YCWA's annual contract amounts and place of delivery (Source: YCWA, 2017a).

Member Unit	Base Contract (acre-feet)	Supplemental Contract (acre-feet)	Total Contract (acre-feet)	Member Unit Water Rights (acre-feet)	Total Contract and Water Rights (acre-feet)
Browns Valley District Pumpline Diversion Facility[a]					
Browns Valley Irrigation District	9,500	--	9,500	24,505	34,005
South Yuba Canal (South Canal)[b]					
Brophy Water District	86,870	--	86,870	--	86,870
South Yuba Water District	54,307	--	54,307	--	54,307
Dry Creek Mutual Water Company	17,751	--	17,751	--	17,751
Wheatland Water District	40,230	--	40,230	--	40,230
Hallwood-Cordua Canal (North Canal)[c]					
Cordua Irrigation District	24,000	--	24,000	60,000	84,000
Hallwood Irrigation Company	11,208	--	--	78,000	89,208
Ramirez Water District	30,389	--	30,389	--	30,389
Total	**274,255**	--	**274,255**	**161,469**	**435,724**

[a] Located 1 mile upstream of the Corps' Daguerre Point Dam.

[b] Located on the south side of the Yuba River slightly upstream of the south abutment of the Corps' Daguerre Point Dam.

[c] Located on the north abutment of the Corps' Daguerre Point Dam.

Water Quality

In the Water Quality Control Plan for the Sacramento and the San Joaquin River Basins (Basin Plan), the Central Valley Regional Water Quality Control Board designates existing beneficial uses and water quality objectives for the Yuba River Development Project (Central Valley Regional Water Quality Control Board, 2016). For the reach upstream of Englebright Dam, existing designated beneficial uses of surface waters are municipal and domestic supply, hydropower, irrigation, stock watering, contact and non-contact recreation, cold freshwater habitat, spawning of coldwater fishes, and wildlife habitat. The Basin Plan's designated existing beneficial uses for the Yuba River downstream of Englebright Dam are hydropower, irrigation, stock watering, contact and non-contact recreation, warm and cold freshwater habitat, migration of warmwater and coldwater aquatic organisms, spawning of warmwater and coldwater fishes, and wildlife habitat.[49] Table 3-7 shows the Basin Plan water quality objectives to support these designated beneficial uses.

Table 3-7. Water quality objectives to support designated beneficial uses in the project area (Source: Central Valley Regional Water Quality Control Board, 2016).

Water Quality Objective	Description
Temperature	The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Quality Control Board that such alteration in water temperature does not adversely affect beneficial uses. In waters designated as cold freshwater habitat, increases in water temperatures must be less than 5.0°F above natural receiving-water temperature.
Bacteria	In waters designated for contact recreation, fecal coliform concentration must be: (1) less than or equal to a geometric mean of 200 per 100 milliliters of water based on a minimum of 5 samples collected in any 30-day period, and (2) less than 400 per 100 milliliters of water in at least 90 percent of all samples taken in all 30-day periods.

[49] Waterbodies with both cold and warm freshwater habitat beneficial use designation are considered cold freshwater habitat for the application of water quality objectives.

Water Quality Objective	Description
Biostimulatory substances	Water shall not contain biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.
Chemical constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At minimum, waters designated for use as domestic or municipal supply shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels specified in Title 22 of the California Code of Regulations, which are incorporated by reference into the Basin Plan.
Color	Water shall be free of discoloration that causes a nuisance or adversely affects beneficial uses.
DO	The DO concentrations shall not be reduced below the following minimum levels at any time. • Waters designated as warm freshwater habitat: 5.0 mg/L • Waters designated as cold freshwater habitat: 7.0 mg/L • Waters designated as spawning habitat: 7.0 mg/L The monthly median of the average 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.
Floating material	Water shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses.
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.
Pesticides	Waters shall not contain individual pesticides or a combination of pesticides in concentrations that adversely affect beneficial uses.[a] Waters designated for use as domestic or municipal supply shall not contain concentrations of pesticides in excess of the limiting concentrations set forth in Title 22 of the California Code of Regulations or in excess of 1.0 micrograms per liter (µg/L) for thiobencarb.[b]
pH	The pH shall neither be depressed below 6.5 nor raised above 8.5.

Water Quality Objective	Description
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.
Suspended material	Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.
Taste and odor	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies, fish flesh or other edible products of aquatic origin, or that cause nuisance or otherwise adversely affect beneficial uses.[c]
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analysis of indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests as specified by the Regional Water Quality Control Board.
Turbidity	Waters 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 the following limits: • where natural turbidity is less than 1 NTU, increases shall not cause downstream turbidity to exceed 2 NTUs • where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU • where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent • where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTU • where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent

Notes: DO – dissolved oxygen, °F – degrees Fahrenheit, °C – degrees Celsius, mg/L – milligram per liter, µg/L – micrograms per liter, NTU – nephelometric turbidity unit

[a] The Basin Plan defines pesticide as: "(1) any substance, or mixture of substances, which is intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest, which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or nonagricultural environment whatsoever, or (2) any spray adjuvant, or (3) any breakdown products of these materials that threaten beneficial uses."

[b] Thiobencarb, also referred to as benthiocarb, is an active ingredient of rice herbicides including Bolero® and Abolish®.

[c] Taste and odor limits for drinking water are provided as secondary maximum contaminant levels in Title 22 of the California Code of Regulations.

The most recent EPA-approved section 303(d) list under the CWA denotes water quality impairments for mercury in the project area (Water Board, 2012). The mercury listing includes New Bullards Bar Reservoir, the North Fork Yuba River between New Bullards Bar and Englebright Reservoirs, the Middle Yuba River from Bear Creek to North Yuba River, the South Yuba River from Rucker Creek to Englebright Reservoir, Englebright Reservoir, and the lower Yuba River from Englebright Reservoir to the Feather River. The Water Board (2017a) is currently developing a statewide mercury program (Water Board, 2017b), and total maximum daily loads for the mercury listings in the Yuba River Basin are expected to be completed by 2021. Bioaccumulation of mercury in organisms consumed by humans can adversely affect human health (World Health Organization, 2017; Klasing and Brodberg, 2008).[50] The California Office of Environmental Health Hazard Assessment evaluates bioaccumulation of mercury in fishes and, when appropriate, issues fish ingestion advisories. It issued mercury-based fish ingestion advisories for New Bullards Bar and Englebright Reservoirs prior to issuance of the draft EIS (OEHHA, 2017; 2009). Since the draft EIS was issued, a mercury-based fish ingestion advisory from the headwaters to the mouth of the North Yuba River, mainstem Yuba River, Middle Yuba River, South Yuba River, and Deer Creek (which flows into the Yuba River near RM 23) has been issued (OEHHA, 2018).

[50] Mercury can cause toxic effects on human nervous, digestive, and immune systems, and on lungs, kidneys, skin and eyes. Human fetuses and children are particularly sensitive to these toxic effects; therefore, the (California) Office of Environmental Health Hazard Assessment's fish consumption advisories have lower fish consumption levels for women in child-bearing years and children than for the rest of the population.

Reservoir Temperature and Dissolved Oxygen

The most recent and complete source of water temperature information for New Bullards Bar and Englebright Reservoirs is data collected by YCWA at a target frequency of about once every 2 weeks, year-round from August 1989 to October 2012. Vertical profiles were collected near the dam in New Bullards Bar Reservoir and Englebright Reservoir.[51] Beginning in April 2011, Englebright Reservoir was also monitored approximately 3.3 miles up-reservoir of the dam. Dissolved oxygen (DO) monitoring began in October 2010 at both reservoirs.

New Bullards Bar Reservoir vertical temperature profiles to a depth of 300 feet show a consistent pattern of mixing once per year during the winter and thermally stratifying with warm water near the surface in the summer (commonly known as warm monomictic) (Wetzel, 1983). Temperature vertical profiles, maximum water surface elevation, and the elevations of the upper and lower intakes for the New Colgate Powerhouse are provided for 2011 in figure 3-3.[52] Temperature reaches a low of about 5°C to 7ºC during the winter, with surface to bottom mixing within the reservoir, preventing the formation of ice on the reservoir. Surface layers begin warming faster than deeper layers in the spring, resulting in reservoir temperature stratification, which is strongest in August, followed by weakening stratification in the fall. The thermocline (the transition zone between warmer surface waters and cooler bottom waters) generally occurs at depths of 20 to 60 feet in the summer.

YCWA conducted additional temperature monitoring on August 29, 2013, at three locations in New Bullards Bar Reservoir to evaluate whether the reservoir has relatively uniform stratification in a longitudinal direction. Vertical profiles collected at the normal sampling location near the dam, in the central arm, and in the northwest arm (near Madrone Cove Boat-in Campground) were nearly identical (YCWA, 2013c), confirming nearly uniform thermal stratification longitudinally.

[51] Profiles were monitored approximately 0.5 mile up-reservoir of the New Bullards Bar Dam and 500 feet up-reservoir of the center point of the dam impounding Englebright Reservoir

[52] The invert elevation for the low-level outlet intake that supplies minimum flow below New Bullards Bar Dam is 1,447.5 feet mean sea level, approximately 508 feet below the NMWSE.

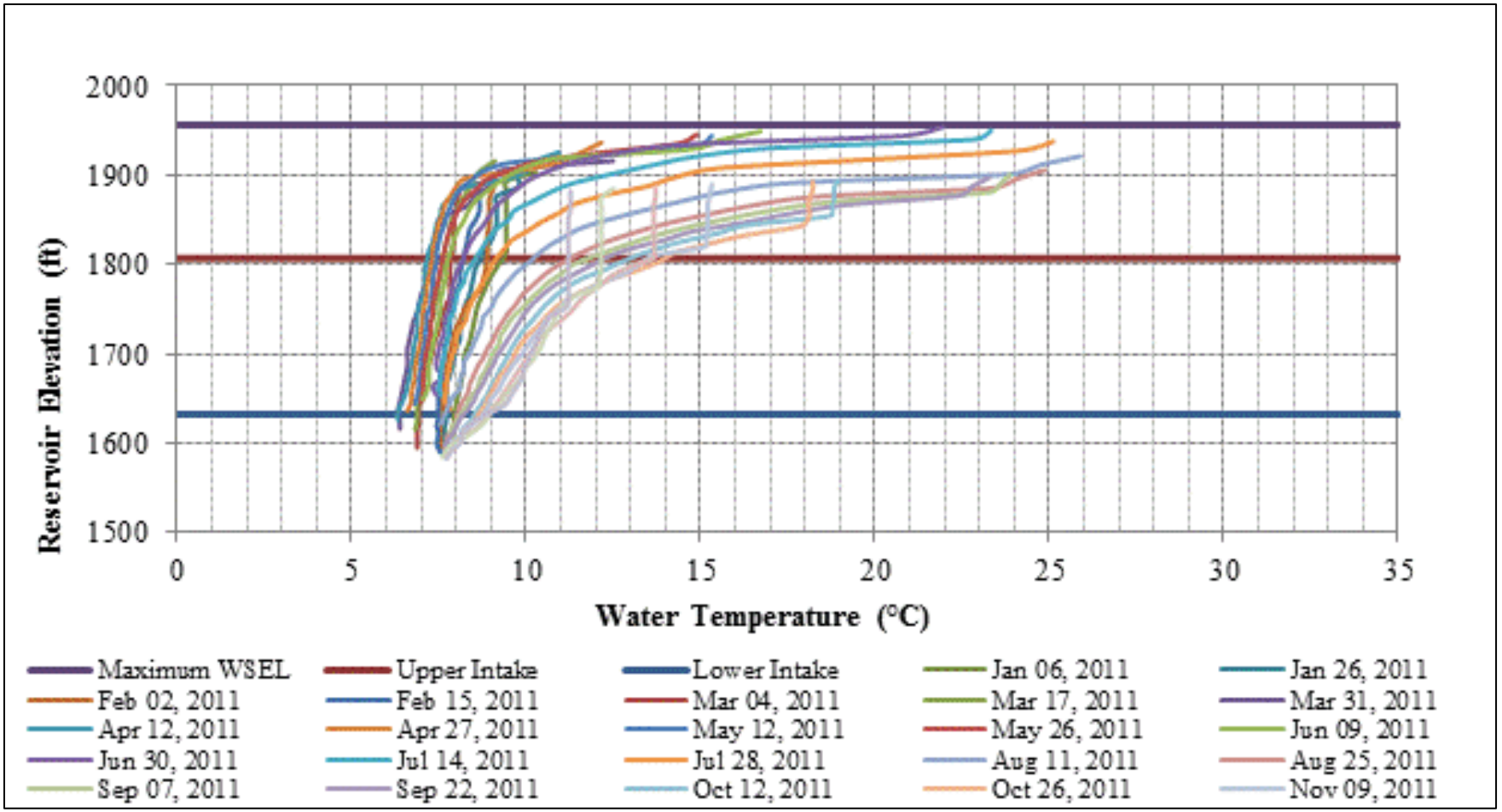

Figure 3-3. Water temperature profiles in New Bullards Bar Reservoir near the dam in 2011 (Source: YCWA, 2013c).

DO in vertical profiles to an approximate depth of 300 feet recorded between November 2010 and October 2012 ranged from 6.3 milligrams per liter (mg/L) in October 2012 to 11.3 mg/L in March 2011 (YCWA, 2013c). DO was greater than 7 mg/L throughout all profiles between November 9, 2010, and July 26, 2012. The DO profiles measured in summer and early fall 2012, a below normal water year, followed a different pattern, with some DO concentrations of less than the 7-mg/L Basin Plan objective. In 2012, DO of less than the 7 mg/L occurred at the water surface in August, at depths of 20 to 40 feet in September, and at depths of 20 to 60 feet in October (YCWA, 2013c).

In addition, YCWA reported that 2012 seasonal water quality monitoring revealed DO of less than 7 mg/L in New Bullards Bar Reservoir near the dam and in Madrone Cove in spring and summer (YCWA, 2013c). The minimum DO reported was 5.1 mg/L for the bottom near Madrone Cove in early September.

Englebright Reservoir water temperature profiles to a depth of 100 feet consistently show it also has warm monomictic characteristics of mixing freely in winter and stratifying vertically in summer (figure 3-4). Temperature generally remains warmer than 6ºC during the winter, which prevents ice from forming on the reservoir. The temperature is relatively uniform throughout the water column (isothermal) in late winter to early spring when surface waters start warming at a faster rate than deep water. Thermal stratification continues to become stronger, and a thermocline generally develops at a depth of 10 to 30 feet. Thermal stratification is usually strongest in late summer to early fall, and the reservoir turns over in winter.[53]

Englebright Reservoir DO vertical profiles were monitored to a depth of 100 feet. DO ranged from 6.5 mg/L in November 2010 to 12.2 mg/L in March 2011 at a site 500 feet up-reservoir of the main dam and between 7.1 mg/L in October 2011 and 12.4 mg/L in April and July of 2011 at a site 3.3 miles up-reservoir from the dam (YCWA, 2013c). With the exception of six measurements near 100-feet deep at the dam, DO was greater than 7 mg/L throughout the profiles. DO measurements of less than 7 mg/L occurred in the cold water near the bottom of the reservoir in November 2010 and in September and October 2012. Lower DO at depth is commonly caused by stagnation of water below the water intake elevations, especially near dams (Thornton et al., 1990). In addition, YCWA reported DO of less than 6.8 mg/L at the bottom of an Englebright Reservoir mid-reservoir site in early September 2012 (YCWA, 2013c).

[53] Meaning that the reservoir becomes isothermal and may be slightly warmer at the bottom.

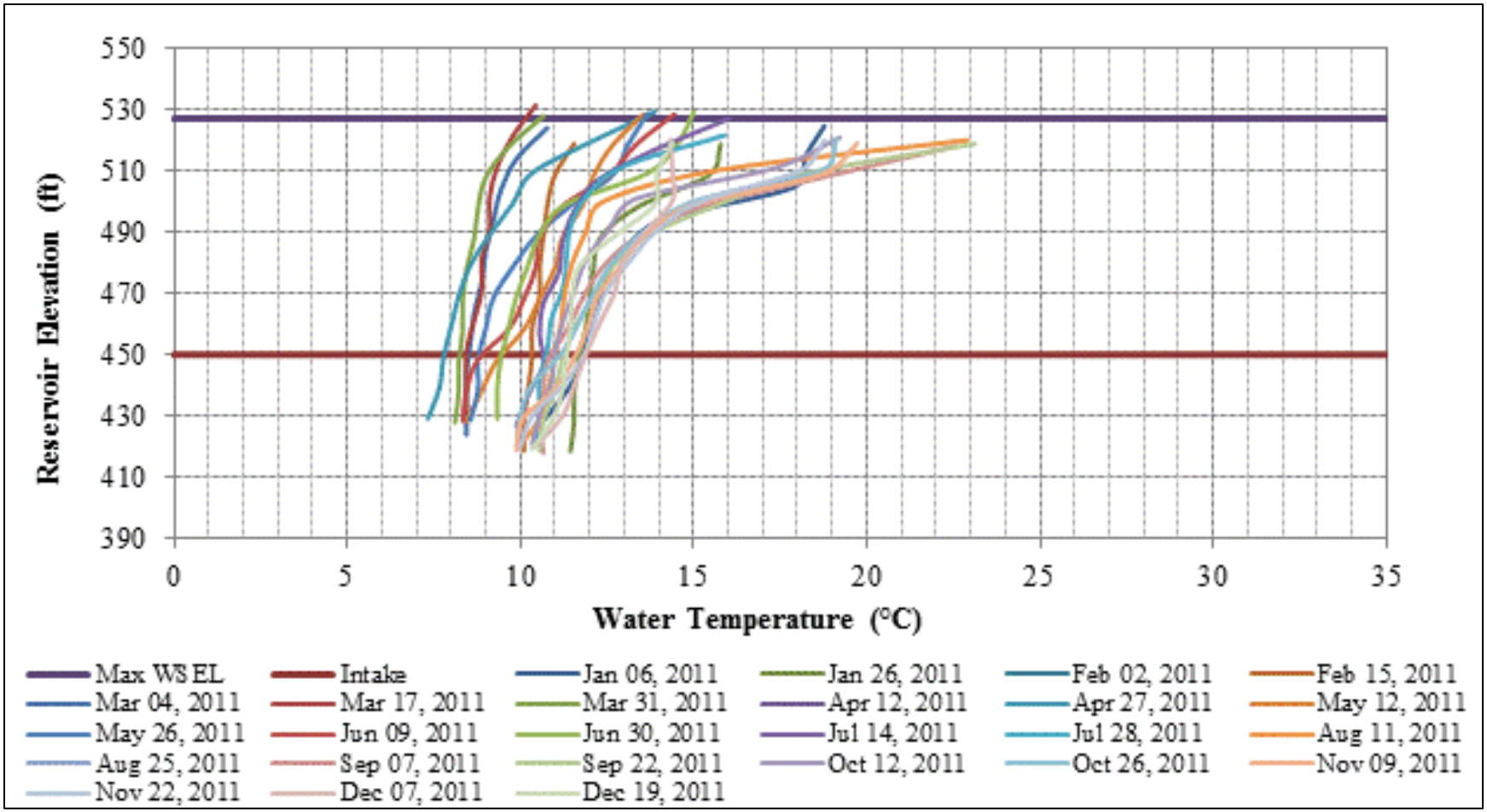

Figure 3-4. Water temperature profiles in Englebright Reservoir near the dam in 2011 (Source: YCWA, 2013c).

Stream Temperature

The approved Water Temperature Study provided temperature data from November 2011 through October 2012. In addition, YCWA voluntarily monitored stream temperature in prior years (YCWA, 2013c). YCWA deployed temperature loggers[54] in selected areas of the deepest part of the active channel (thalweg) to avoid excessive heating from pools and sunlight, and near the stream margins at four monitoring sites within the Middle Yuba River and Oregon Creek, to evaluate temperature differences across these channels. To maintain consistency between both stream and reservoir monitoring sites, we focus on results of YCWA's 2009–2012 program, with additional attention to the mid-July 2012 to mid-July 2013 stream margin monitoring.

Stream temperatures generally followed a seasonal pattern of increasing in May or June through August and early September and declining in late September and October, which is consistent with temperature trends for streams and rivers in northern California. Water temperature in locations directly downstream of project facilities or in project conduits tended to vary less both seasonally and daily, although they were affected by changes in flow releases from nearby upstream facilities. At other sites, stream temperature trends tended to closely follow trends in regional mean daily air temperatures, with this trend being strongest at locations with lower flows or increased distance from reservoir outlets, as water temperatures began to approach equilibrium with the surrounding environment. The stream margin study indicated that temperatures across the channels tended to be similar, although minor differences occurred during summer and fall. These differences appear to be primarily due to the influence of local solar radiation in shallow and backwater habitats (YCWA, 2013c).

Middle Yuba River daily mean temperatures showed a typical seasonal pattern (figure 3-5), with temperatures typically 1°C to 2°C warmer in the fall and winter and 3°C to 5°C warmer in the summer at the confluence with the North Yuba River (RM 0.0) compared to just below Our House Diversion Dam (RM 11.9). Daily mean temperature frequently exceeded 20°C for all Middle Yuba River sites, including the site upstream of the project's influence (table 3-8). Instantaneous temperature measurements exceeded 25°C at all sites, with frequencies of exceedance of 15 percent at the lowermost site upstream of the North Yuba confluence and 13 percent upstream of the Our House Diversion Dam impoundment.

[54] The temperature loggers had ±0.2ºC accuracy.

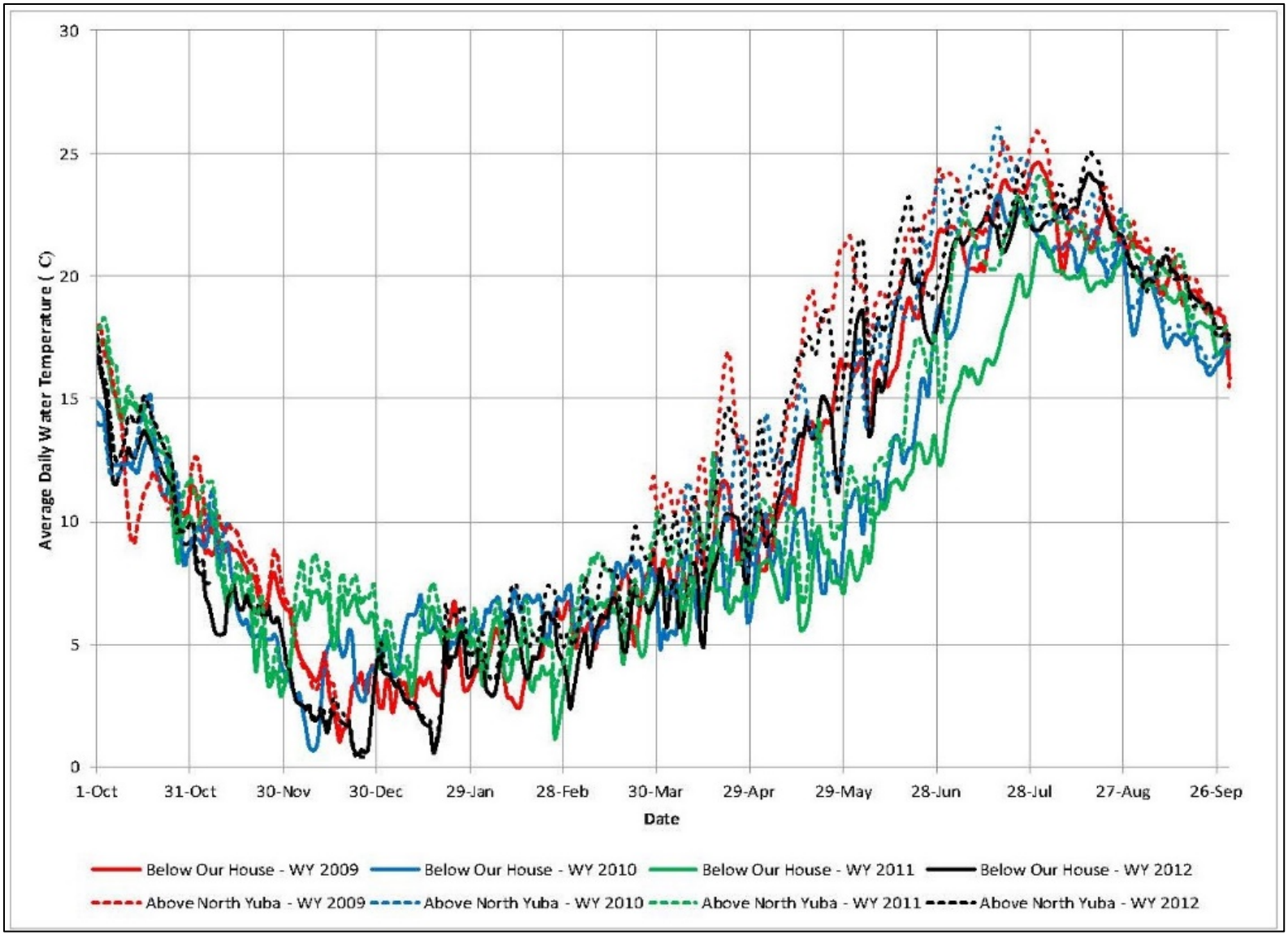

Figure 3-5. Daily mean temperatures in the Middle Yuba River from Our House Diversion Dam (RM 12.6) to the North Yuba River confluence (RM 0.0) in water years 2009–2012 (Source: YCWA, 2013c).

Table 3-8. Stream sampling water temperature results for June–September (2009–2012) (Source: YCWA, 2013c, as modified by staff).

Location	River Mile (mi)	June–September of 2009, 2010, 2011, and 2012[a]					
		Total Days Sampled	Min Daily Mean Temp (ºC)	Max Daily Mean Temp (ºC)	Max Instantaneous Temp (ºC)	Daily Mean Temp > 20ºC (% of days)	Instantaneous Temp > 25ºC (% of days)
Middle Yuba River							
Upstream of Our House Diversion Dam impoundment[b]	12.2	481	7.6	24.9	27.5	46%	13%
At intake to Lohman Ridge Diversion Tunnel	12.0	281	9.4	24.9	25.8	56%	3%
Downstream of Our House Diversion Dam	11.9	488	9.5	24.6	25.5	44%	1%
Upstream of North Yuba River[c]	0.0	488	10.0	26.0	27.6	64%	15%
Oregon Creek							
Upstream of Log Cabin Diversion Dam impoundment[b]	4.3	488	7.4	21.6	24.3	7%	0%
At intake to Camptonville Diversion Tunnel	4.1	207	9.6	22.9	23.8	44%	0%

Location	River Mile (mi)	June–September of 2009, 2010, 2011, and 2012[a] Total Days Sampled	Min Daily Mean Temp (ºC)	Max Daily Mean Temp (ºC)	Max Instantaneous Temp (ºC)	Daily Mean Temp > 20ºC (% of days)	Instantaneous Temp > 25ºC (% of days)
Downstream of Log Cabin Diversion Dam	4.0	487	7.8	23.0	24.4	20%	0%
Upstream of confluence with Middle Yuba River	0.1	244	9.4	20.9	22.6	4%	0%
North Yuba River							
Upstream of New Bullards Bar Reservoir[b]	16.0	471	7.1	23.5	25	23%	0%
At low-flow releases from New Bullards Bar Dam	2.3	nr	7.6	10.9	nr	0%	nr
Upstream of Middle Yuba River[c]	0.0	451	8.3	23.9	25	51%	0%
South Yuba River							
At Jones Bar[b]	6.2	488	9.1	26.0	27.5	62%	17%
Yuba River and its Tributaries							
Yuba River downstream of confluence of North Yuba and Middle Yuba River[c]	39.7	450	11.5	25.4	26.8	66%	12%

Location	River Mile (mi)	June–September of 2009, 2010, 2011, and 2012[a] Total Days Sampled	Min Daily Mean Temp (ºC)	Max Daily Mean Temp (ºC)	Max Instantaneous Temp (ºC)	Daily Mean Temp > 20ºC (% of days)	Instantaneous Temp > 25ºC (% of days)
Yuba River upstream of New Colgate Powerhouse [c]	34.1	488	9.6	26.4	27.7	67%	13%
Yuba River in New Colgate Powerhouse Penstock	33.9	nr	7.6	10.1	nr	0%	nr
Yuba River downstream of New Colgate Powerhouse	33.8	nr	7.3	14.0	nr	0%	nr
Dobbins Creek Upstream Yuba River [b,c]	0.1	328	11.2	24.3	26.7	53%	5%
Yuba River downstream of Dobbins Creek	33.6	nr	7.6	14.1	nr	0%	nr
Yuba River in Narrows 2 Powerhouse Penstock	23.9	nr	9.3	19.1	nr	0%	nr
Yuba River downstream Narrows 2 Powerhouse at Smartsville	23.6	nr	9.2	13.2	nr	0%	nr
Deer Creek upstream of Yuba River [b,c,d,e]	0.9	312	16.5	27.4	33.8	90%	65%
Yuba River downstream of Deer Creek	22.7	nr	9.4	13.3	nr	0%	nr

Location	River Mile (mi)	June–September of 2009, 2010, 2011, and 2012[a] Total Days Sampled	Min Daily Mean Temp (ºC)	Max Daily Mean Temp (ºC)	Max Instantaneous Temp (ºC)	Daily Mean Temp > 20ºC (% of days)	Instantaneous Temp > 25ºC (% of days)
Yuba River at Parks Bar	17.4	nr	9.4	13.5	nr	0%	nr
Yuba River at Long Bar	16.0	nr	9.5	13.8	nr	0%	nr
Dry Creek upstream of Yuba River [b,c,d]	0.7	447	18.0	26.8	29.1	85%	30%
Yuba River upstream of the Corps' Daguerre Point Dam	11.5	nr	9.9	15.2	nr	0%	nr
Yuba River at the Corps' Daguerre Point Dam fish ladder	11.4	nr	10.1	15.9	nr	0%	nr
Yuba River at Walnut Avenue (near western extent of Yuba Goldfields)	8.1	nr	10.1	16.3	nr	0%	nr
Yuba River at Marysville gage	6.0	nr	10.8	18.5	nr	0%	nr
Yuba River upstream of Sipson Lane (between Yuba Goldfields and Marysville)	4.8	nr	10.3	19.2	nr	0%	nr

Location	River Mile (mi)	June–September of 2009, 2010, 2011, and 2012[a] Total Days Sampled	Min Daily Mean Temp (ºC)	Max Daily Mean Temp (ºC)	Max Instantaneous Temp (ºC)	Daily Mean Temp > 20ºC (% of days)	Instantaneous Temp > 25ºC (% of days)
Yuba River at Marysville (downstream of Highway 70 Bridge)	0.7	nr	11.1	18.3	nr	0%	nr
Feather River							
Upstream of Yuba River [b,c,d]	--	366	16.3	25.9	27.1	55%	2%
Downstream of Yuba River on right bank [c]	--	488	10.9	20.9	26.6	1%	0.2%
Downstream of Yuba River on left bank [c,d]	--	488	13.9	23.3	24.8	35%	0%

Notes: Shaded locations had daily mean temperature that exceeded 20ºC; nr – not reported

[a] Not all stations were monitored in all 4 years.

[b] Located outside the influence of the FERC project.

[c] Daily mean temperature exceeded 20ºC in May.

[d] Daily mean temperature exceeded 20ºC in April.

[e] Daily mean temperature exceeded 20ºC in October.

Oregon Creek daily mean temperatures were similar upstream and downstream of the Log Cabin Diversion Dam impoundment, although there were periods in all seasons when the creek was slightly warmer downstream of the diversion. YCWA started monitoring Oregon Creek above the Middle Yuba River confluence (RM 0.1) in early 2011. Comparison of daily mean temperatures for this site and the sites upstream and downstream of the Log Cabin Diversion Dam impoundment shows the RM 0.1 site was consistently warmer (up to 2°C) in the spring, but the site downstream of the Log Cabin Diversion Dam was consistently warmer in mid- to late summer (figure 3-6). The number of days with daily mean temperature exceedances of 20°C during June through September is fewer than 10 percent upstream of the Log Cabin Diversion Dam impoundment and the Middle Yuba River, about 20 percent downstream of the Log Cabin Diversion Dam impoundment, and about 44 percent at the intake to Camptonville Diversion Tunnel. The maximum instantaneous temperature recorded for Oregon Creek was 24.4°C downstream of the Log Cabin Diversion Dam (see table 3-8).

North Yuba River daily mean temperature for the low-flow releases from New Bullards Bar Dam remained relatively stable at 7 to 11°C because of water releases through New Bullards Bar's low-level outlet (figure 3-7). Water in the reach approached ambient air temperatures as it flowed through the 2.4-mile-long reach upstream of the Middle Yuba River confluence (i.e., cooled in the winter and warmed in spring and through fall). An exception to this occurred in August 2009 when a New Colgate Powerhouse outage associated with a nearby forest fire resulted in New Bullards Bar Dam's low-level outlet releases of greater than 1,000 cfs, which eliminated warming to the Middle Yuba River confluence (figure 3-7). In general, temperatures below New Bullards Bar Dam were cooler than those immediately above the North Yuba River confluence with the Middle Yuba River. During the winter, the temperature difference was usually only a few degrees. In the period from May to October, the difference was between 3°C and 12°C, with the greatest difference in June and July. Stream temperature trends near the Middle Yuba River confluence were similar to those at the unregulated stream reach upstream of New Bullards Bar Reservoir. Temperature differences were greatest in the spring when upstream runoff flows were captured by the reservoir. Once reservoir storage was complete and all inflow was routed through the reservoir, stream temperatures were similar to the upstream unregulated reach through the summer. Daily mean temperature exceedances of 20°C occurred both upstream of New Bullards Bar Reservoir (23 percent of the time) and upstream of the Middle Yuba River confluence (51 percent of the time), but not at the low-flow release below New Bullards Bar Dam (see table 3-8). None of the sites had instantaneous temperature measurements exceeding 25ºC.

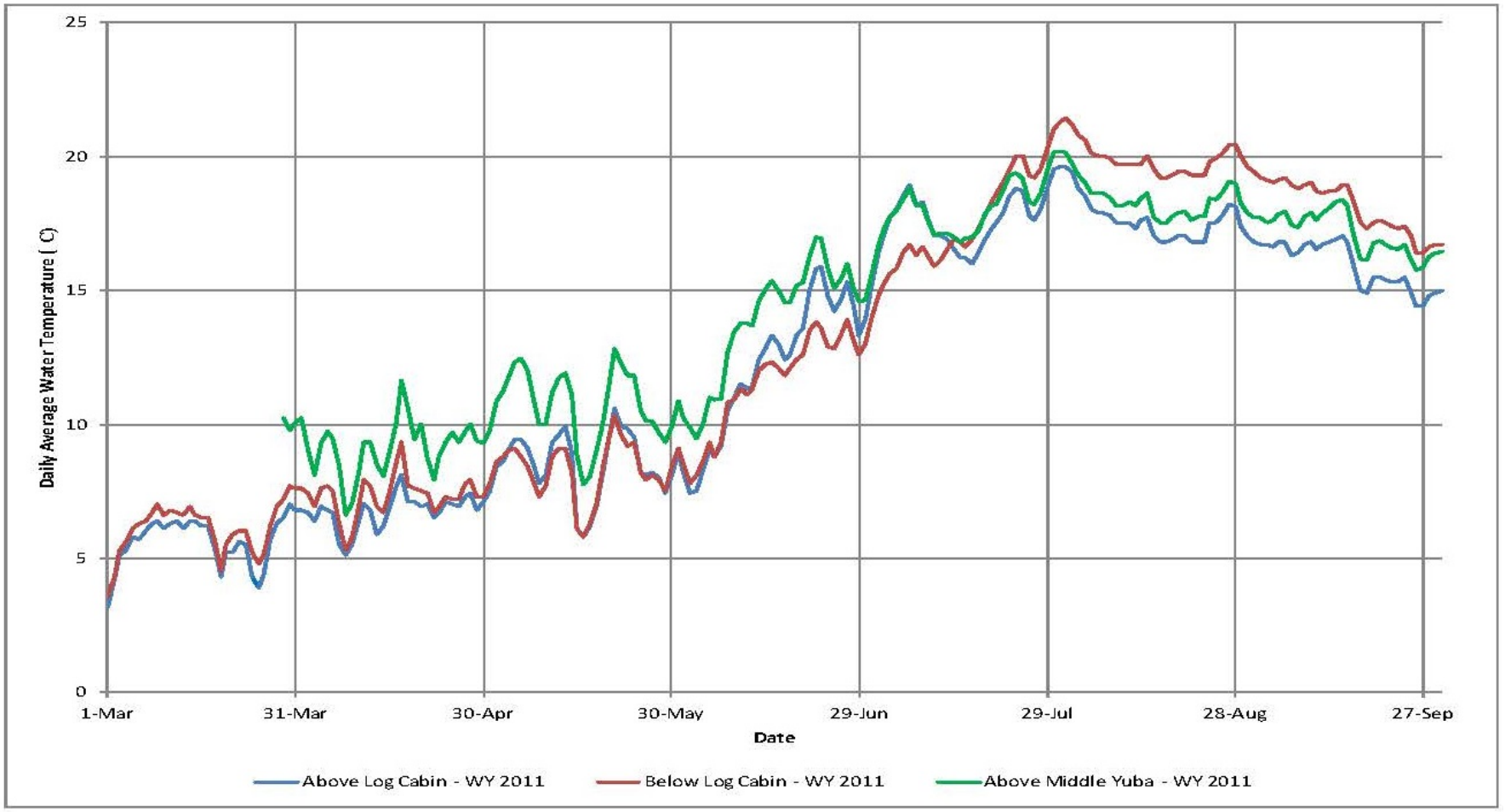

Figure 3-6. Daily mean temperatures in Oregon Creek upstream of and downstream of Log Cabin Diversion Dam (RM 4.3 and 4.0, respectively) and upstream of the Middle Yuba River confluence (RM 0.1) in water year 2011 (Source: YCWA, 2013c).

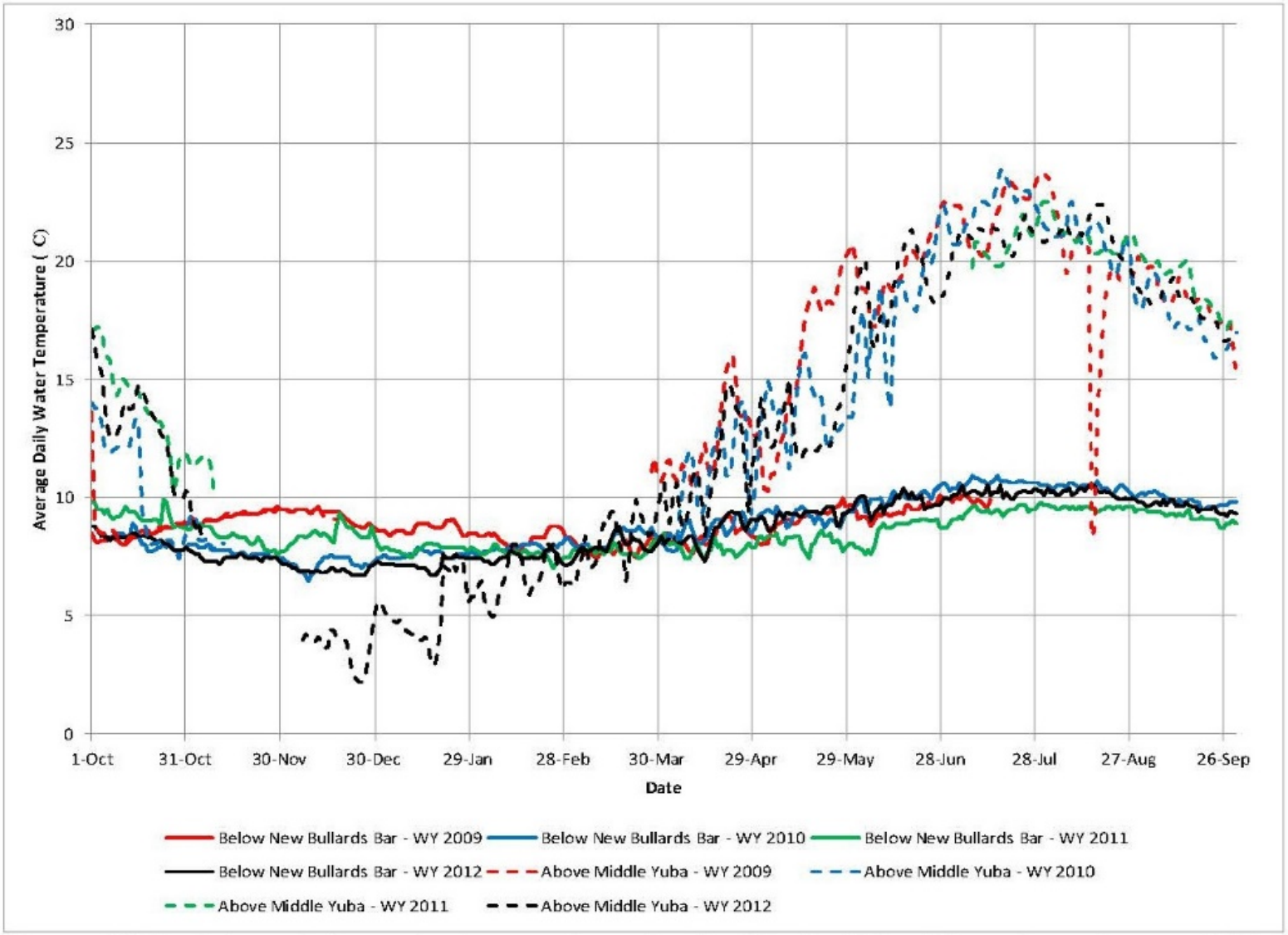

Figure 3-7. Daily mean temperatures in the North Yuba River downstream of New Bullards Bar Dam (RM 22.4) and upstream of the Middle Yuba River confluence (RM 0.1) in water years 2009–2012 (Source: YCWA, 2013c).

Yuba River daily mean temperatures for downstream of the North Yuba/Middle Yuba Rivers confluence (RM 39.7) and upstream of the New Colgate Powerhouse (RM 34.1) were similar (figure 3-8). YCWA reports that year-to-year temperature variations were likely due to spill timing and intensity from New Bullards Bar Dam, Our House Diversion Dam, and Log Cabin Diversion Dam (YCWA, 2013c). Both stations at RM 39.7 and RM 34.1 had daily mean temperature exceeding 20°C on approximately 66 to 67 percent of days in June through September, and instantaneous temperature exceeding 25°C on approximately 12 to 13 percent of the days (see table 3-8).

Cool water drafted from New Bullards Bar Reservoir via the lower intake for New Colgate Powerhouse was discharged from this powerhouse throughout all seasons (figure 3-9). In the summer, these cool-water discharges substantially cooled the Yuba River before it entered Englebright Reservoir. Discharges from Englebright Reservoir consistently maintained cool temperatures year-round in the Yuba River below the Narrows 1 and 2 Powerhouses (figure 3-9). Summertime daily mean temperature reported for this reach (from RM 33.8 to RM 0.7) ranged from 7.3°C to 19.2°C (see table 3-8).

Table 3-8 summarizes YCWA tributary temperatures (YCWA, 2013c). These include Dobbins, Deer, and Dry Creeks, all of which exceeded the daily mean 20°C and instantaneous 25°C screening values. The lowermost sites on Deer and Dry Creeks exceeded a daily mean of 20°C with a frequency of 90 and 85 percent of the days in June—September, respectively. In comparison, the lowermost site in Dobbins Creek had a 20°C exceedance frequency of 53 percent.

The Feather River was warmer upstream of the Yuba River confluence than along both sides of river downstream of the Yuba River's inflow (figure 3-10). June through September daily mean temperature exceedances of 20°C occurred at a frequency of 55 percent upstream of the Yuba River, but downstream of the Yuba River confluence was 35 percent for the right bank and 1 percent for the left bank (see table 3-8). The upstream and downstream right bank sites had rare occasions when instantaneous temperature exceeded 25ºC.

Results from Other Water Quality Studies

YCWA conducted an investigation of surface water quality in 2012, which included sampling (1) the Middle Yuba River from and including Our House Diversion Dam impoundment to the confluence with the North Yuba River; (2) Oregon Creek from and including the Log Cabin Diversion Dam impoundment to the confluence with the Middle Yuba River; (3) the North Yuba River from and including New Bullards Bar Dam Reservoir to the confluence with the Middle Yuba River; (4) the Yuba River from the confluence of the North and Middle Yuba Rivers to the Feather River (including the Corps' Englebright Reservoir), and (5) sampling sites upstream of the uppermost project facilities on each stream (YCWA, 2013d). This study was designed to sample near worst-case conditions for each parameter.

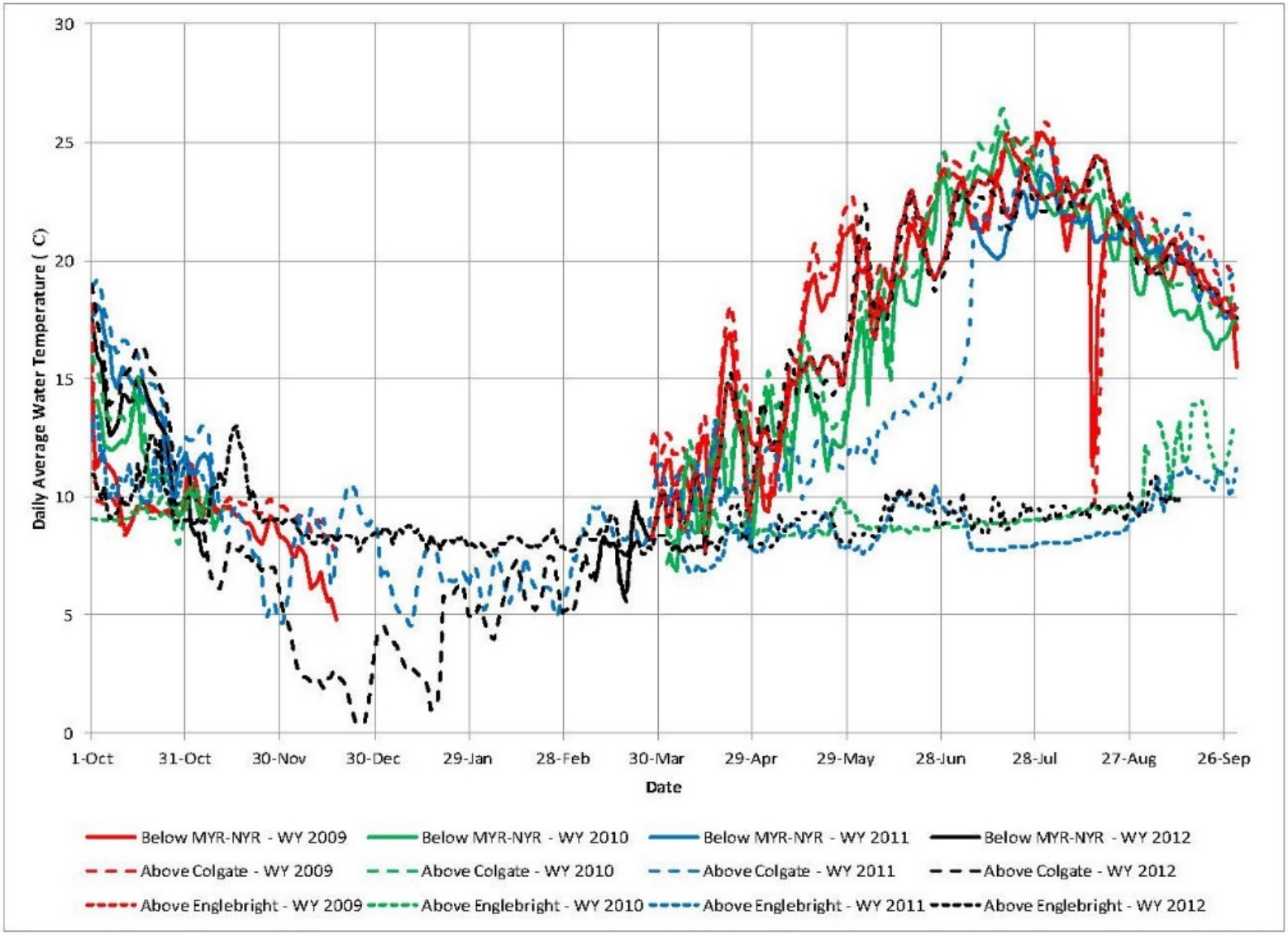

Figure 3-8. Daily mean temperatures in the Yuba River from the Middle and North Yuba Rivers downstream to above the NMWSE of the Corps' Englebright Reservoir in water years 2009–2012 (Source: YCWA, 2013c).

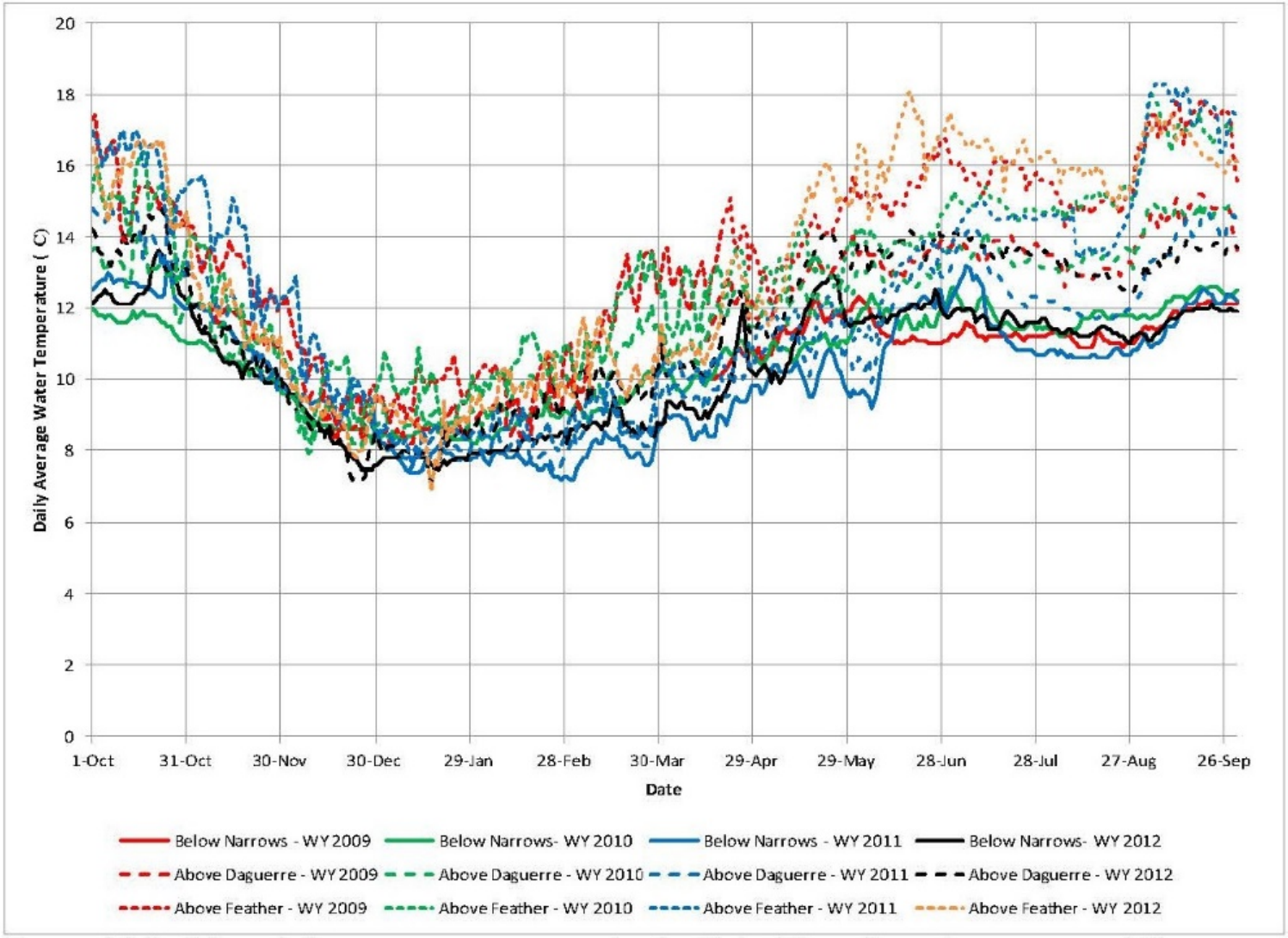

Figure 3-9. Daily mean temperatures in the Yuba River from the Smartsville gage downstream of Narrows 1 and Narrows 2 Powerhouses to upstream of the Feather River confluence in water years 2009–2012 (Source: YCWA, 2013c).

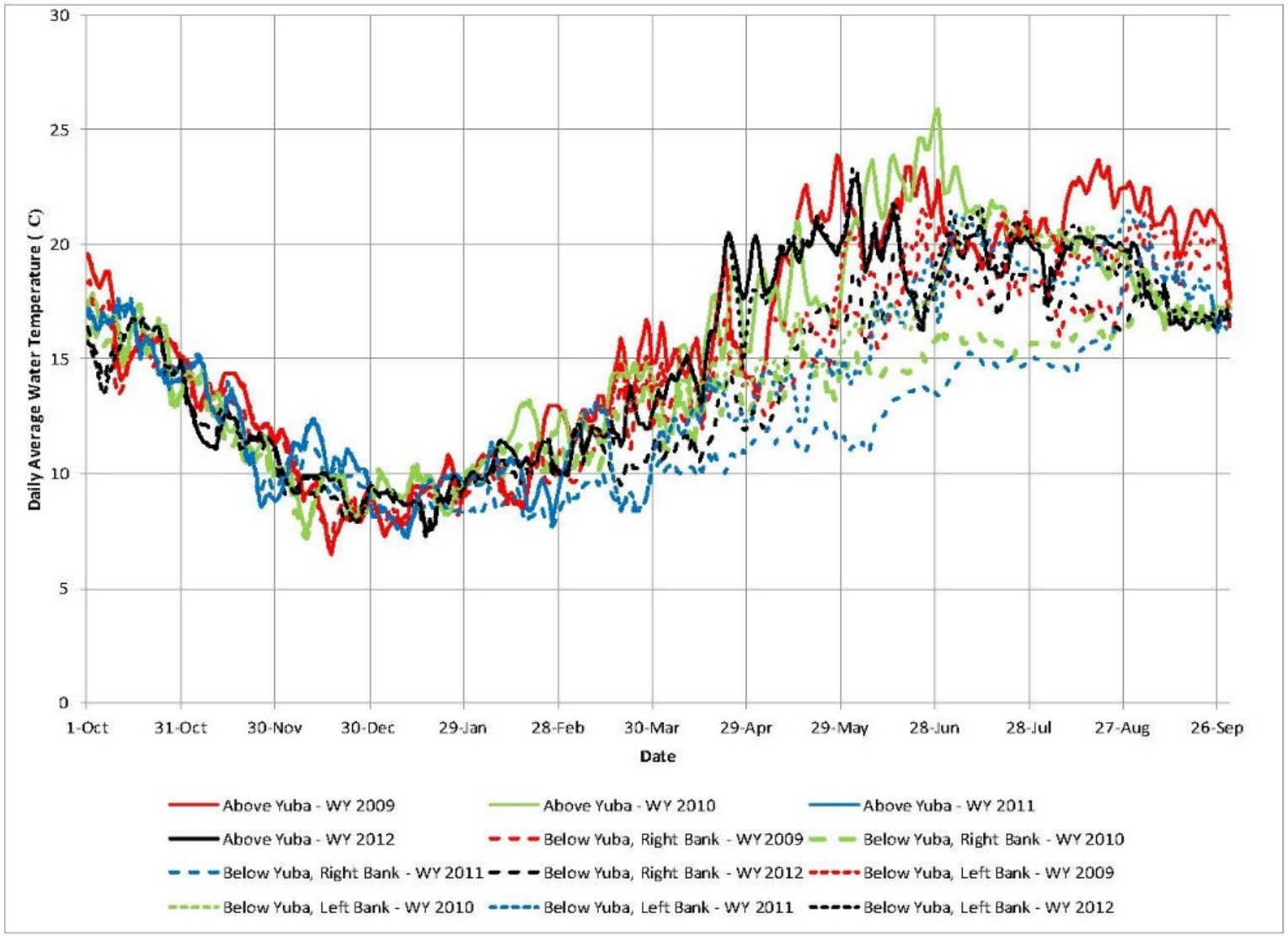

Figure 3-10. Daily mean temperatures in the Feather River from upstream and downstream of the Yuba River confluence in water years 2009–2012 (Source: YCWA, 2013c).

The recreation-related water quality element consisted of sampling for bacteria and petroleum products at near-shore locations adjacent to unmanaged and lightly managed recreation facilities. Samples were collected from four sites in New Bullards Bar Reservoir and one site in the Our House and Log Cabin Diversion Dam impoundments. Sampling focused on two holiday periods that typically have high recreation use. Analysis of one sample collected from each site during both the Independence Day and Labor Day weekends revealed no detectable concentrations for total petroleum hydrocarbon and oil and grease.

Bacteria samples were collected on 5 days in the 30 days surrounding and including the Independence Day and Labor Day weekends (YCWA, 2013d). Concentrations of total coliform, which include bacteria from soil, plants, and animals, ranged from 39 to greater than 2,419 most probable number per 100 milliliter. YCWA reported concentrations for fecal coliforms, which are bacteria from warm-blooded animals, from less than 2 to 170 most probable number per 100 milliliter. Concentrations of *Escherichia coli* (*E. coli*), which EPA considers better indicators of fecal contamination than total coliforms and fecal coliforms, ranged from zero to 54 most probable number per 100 milliliter (EPA, 2012). All sites met the Basin Plan's water quality objective for fecal coliform and the EPA guidance levels for *E. coli* (EPA, 2012).

The general water quality element results for the 28 sampling sites throughout the Yuba River Basin indicate that most of the analytes were reported at non-detectable levels to just above reporting limit concentrations. YCWA reported no evidence for a pattern of increasing chemical concentrations from upstream to downstream of project impoundments and facilities (YCWA, 2013d). Table 3-9 shows the only reported inconsistencies with Basin Plan Water Quality Objectives. EPA's aquatic life chronic criteria for aluminum was exceeded in Englebright Reservoir during the spring (EPA, 1988). The EPA California Toxics Rule (CTR) guidelines were exceeded for dissolved copper, nickel, and silver and were also exceeded in Englebright Reservoir (EPA, 2000). New Bullards Bar Reservoir had exceedances of the CTR for dissolved copper.

Table 3-9. General water quality element exceedances of Basin Water Quality Objectives (Source: YCWA, 2013d).

Analyte	Season	Location	Screening Basis and Value (µg/L)	Value (µg/L)
Aluminum, total	Spring	Englebright Reservoir mid-reservoir surface	AWQC = 87	130
Aluminum, total	Spring	Englebright Reservoir near dam bottom	AWQC = 87	213
Copper, dissolved	Spring	Englebright Reservoir mid-reservoir surface	CTR = 0.37	0.39

Analyte	Season	Location	Screening Basis and Value (µg/L)	Value (µg/L)
Copper, dissolved	Summer	Englebright Reservoir mid-reservoir bottom	CTR = 3.02	7.57
Copper, dissolved	Summer	Englebright Reservoir near dam bottom	CTR = 3.11	3.84
Copper, dissolved	Summer	Englebright Reservoir upper reservoir bottom	CTR = 3.47	5.32
Copper, dissolved	Summer	New Bullards Bar Reservoir mid-reservoir bottom	CTR = 2.93	5.86
Copper, dissolved	Summer	New Bullards Bar Reservoir near dam bottom	CTR = 3.11	5.01
Copper, dissolved	Summer	New Bullards Bar Reservoir near Madrone Cove bottom	CTR = 2.83	9.13
Nickel, dissolved	Spring	Englebright Reservoir upper reservoir surface	CTR = 18.8	27.7
Silver, dissolved	Spring	Englebright Reservoir mid-reservoir surface	CTR = 0.01	<0.02

Notes: AWQC – ambient water quality criterion; CTR – California Toxics Rule

Although mercury was detected at all locations in spring and summer 2012, the concentrations ranged from 0.27 to 15.9 nanograms per liter, which is substantially less than the maximum contaminant level of 2,000 nanograms per liter and the CTR benchmark of 50 nanograms per liter.

YCWA evaluated bioaccumulation of mercury and other metals in fish from the project's three impoundments by collecting edible-sized fish, and analyzing their fillets in a manner consistent with the Water Board's Surface Water Ambient Monitoring Program Bioaccumulation Oversight Group Quality Assurance Project Plan (Bonnema, 2007, as cited by YCWA, 2012a). The mercury results were subsequently compared to the 0.070-parts per million (ppm) California Office of Environmental Health Hazard Assessment Advisory Tissue Level (Klasing and Brodberg, 2008), which is used by public health managers to help decide whether or not to ask the California Office of Environmental Health Hazard Assessment to evaluate the need for fish ingestion advisories. Results of this investigation are summarized in table 3-10, which shows that the 0.070-ppm mercury Advisory Tissue Level was exceeded at each impoundment location sampled, and for rainbow trout, kokanee salmon, and smallmouth bass. Mercury concentrations measured in fish collected between 1978 and 2005 from the North Yuba,

Table 3-10. Fish tissue analytical results for the project's three impoundments (Source: YCWA, 2012a).

Location	Species	Number of Fish Sampled	Arsenic (ppm)	Copper (ppm)	Mercury (ppm) [a]	Selenium (ppm)	Silver (ppm)
New Bullards Bar Reservoir – East Arm near the Willow Creek inlet	Rainbow trout	10	<0.02 to 0.16	0.12 to 0.22	0.068 to 0.143 (9 >0.070)	0.18 to 0.44	<0.003 to 0.016
	Kokanee salmon	10	0.02 to 0.07	0.27 to 0.35	0.075 to 0.167 (10 >0.070)	0.30 to 0.53	<0.003 to 0.020
New Bullards Bar Reservoir – North Arm near the North Yuba River inflow	Smallmouth bass	9	0.02 to 0.04	0.11 to 0.16	0.446 to 0.807 (9 >0.070)	<0.15 to 0.51	<0.003 to 0.14
Log Cabin Diversion Dam impoundment	Rainbow trout	9	<0.02 to 0.15	0.16 to 0.28	0.073 to 0.161 (9 >0.070)	<0.15 to 0.74	<0.003 to 0.013
Our House Diversion Dam impoundment	Rainbow trout	9	0.11 to 0.63	0.12 to 0.26	0.062 to 0.113 (6 >0.070)	<0.15	<0.003 to 0.009

Note: ppm – parts per million wet-weight

[a] Values in ()s indicate number of fish with greater than the 0.070-ppm Advisory Tissue Level used as the lower limit to consider advising children and women of child-bearing age to limit consumption to fewer than eight meals per month (Klasing and Brodberg, 2008).

Middle Yuba, and mainstem Yuba Rivers exceeded the 0.070-ppm mercury Advisory Tissue Level for all pikeminnow, Sacramento sucker, and smallmouth bass samples, and for the average concentration of 39 rainbow trout samples (OEHHA, 2018).[55]

Fishery Resources

Historically, the Sacramento–San Joaquin drainage, which includes most of the watersheds on the west side of the Sierra Nevada Mountain Range, supported 22 native fish species, including three anadromous fish—Chinook salmon, steelhead, and Pacific lamprey—that were an important source of food for Native Americans of the region (Moyle, 1976; Lindstrom, 1993; Moyle et al., 1997). The only native non-salmonid species found at high elevations on the west side of the Sierra Nevada Mountain Range is the Sacramento sucker, which occurred naturally at elevations as high as 8,200 feet in the Kern River (Moyle et al., 1997). Native foothill fish included both anadromous and resident salmonid species, lamprey, hitch, roach, hardhead, pikeminnow, dace, sucker, perch, and sculpin (Moyle et al., 1997). Anadromous sturgeon may also have occurred in the basin.

The Yuba River once supported large numbers of spring-run Chinook salmon, fall-run Chinook salmon, steelhead, and other native fish species. However, hydraulic gold mining started in the mountains of the Yuba River Basin in 1853 and resulted in the release of vast amounts of sediment through the 1870s. Most of this sediment initially remained in the mountains, but by 1862, torrents of sediment were transported downslope to the valley and caused rapid aggradation and exacerbation of flooding along valley rivers (i.e., on the lower Yuba, Feather, Bear, American, and Sacramento Rivers) (James and Singer, 2008). Construction of levees along the lower Yuba River to protect the town of Marysville started as early as 1868, and by the early 1960s, levees extended completely around the town of Marysville and approximately 7 miles upstream along the north and south banks of the lower Yuba River.

In addition to eliminating much of the riparian vegetation corridor along the lower Yuba River, the hydraulic mining debris had a serious adverse effect on the quality of salmon and steelhead habitat. Even by the 1870s and 1880s, the Yuba River salmon runs had been greatly diminished (Yoshiyama et al., 2001). Furthermore, because mercury was used to extract gold from mining debris, mercury exists in the Yuba River system, and this mercury can be extremely toxic to salmonids.

The habitat degradation caused by mining debris was followed by the California Debris Commission's construction of a series of impassable debris dams from the early to mid-1900s, that led to major reductions in salmon and steelhead populations in the Yuba River Basin (Yoshiyama et al., 2001). Daguerre Point Dam was completed in 1906, and

[55] This includes 11 pikeminnow, 13 Sacramento sucker, and 9 smallmouth bass samples.

while it included fish ladders at each end of the dam, they were not very effective (California DWR and Corps, 2003). The dam made it difficult for spawning fish to migrate upstream; however, salmon reportedly did pass upstream of the dam because they were observed in large numbers 30.8 miles upstream, in the North Yuba River near the current location of Bullards Bar Dam during the early 1920s (Yoshiyama et al., 2001).

The California Debris Commission constructed Englebright Dam in 1941 for the primary purpose of trapping sediment derived from hydraulic mining operations in the Yuba River Watershed. Although no hydraulic mining in the upper Yuba River Watershed resumed after the construction of the dam, historical mine sites continued to contribute sediment to the river. Englebright Dam was built without fish passage facilities, and it continues to be a complete barrier to the historic Chinook salmon and steelhead in the upper Yuba Watershed. Prior to construction of these dams (which are currently operated by the Corps), large numbers of steelhead spawned in the uppermost reaches of the Yuba River and its tributaries (California DFG, 1998). Spring-run Chinook salmon and steelhead populations depended on the upper basin for successful summer holding and rearing (Yoshiyama et al., 1998; 2001).

YCWA completed New Bullards Bar Dam in 1970 to provide flood control, power generation, irrigation, recreation, and protection and enhancement of fish and wildlife. Like Englebright Dam, New Bullards Bar Dam is not equipped with fish passage facilities; however, its operations do result in higher, colder flows in the Yuba River during summer, as a result of deepwater withdrawals from its low-level outlet.[56] Discharges from Englebright Reservoir also consistently maintain cool temperatures in the lower Yuba River during the summer. In addition to these dams, aquatic habitat and resident fish populations in the Yuba River Basin are affected by YCWA's Our House and Log Cabin Diversion Dams, as well as other dams and diversions that are not part of the project. Our House Diversion Dam prevents the upstream passage of resident fish at RM 12.0 on the Middle Yuba River, and Log Cabin Diversion Dam prevents the upstream passage of resident fish at RM 4.1 on Oregon Creek.

Under existing conditions, the primary subbasins in the Yuba River Watershed are the North, Middle, and South Yuba Rivers, which flow into Englebright Reservoir; and the lower Yuba River, which flows from the base of Englebright Dam to its confluence with the Feather River (figure 3-11). In this section, we summarize the aquatic habitats and fish populations in these subbasins and in New Bullards Bar Reservoir. More detailed information describing these fishery resources is available in YCWA's amended application, filed on June 5, 2017.

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[56] The temperature of the water withdrawn from New Bullards Bar Reservoir typically ranges from 9°C to 11°C.

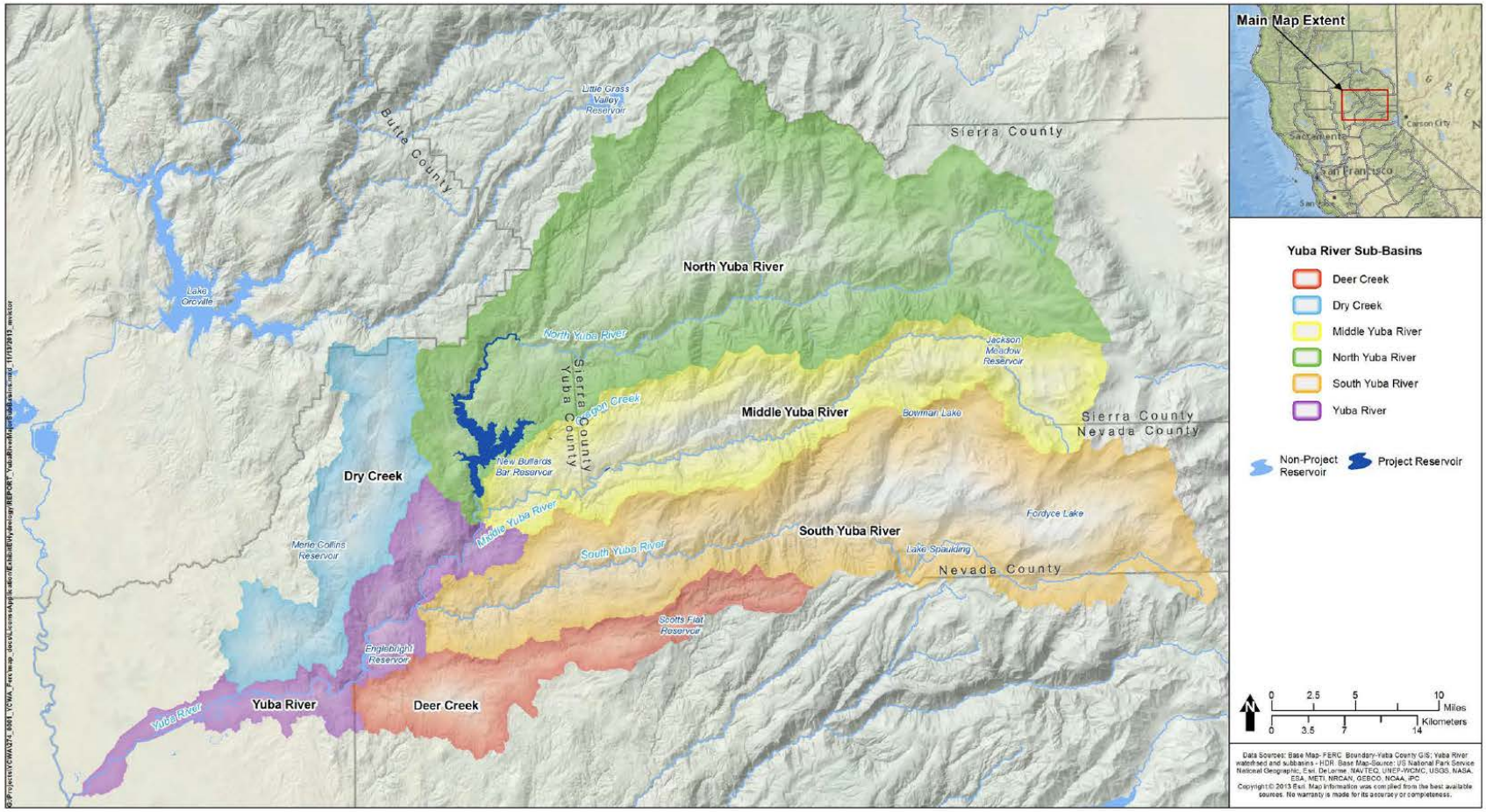

Figure 3-11. Primary watercourses located in the Yuba River Watershed (Source: YCWA, 2017a).

Aquatic Habitat

Prior to filing its notice of intent and preliminary application document, YCWA assessed aquatic habitat conditions in multiple stream reaches upstream of Englebright Reservoir (YCWA, 2012b). Specifically, YCWA mapped aquatic habitat types and channel features in: (1) the North Yuba River downstream of New Bullards Bar Dam; (2) the Middle Yuba River downstream of Our House Diversion Dam; (3) Oregon Creek, a tributary to the Middle Yuba River, downstream of Log Cabin Diversion Dam; and (4) the Yuba River from the North and Middle Yuba river confluence to Englebright Reservoir (collectively referred to as the reaches). Except for Oregon Creek, the reaches were mapped using a low-altitude aerial video, with ground-based ground-truth mapping conducted at five accessible locations. Oregon Creek was mapped entirely by ground-based mapping because it was accessible by foot and was not visible using the aerial video because of overhanging vegetation.

With the exception of Oregon Creek, the reaches are generally confined by bedrock and boulder slopes, with bedrock and boulders limiting vertical and lateral movement. A few alluvial reaches exist (e.g., reaches that are composed of mobile and deformable substrate). Pocket-water and mid-channel pools are the dominant habitats, both in length and frequency. Freemans Crossing and Emory Island on the Middle Yuba River are notable exceptions and likely represent long-term sediment depositional sections. Large woody debris and spawning-sized gravel are uncommon, bank erosion is low, channel lateral and vertical stability is high, and barriers to foot access are numerous. The lower mid-section of Oregon Creek is dominated by bedrock falls and steeper habitat types, but low gradient riffles and mid-channel pools within a more deformable substrate are common in the middle to upper section of Oregon Creek.

Working in collaboration with YCWA, the RMT also assessed existing physical habitat conditions in the 25.2-mile-long lower Yuba River (downstream of Englebright Dam), using a combination of ground-based surveying, boat-based bathymetry, airborne LiDAR; and a river-corridor digital elevation model (RMT, 2013). The results of this assessment found that the average bed channel slope of the thalweg from the Narrows 1 and Narrows 2 Powerhouses is 0.16 percent, while the average bed channel slope between Deer Creek and Englebright Dam is 0.31 percent (figure 3-12). The lower river study segment has an average wetted width of 195 feet at baseflow conditions (880/530 cfs above/below Daguerre Point Dam). At near-bankfull flow conditions (5,000 cfs) the wetted width is 319 feet.

The river corridor is confined in a steep-walled bedrock canyon for the upper 2 river miles, then transitions first into a wider bedrock valley with some meandering through Timbuctoo Bend, then into a wide, alluvial valley from RM 19.3 to the mouth. Past hydraulic mining is the source for much of the present alluvium. Tailings that remain from the hydraulic mining were used to create training berms in some sections of the corridor.

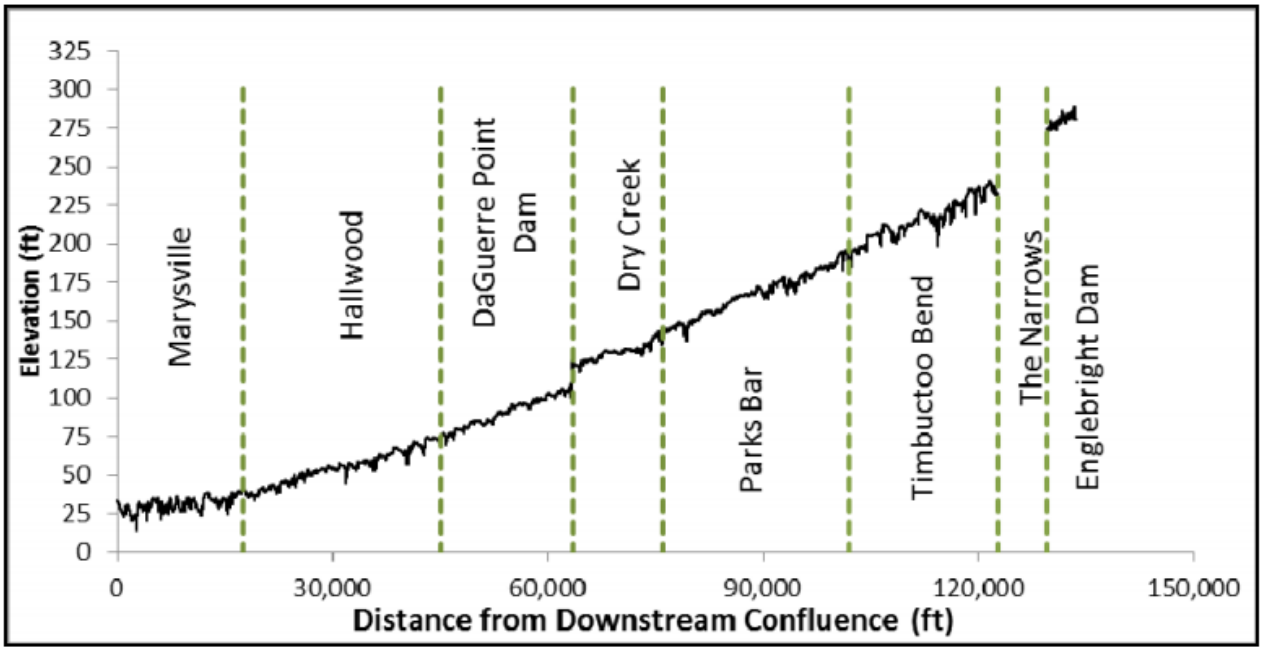

Figure 3-12. Longitudinal thalweg profile of the lower Yuba River between Englebright Dam and its confluence with the Feather River by reach (Source: RMT, 2013).

At the geomorphological reach scale, the RMT delineated and characterized eight distinct reaches for the lower Yuba River. From upstream to downstream the reaches are named Englebright Dam, Narrows, Timbuctoo Bend, Parks Bar, Dry Creek, Daguerre Point Dam, Hallwood, and Marysville (figure 3-12). At the segment scale, chutes and runs are more predominant in the upper reaches of the lower Yuba River (table 3-11). Pools are unequally distributed with the highest abundance between the upper and lower reaches and lower abundance in the middle reaches, except for the large scour pool downstream of Daguerre Point Dam. Riffles exhibit uniform probabilities through most of the reaches, except for Englebright and Marysville. Riffle transitions trend generally upwards in occurrence probability from the Englebright to the Daguerre Point Dam reach, peaking in the Hallwood Reach, and then drastically declining into the Marysville reach. Slackwater and slow glide units, however, are distributed fairly uniformly across the segment.

Table 3-11. Array of habitat units that provide some minimum percent of potential areas for salmonid lifestages (Source: RMT, 2013).

	Adult Holding	Spawning	Juvenile Rearing
	Pool	Riffle	Run
Reach	**Percent Areas of Baseflow Channel**		
Englebright	52	9	32
Timbuctoo	9	37	32
Parks Bar	5	48	27
Dry Creek	7	36	34
Daguerre Point Dam	8	48	22
Hallwood	20	38	25
Marysville	41	19	28
Total Lower Yuba River	16	37	28

On the lower Yuba River, salmonids tend to spawn in mean substrate sizes ranging from about 50 to 150 millimeters. The overall mean substrate diameter within the lower Yuba River's bankfull channel is 97.4 millimeters. The exceptions are sand/silt areas near the confluence of the Feather River and the boulder/bedrock regions in the upper sections of Timbuctoo Bend and most of Englebright Dam reaches. In general, more scour has occurred upstream of the Daguerre Point Dam than downstream. The Feather River downstream from the Yuba River confluence is an alluvial stream flowing through sedimentary deposits of clay, silt, sand, and gravel.

Fish Species in the Project Area

Collectively, 50 fish species have been reported to occur in the Yuba River, the Englebright and New Bullards Bar Reservoirs, and the Our House and Log Cabin Diversion Dam impoundments, of which 22 are native (table 3-12). Forty-five occur downstream of Englebright Dam; five only occur within the reservoirs or impoundments upstream of Englebright Dam; and seven have been documented in the stream environments upstream of Englebright Dam. Eleven of the fish species are either listed under the federal ESA or are considered special-status species by either state or federal agencies, or both (table 3-12).

Reservoir Fish Populations

New Bullards Bar Reservoir has been historically stocked with rainbow trout, kokanee, brook trout, and cutthroat trout (California DFW, 2008), and under existing conditions it supports a diverse assemblage of cold and warmwater fishes, including sport and nongame species.

Table 3-12. Fish species distribution in the Yuba River Watershed (Source: YCWA, 2014a; Moyle et al., 2015; FWS, 2017a; and NMFS, 2017, as modified by staff).

			Stream Distribution		Reservoir or Impoundment Distribution			
Common Name	**Native (N) or Introduced (I)**	**Status[b]**	**Upstream of Englebright Reservoir**	**Downstream of Englebright Dam**	**Our House Diversion Dam**	**Log Cabin Diversion Dam**	**New Bullards Bar Reservoir**	**Englebright Reservoir**
Pacific lamprey	N	CSC	--	x	--	--	--	--
River lamprey	N	CSC	--	x	--	--	--	--
Green sturgeon	N	FT	--	x	--	--	--	--
White sturgeon	N	--	--	x	--	--	--	--
American shad	I	--	--	x	--	--	--	--
Threadfin shad	I	--	--	x	--	--	x	--
Common carp	I	--	--	x	--	--	x	x
Hardhead	N	FS-S, CSC	x	x	--	--	--	x
Fathead minnow	I	--	--	x	--	--	x	--
Golden shiner	I	--	--	x	--	--	x	--
Speckled dace	N	--	x	x	--	--	--	--
California roach	N	CSC	--	x	--	--	--	--
Hitch	N	--	--	x	--	--	--	--
Sacramento pikeminnow	N	--	x	x	--	--	x	x
Sacramento blackfish	N	--	--	x	--	--	--	--
Sacramento splittail	N	CSC	--	x	--	--	--	--

Common Name	Native (N) or Introduced (I)	Status[b]	Stream Distribution		Reservoir or Impoundment Distribution			
			Upstream of Englebright Reservoir	Downstream of Englebright Dam	Our House Diversion Dam	Log Cabin Diversion Dam	New Bullards Bar Reservoir	Englebright Reservoir
Sacramento sucker	N	--	x	x	--	x	x	x
Channel catfish	I	--	--	x	--	--	x	x
White catfish	I	--	--	x	--	--	x	--
Brown bullhead	I	--	--	x	--	--	x	--
Black bullhead	I	--	--	x	--	--	--	--
Wagasaki	I	--	--	x	--	--	--	--
Chinook salmon, Central Valley spring run	N	FT, CT	--	x	--	--	--	--
Chinook salmon, Central Valley fall- late-fall run	N	NMFS-SC, CSC	--	x	--	--	--	--
Steelhead trout, Central Valley	N	FT	--	x	--	--	--	--
Pink salmon	N	CSC	--	x	--	--	--	--
Chum salmon	N	CSC	--	x	--	--	--	--
Cutthroat trout	I	--	--	--	--	--	x	--
Kokanee	I	--	x	--	--	--	x	x
Rainbow trout	N	--	x	x	x	x	x	x
Lake trout	I	--	--	--	--	--	--	x
Brook trout	I	--	--	--	--	--	x	x
Brown trout	I	--	x	x	x	--	x	x

Common Name	Native (N) or Introduced (I)	Status[b]	Stream Distribution		Reservoir or Impoundment Distribution			
			Upstream of Englebright Reservoir	Downstream of Englebright Dam	Our House Diversion Dam	Log Cabin Diversion Dam	New Bullards Bar Reservoir	Englebright Reservoir
Inland silverside	I	--	--	x	--	--	--	--
Mosquitofish	I	--	--	x	--	--	--	--
Prickly sculpin	N	--	--	x	--	--	--	--
Riffle sculpin	N	---	--	x	--	--	--	--
Striped bass	I	--	--	x	--	--	--	--
Largemouth bass	I	--	--	x	--	--	x	x
Smallmouth bass	I	--	x	x	--	--	x	x
Spotted bass	I	--	--	--	--	--	x	x
Warmouth	I	--	--	x	--	--	x	--
Redear sunfish	N	--	--	x	--	--	x	x
Green sunfish	I	--	--	x	--	--	x	x
Bluegill	I	--	--	x	--	--	x	x
Black crappie	I	--	--	x	--	--	x	x
White crappie	I	--	--	x	--	--	x	x
Yellow perch	I	--	--	--	--	--	--	x
Bigscale logperch	I	--	--	x	--	--	--	--
Tule perch	N	--	--	x	--	--	--	--

[a] FT = listed as threatened under the ESA; CT = listed as threatened under the California ESA; NMFS-S = listed as a species of concern by NMFS; CSC = listed as a species of special concern by California DFW; FS-S = listed as sensitive on NFS land by the Forest Service.

During fish population sampling in New Bullards Bar Reservoir in January and June 2012, YCWA captured 11 fish species, compared to the 24 fish species that have been previously documented in the reservoir (tables 3-12 and 3-13). Spotted bass was the most common species (sample size (n)=644), accounting for 66 percent of the total numbers caught and 66 percent of the biomass. Other common centrarchids were bluegill (n=79, 8 percent of the catch) and green sunfish (n=63, 7 percent of the catch). Salmonid species were represented by rainbow trout (n=49, 5 percent of the catch) and kokanee (n=47, 5 percent of the catch), which have been historically stocked in the reservoir by California DFW. Fish species documented in tributaries to New Bullards Bar Reservoir included brown trout (Mill Creek only), rainbow trout, and Sacramento sucker. Six of the nine tributaries contained only rainbow trout. The North Yuba River and Willow Creek contained both rainbow trout and Sacramento sucker.

Englebright Reservoir has been stocked extensively with rainbow trout for recreational purposes. Other species with sporadic or isolated stockings for recreational purposes include brown trout, brook trout, kokanee, lake trout, black crappie, and white crappie. During sampling in Englebright Reservoir in June 2012, YCWA captured 10 fish species, compared to the 18 fish species found during prior surveys (table 3-12). Two of these species, redear sunfish and green sunfish, had not been previously documented in the reservoir. Table 3-13 shows abundance, length, and weight data of fish species collected from YCWA electrofishing and gillnetting samples in January and June 2012. Species with larger populations were present in multiple size classes, including juveniles. In New Bullards Bar Reservoir, common carp, kokanee, and Sacramento sucker were only represented by larger adult fish. Sacramento pikeminnow, white catfish, brown bullhead, and white crappie were also represented by larger individuals; however, relatively few individuals of these species were collected compared to others in the reservoir.

Stream Fish Populations

North Yuba River—In 2008 and 2009, Nevada Irrigation District and PG&E performed snorkeling surveys in the North Yuba River approximately 5 miles upstream of New Bullards Bar Reservoir (NID and PG&E, 2010). In 2008, Sacramento pikeminnow was the most abundant species observed at the site (2,366 fish/mile), followed by rainbow trout (1,690 fish/mile) and Sacramento sucker (467 fish/mile). However, in 2009, Sacramento sucker was the dominant species (2,688 fish/mile) followed by rainbow trout (1,513 fish/mile) and Sacramento pikeminnow (467 fish/mile).

In 2012, YCWA also conducted snorkeling surveys in the North Yuba River upstream of the Slate Creek confluence for approximately 0.25 mile. Snorkelers primarily observed rainbow trout (n=23) followed by Sacramento sucker (n=15).

Table 3-13. Relative abundance, length, and weight data of fish species collected from YCWA electrofishing and gillnetting samples in January and June 2012 (Source: YCWA, 2012b, as modified by staff).

		Length (inches)			Weight (pounds (ounces))[a]		
Species	**N**	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**
New Bullards Bar Reservoir							
Spotted bass	644	1.69	20.28	9.25	(0.03)	7.50	(13.35)
Bluegill	79	1.34	8.70	3.62	(0.02)	(8.35)	(1.47)
Green sunfish	63	1.46	9.06	4.09	(0.01)	(7.41)	(1.20)
Common carp	56	14.17	22.44	17.44	1.71	6.83	3.18
Rainbow trout	49	2.17	16.57	9.41	(0.07)	1.48	(8.02)
Kokanee	47	6.26	11.61	9.02	(2.22)	(8.13)	(5.01)
Sacramento sucker	18	12.60	16.93	14.37	(15.87)	2.34	1.57
Sacramento pikeminnow	9	5.87	18.82	13.90	(4.76)	2.91	1.45
White catfish	3	11.22	15.16	13.66	(13.83)	2.09	1.63
Brown bullhead	2	13.98	15.55	14.76	1.98	2.87	2.43
White crappie	1	9.41	9.41	9.41	(6.95)	(6.95)	(6.95)
Englebright Reservoir							
Sacramento sucker	114	1.89	20.67	11.38	(0.04)	3.64	1.20
Spotted bass	96	1.77	16.14	8.62	(0.04)	2.67	(7.93)
Hardhead	49	2.56	19.13	9.21	(0.10)	3.64	(12.99)
Rainbow trout	30	1.97	13.58	8.82	(0.04)	(14.11)	(6.05)

		Length (inches)			Weight (pounds (ounces))[a]		
Species	**N**	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**
Bluegill	27	1.77	6.06	4.06	(0.04)	(3.77)	(1.21)
Sacramento pikeminnow	25	2.24	24.41	9.37	(0.06)	6.28	(11.92)
Common carp	7	18.50	27.36	22.91	3.91	14.33	7.69
Brown trout	6	6.93	17.32	12.01	(2.38)	1.81	(13.94)
Smallmouth bass	5	2.17	7.20	3.90	(0.10)	(3.32)	(0.99)

[a] N = number; values in parentheses are expressed in ounces and not pounds.

The fish composition in the upper elevations of Slate Creek, a tributary to the North Yuba River, includes rainbow trout and speckled dace, whereas the lower elevations support Sacramento pikeminnow, Sacramento sucker, hardhead, and smallmouth bass.

YCWA documented three fish species during snorkeling and electrofishing surveys in the North Yuba River 0.2 mile upstream of the confluence of the North Yuba and Middle Yuba Rivers in 2012 and 2013. Sacramento sucker was the numerically dominant species collected via electrofishing over both years (n=38), followed by rainbow trout (n=23) and speckled dace (n=1). YCWA estimated Sacramento sucker to be the most common species observed during snorkeling in 2012 (3,203 fish/mile), followed by rainbow trout (567 fish/mile) and Sacramento pikeminnow (14 fish/mile). However, in the 2013 surveys, rainbow trout density estimates were higher (534 fish/mile) than Sacramento sucker (181 fish/mile). Sacramento pikeminnow were not observed in 2013.

Oregon Creek—In fall 2012, YCWA used electrofishing, seine netting, and hook-and-line sampling to survey Oregon Creek 1.7 miles upstream of Log Cabin Diversion Dam. Biologists collected 437 rainbow trout, representing all lifestages. The only other fish species observed during the sampling effort was Sacramento sucker. Species composition from electrofishing closer to the dam (0.4 mile upstream of the structure) was similar in 2012 and 2013. Sacramento sucker was numerically dominant, followed by rainbow trout and Sacramento pikeminnow over both years of the survey.

Approximately 4 miles downstream of Log Cabin Diversion Dam, rainbow trout were numerically dominant in 2012 (92 percent of the catch) and 2013 (80 percent of the catch), followed by Sacramento sucker (7 and 17 percent of the catch in 2012 and 2013), and smallmouth bass (one fish in 2012, two in 2013). Biologists estimated rainbow trout density to be 2,266 fish/mile in 2012 and 1,430 fish/ mile in 2013.

Middle Yuba River—Upstream of Our House Diversion Dam, YCWA primarily collected Sacramento sucker via electrofishing in 2012 and 2013. Estimated fish density for 2012 and 2013 for Sacramento sucker was 917 and 160 fish/mile, 409 and 0 fish/mile for rainbow trout; and 131 and 16 fish/mile for Sacramento pikeminnow, respectively. Additional electrofishing, gillnetting, and hook-and-line sampling in the fall of 2012 collected 187 rainbow trout, representing all lifestages, and 2 adult brown trout. Other fish species observed by YCWA, but not quantified, were Sacramento sucker and Sacramento pikeminnow. Electrofishing in 2011, as a component of YCWA's proposed Sediment Pass-through Program, collected 23 rainbow trout and 5 Sacramento suckers.

Approximately 0.25 mile downstream of Our House Diversion Dam, YCWA collected 82 rainbow trout, 14 Sacramento suckers, and 7 smallmouth bass via electrofishing in 2011, as part of the same Sediment Pass-through Program.

At RM 12.5 downstream of Our House Diversion Dam, rainbow trout composed approximately 84 percent of observed fish in 2012, while smallmouth bass composed

approximately 60 percent in 2013. Three Sacramento suckers and three Sacramento pikeminnows were collected in 2013. YCWA estimated rainbow trout density to be 453 fish/mile in 2012 and 450 fish/mile in 2013, while it estimated smallmouth bass density to be 88 fish/mile in 2012 and 708 fish/mile in 2013. The site upstream of the Oregon Creek confluence, at RM 5.0, was dominated by smallmouth bass in both 2012 and 2013. Smallmouth bass extrapolated density was estimated to be 1,915 fish/mile in 2012 and 1,282 fish/mile in 2013. Rainbow trout and Sacramento suckers were also present but only made up 8 and 7 percent of the total sample in 2012, and 8 and 4 percent of the total sample in 2013, respectively. Rainbow trout density was estimated to be 155 fish/mile in 2012 and 90 fish/mile in 2013. Gast et al. (2005) documented hardhead within the Middle Yuba River between Our House Diversion Dam and the confluence of Oregon Creek.

Gast et al. (2005) reported rainbow trout, Sacramento sucker, Sacramento pikeminnow, and smallmouth bass from snorkeling surveys at four sites on the Middle Yuba River between Oregon Creek and the confluence with the North Yuba River. YCWA sampled two sites downstream of the confluence with Oregon Creek on the Middle Yuba River at RM 3.3 (downstream of Moonshine Creek) and at RM 1.0 (downstream of Yellowjacket Creek). From snorkeling samples at RM 3.3 in 2012 and 2013, rainbow trout was numerically dominant (74 and 56 percent of the catch, respectively), followed by smallmouth bass (15 and 34 percent of the catch) and Sacramento sucker (11 and 10 percent of the catch). The extrapolated density estimate of rainbow trout was 613 fish/mile in 2012 and 350 fish/mile in 2013. Density estimates of smallmouth bass at the site were 126 fish/mile in 2012 and 212 fish/mile in 2013. Estimated density of Sacramento sucker was 91 and 65 fish/mile in 2012 and 2013, respectively. From electrofishing at RM 3.3, Sacramento sucker were the numerically dominant species over the 2 years (n=26) followed by rainbow trout (n=10) and smallmouth bass (n=2).

At the RM 1.0 site, species composition and relative abundance changed over the 2-year study. Smallmouth bass was the most common species collected during electrofishing and observed while snorkeling in both years (76 percent electrofishing and 50 percent snorkeling). Rainbow trout represented a large portion of the species assemblage in 2012 (24 percent electrofishing and 46 percent snorkeling), but only one was observed in the snorkeled section in 2013. The density of smallmouth bass increased in 2013 while rainbow trout density decreased. Sacramento sucker were only collected in 2013.

Upper Yuba River—During snorkeling surveys conducted in 2012 at RM 39.6, downstream of the confluence of Middle Yuba and North Yuba Rivers, rainbow trout were the most common species observed (61 percent) followed by smallmouth bass (38 percent), and Sacramento pikeminnow (1 percent). In addition, two Sacramento suckers were collected during qualitative electrofishing at the stream margins. In 2013, smallmouth bass (77 percent) and rainbow trout (22 percent) were the only species observed. Extrapolated density estimates for rainbow trout were 543 fish/mile in 2012

and 243 fish/mile in 2013. The same metric for smallmouth bass was 337 fish/mile in 2012 and 889 fish/mile in 2013. At RM 35.0 upstream of New Colgate Powerhouse, smallmouth bass made up 93 percent of fish observed in 2012, with an estimated density of 1,409 fish/mile. In 2013, smallmouth bass composed 99 percent of fish observed with an estimated density of 1,257 fish/mile. In both years, rainbow trout composed the remainder of the sample with 108 fish/mile (7 percent) and 16 fish/mile (1 percent) in 2012 and 2013, respectively.

Between New Colgate Powerhouse and Englebright Reservoir at RM 33.7, rainbow trout were collected almost exclusively by YCWA in 2012, with the exception of one brown trout. The extrapolated density estimate for rainbow trout was 323 fish/mile. Rainbow trout were numerically dominant again in 2013, and estimated density was 560 fish/mile. Brown trout were not documented at the site in 2013; however, a single Sacramento sucker was observed. In addition to survey results, several carcasses of adult kokanee were observed in 2012 downstream of New Colgate Powerhouse.

South Yuba River—The South Yuba River supports a predominantly warmwater fishery. From snorkeling surveys conducted in 2009 in the South Yuba River at RM 0.8, smallmouth bass were the most abundant species (estimated 845 fish/mile), followed by Sacramento pikeminnow (114 fish/mile), rainbow trout (16 fish/mile), and green sunfish (8 fish/mile). Limited electrofishing collected three rainbow trout and one smallmouth bass. Gast et al. (2005) observed adult hardhead in the South Yuba River at RM 3.9, approximately 0.3 mile downstream of the confluence with Owl Creek.

Lower Yuba River—The Yuba River downstream of Englebright Dam is primarily occupied by the pikeminnow-hardhead-sucker and California Roach assemblages, bounded by the rainbow trout assemblage in the uppermost reach and the deep-bodied assemblage (i.e., Sacramento perch, thicktail chub, and tule perch) in the lowermost reach. Table 3-14 shows fish species distribution in the Yuba River downstream of Englebright Dam. Data were compiled primarily from two previous studies conducted between 1986 and 2001 (Beak Consultants, 1989; Kozlowski, 2004) that used snorkeling and electrofishing, as well as current studies by the RMT, that include rotary screw traps and fish count data at Daguerre Point Dam.[57]

[57] The Daguerre Point Dam has two fish ladders where fish passage counts are made by the RMT. The fish ladders are equipped with VAKI Riverwatcher™ systems that monitor fish passage via scanner plates and record both infrared silhouettes and electronic images of each fish passage event.

Table 3-14. Fish species distribution in the Yuba River downstream of Englebright Dam (Source: YCWA, 2014a).

	Reach			
Common Name	**Narrows[a]**	**Garcia Gravel Pit[b]**	**Daguerre Point Dam[c]**	**Simpson Lane[d]**
Native Resident Species				
California roach		x	x	x
Hardhead		x	x	x
Hitch			x	x
Prickly sculpin		x		x
Riffle sculpin		x	x	x
Sacramento blackfish	x			
Sacramento pikeminnow	x	x	x	x
Sacramento splittail	x			
Sacramento sucker	x	x	x	
Speckled dace		x	x	
Rainbow trout	x	x	x	x
Tule perch			x	x
Three-spine stickleback			x	x
Native Anadromous Species				
Fall-run Chinook salmon	x	x	x	x
Spring-run Chinook salmon ESU	x	x	x	x
Chum salmon	x	x	x	x
Pink salmon	x	x	x	x
Steelhead trout	x	x	x	x
Pacific lamprey		x	x	x
River lamprey			x	x
Green sturgeon			x	x
White sturgeon			x	x
Introduced Resident Species				
Black bullhead			x	x
Black crappie			x	x
Bluegill		x	x	x
Brown bullhead			x	x
Brown trout		x	x	

Common Name	Reach			
	Narrows[a]	Garcia Gravel Pit[b]	Daguerre Point Dam[c]	Simpson Lane[d]
Common carp		x	x	x
Channel catfish			x	x
Fathead minnow			x	x
Golden shiner			x	x
Green sunfish	x	x	x	x
Inland silverside			x	x
Largemouth bass		x		x
Redear sunfish			x	x
Smallmouth bass		x	x	x
Threadfin shad			x	x
Wagasaki			x	x
Warmouth			x	x
White catfish			x	x
White crappie			x	x
Bigscale logperch			x	x
Mosquitofish				x
Introduced Anadromous Species				
American shad		x	x	x
Striped bass		x	x	x

[a] The Narrows Reach is defined as Englebright Dam at RM 24.3 to the downstream side of the Narrows 1 and Narrows 2 Powerhouses at RM 24.

[b] The Garcia Gravel Pit Reach begins downstream of the Narrows Reach at RM 22 and extends downstream to the Daguerre Point Dam at approximately RM 11.6.

[c] The Daguerre Point Dam reach begins at RM 11.6 and extends to the downstream terminus of the Yuba Goldfields at approximately RM 3.5.

[d] The Simpson Lane Reach extends from approximately RM 3.5 to the confluence with the Feather River at RM 0 in the town of Marysville.

The lower Yuba River contains several anadromous species. Numerically, nearly all of anadromous fish identified during surveys were Chinook salmon and steelhead juveniles. Introduced anadromous fishes observed during surveys at Daguerre Point Dam primarily consisted of adult American shad and striped bass but relatively few juveniles. Study results showed seasonal variations in the catch of native and introduced species. When the number of native anadromous fish peaked, primarily juvenile Chinook salmon between February and March, native species composed over 90 percent of the rotary

screw trap catch. The non-anadromous population, however, appeared to contain a more balanced proportion of introduced and native fishes. Chinook salmon were the most abundant species in all four reaches during the winter-spring periods. Results from the rotary screw trap surveys from 1999 through 2009 in the Yuba River at RM 7.2 showed that juvenile Chinook salmon were the most common (98.5 percent) species in the lower Yuba River. VAKI Riverwatcher™ results showed that adult Chinook salmon were also the most common species (66 percent) in adult counts at Daguerre Point Dam from 2003 through 2016. Adult passage counts showed variable run sizes up to a maximum of 11,380 for Chinook salmon in 2013 and up to 6,559 for steelhead in 2011 (table 3-15). Other salmonids such as sockeye, pink, and chum salmon all had comparatively small run sizes (fewer than 16 fish in any year between 2003 and 2016).

Feather River—Both native and introduced fish species occur in the Feather River downstream of the Yuba River, including federally and state-listed species and species of concern. The reach supports spawning and rearing habitat for resident native species and provides a migratory route to upstream spawning and rearing habitat for native anadromous species.

Aquatic Macroinvertebrates

Special-status Brachiopods—Vernal pool tadpole shrimp (federally endangered) and vernal pool fairy shrimp (federally threatened) are ESA-listed crustacean species that have been collected from vernal pools at Beale Air Force Base approximately 7 miles south of the Yuba Goldfields and the Yuba River (Platenkamp, 1996). These species are discussed in section 3.3.4, *Threatened and Endangered Species*.

Special-status Mollusks—According to the Forest Service, seven aquatic mollusk species are considered sensitive species and have a potential to occur in project-affected reaches on NFS lands (table 3-16). California DFW does not list any special-status aquatic mollusks in the vicinity of the project.

In July 2012, YCWA surveyed three sites within New Bullards Bar Reservoir, one site in Oregon Creek downstream of Log Cabin Diversion Dam, and one site in the Middle Yuba River downstream of Our House Diversion Dam using qualitative timed-search methods and snorkel gear. Special-status mollusks were not found during the surveys.

Non-special-status Aquatic Mollusks—YCWA did not observe mollusks in New Bullards Bar Reservoir. Several different families of non-special-status aquatic mollusks were observed at the Oregon Creek and Middle Yuba River sample sites. Live specimens of western pearlshell mussel and two gastropod families, Pleuroceridae and Physidae, were found at both stream sites. The specimens of Pleuroceridae were identified as members of the *Juga* genus but were neither of the two special-status *Juga* species. Other gastropods observed at the Oregon Creek site included three live specimens of the family Physidae and a single shell of the family Lymnaeidae.

Table 3-15. Net passage (upstream subtracted from downstream passage) for fish observed passing through the fishways at Daguerre Point Dam on the Yuba River (2003–2016) (Source: YCWA, 2017a).

Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	All Years	% Comp
Chinook salmon	84	5,154	10,915	4,300	1,324	2,385	4,316	6,333	7,721	6,655	11,380	9,135	4,981	1,561	76,244	66.00%
Steelhead	15	540	556	213	698	523	290	1,107	6,559	780	788	618	5,284	1,770	19,741	17.09%
Sacramento sucker	0	696	1,369	2,549	664	470	1,256	1,122	2,921	1,397	600	479	439	971	14,933	12.93%
Sacramento pikeminnow	0	313	112	183	190	250	492	359	685	291	212	214	161	304	3,766	3.26%
Hardhead	0	147	4	20	46	24	18	44	56	46	26	9	19	35	494	0.43%
American shad	0	15	10	2	0	0	0	0	213	35	12	1	0	3	291	0.25%
Sockeye salmon	0	0	0	0	0	0	0	0	0	2	15	1	0	0	18	0.02%
Brown trout	0	0	0	0	0	0	0	0	5	4	3	1	0	0	13	0.01%
Largemouth bass	0	0	0	0	0	0	0	-1	6	0	0	3	0	0	8	0.01%
Pink salmon	0	0	0	0	0	0	0	0	5	0	2	0	0	0	7	0.01%
Chum salmon	0	0	0	0	0	1	0	0	0	0	2	0	0	0	3	<0.01%
Common carp	0	0	1	0	1	0	0	0	-1	0	0	0	0	0	1	<0.01%
Pacific lamprey	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	<0.01%
Smallmouth bass	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	<0.01%
Striped bass	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	<0.01%
White catfish	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	<0.01%
Total	**99**	**6,865**	**12,967**	**7,267**	**2,923**	**3,653**	**6,372**	**8,964**	**18,172**	**9,211**	**13,040**	**10,462**	**10,884**	**4,644**	**115,523**	

Note: Negative values denote net downstream passage.

Table 3-16. Forest Service sensitive mollusk species that may occur in the project area. (Source: YCWA, 2012c).

Common Name	Scientific Name	Habitat Requirements
California floater	*Anodonta californiensis*	Shallow muddy or sandy habitats in large rivers, reservoirs, and lakes
Great Basin rams-horn	*Helisoma newberryi*	Large lakes, slow rivers, and spring-fed creeks; burrows in soft mud
Topaz juga	*Juga acutifilosa*	Sand and gravel substrates in spring-influenced streams and lakes and occasionally in large spring pools
Scalloped juga	*Juga occata*	Cold, moving waters of large rivers, often spring-influenced, with stable boulder and cobble substrates
Montane peaclam	*Pisidium ultramontanum*	Sand and gravel substrates in spring-influenced streams and lakes and occasionally in large spring pools
Owen's Valley springsnail	*Pyrgulopsis owensensis*	Small springs and spring runs, typically in watercress
Wong's springsnail	*Pyrgulopsis wongi*	Perennial seeps and small- to moderate-sized springs and spring runs, only in flowing waters

Benthic Macroinvertebrates—BMI are a diverse and typically abundant group of organisms with very specific habitat preferences. Many species are sensitive to environmental conditions and stresses and intolerant of specific pollution sources. Therefore, benthic communities are excellent indicators of both water quality and biological integrity. Based on community structure metrics, indices can be developed where higher scores on an index indicate better water quality and higher biological integrity.

In 2012, YCWA conducted surveys at eight sites in stream reaches upstream of Englebright Reservoir. YCWA identified 3,481 organisms representing 89 insect taxa and 10 orders: Diptera (32 taxa), Trichoptera (18), Ephemeroptera (10), Hemiptera (2), Homoptera (1), Coleoptera (8), Plecoptera (10), Odonata (4), Megaloptera (3), and Lepidoptera (1), as well as 7 non-insect taxa that included aquatic crustaceans, arachnids, oligochaetes, gastropods, and bivalves. Index of biotic integrity scores ranged from 21 at the site in the North Yuba River upstream of the Middle Yuba River confluence, to 69 at

the site in the Middle Yuba River downstream of the Oregon Creek confluence.[58] Multi-metric index[59] scores ranged from 16 at the site in the North Yuba River upstream of the Middle Yuba River confluence, to 64 at the site in the Middle Yuba River downstream of the Oregon Creek confluence. Overall, the highest scores were observed consistently on the Middle Yuba River. Lower scores were found on the North Yuba River and Yuba River.

In 2012, YCWA also conducted surveys at six sites on the Yuba River between Englebright Dam and the confluence with the Feather River. An estimated 183,682 organisms were collected from the 6 sample sites. A randomly sorted subset of 3,665 invertebrates was used to derive BMI metrics. Six aquatic insect orders were represented: Diptera (50 taxa), Ephemeroptera (11), Trichoptera (6), Plecoptera (3), Coleoptera (3), and Hemiptera (1). In addition, aquatic crustaceans, arachnids, annelids, gastropods, nemerteans, and turbellarians were identified. In general, the BMI communities at all sites were dominated by midges (Chironomidae), worms (Oligochaeta), mayflies (Baetidae), and caddisflies (Hydropsychidae). No clear upstream to downstream trend in total estimated abundance and taxa richness was observed, although abundance was highest at sites 1 and 2 (RMs 7 and 11) and lowest at the most upstream location, site 6 (RM 23). While no clear upstream to downstream trend in tolerance was observed, the number of intolerant taxa[60] was highest at the farthest downstream site. Dominant functional feeding groups in the BMI communities in all sites were collector-gatherers and collector-filterers (range of 83 to 91 percent). Site conditions overall were good, and no site showed substantial degradation or disturbance based on BMI metrics. The quality of each site was generally a factor of substrate, channel size, and morphology. Overall, site 6, the site downstream of Englebright Dam, reflected the greatest degree of disturbance relative to the other sites, while site 2, the site downstream of Daguerre Point Dam, showed the best overall reported matrix scores. There was no upstream to downstream decrease in site condition.

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[58] The index of biotic integrity that YCWA uses to assess stream health is composed of 23 multiple metrics (i.e., Ephemeroptera and Trichoptera taxa richness, percent pollutant-intolerant, percent pollutant-tolerant, and percent non-insect). Scores range from 0 to 100, with scores of 0 to 32 considered poor, 33 to 66 considered fair, and 67 to 100 considered good.

[59] The multi-metric index used by YCWA is used to assess stream health by evaluating metrics such as the numbers of certain taxa (Ephemeroptera, Plecoptera, and Trichoptera), percent non-gastropod scraper individuals, and percent pollutant-tolerant.

[60] Intolerant taxa include Plecoptera and Trichoptera, are sensitive to perturbations, and have low tolerance values. The California Tolerance Value scale ranges from 0 to 10.

Aquatic Invasive Species

Aquatic invasive species that have the potential to occur within the project area based on proximity of documented occurrences to the Yuba River Watershed include quagga mussel (*Dreissena rostriformis bugensis*), zebra mussel (*D. polymorpha*), New Zealand mudsnail (*Potamopyrgus antipodarum*), and Asian clam (*Corbicula fluminea*). YCWA did not document these species during macroinvertebrate or other relicensing studies. However, in November 2014, the Forest Service observed Asian clams at the mouth of Cottage Creek and the Dark Day Boat Launch, and, in 2015, YCWA received a report of Asian clams in New Bullards Bar Reservoir at Emerald Cove from California DFW. Additionally, California DFW biologists have discovered New Zealand mudsnails in the Yuba River above and below the Highway 20 Bridge and in the lower Feather River (California DFW, 2016a). The Highway 20 Bridge crosses the lower Yuba River approximately 6 miles downstream of Englebright Dam near the town of Smartsville.

3.3.2.2 Environmental Effects

Effects of YCWA's Proposed Measures on Instream Flows and Water Levels

YCWA has historically operated the project to retain snowmelt from springtime runoff for flood control, water supply, recreation, hydropower, and environmental benefits. The project attenuates high flows in the North Yuba River from winter storms and spring runoff and stores water in New Bullards Bar Reservoir. To meet target storage levels in New Bullards Bar Reservoir, the project also diverts flows from the Middle Yuba River and Oregon Creek. In spring and summer, water levels in New Bullards Bar Reservoir are maintained relatively high for recreational purposes, with releases from March through October made for downstream water supply and hydropower generation. This release pattern results in higher flows during the drier months of July through October compared to unregulated flows. The water surface elevation of New Bullards Bar Reservoir fluctuates by about 105 feet in a typical wet water year and about 75 feet in a typical dry water year.

YCWA's proposed measure WR2 includes the definition of a new hydrologic index, the "Smartsville Hydrologic Index," and associated water year types to determine minimum required flows in North Yuba River downstream of New Bullards Bar Dam, Middle Yuba River downstream of Our House Diversion Dam, and in Oregon Creek downstream of Log Cabin Diversion Dam. These hydrologic year types would be defined by published forecasts of annual unimpaired Yuba River flow near Smartsville and computed unimpaired flows for previous months. The basis for the forecast would be California DWR's Bulletin 120, *Water Year Conditions in California,* a publication issued four times a year in the second week of February, March, April, and May. The bulletin forecasts the volume of seasonal runoff from the state's major watersheds, including the Yuba River. It provides summaries of precipitation, snowpack, reservoir storage, and runoff to define water year type classifications. After the end of the water year (i.e., the beginning of October), YCWA would use the actual volume of unimpaired

Yuba River flow near Smartsville for the previous water year to determine the water year type to be used until the next forecast is released (i.e., in early February). Table 3-17 presents the Smartsville Hydrological Index thresholds and associated water year types.

Table 3-17. Smartsville Hydrologic Index water year types and associated thresholds (Source: YCWA, 2017a).

Water Year Type	Forecast of Unimpaired Runoff in the Yuba River at Smartsville or California DWR Full Natural Flow near Smartsville in Thousand Acre-feet[a]
Wet	Greater than 3,240
Above Normal	2,191 to 3,240
Below Normal	1,461 to 2,190
Dry	901 to 1,460
Critically Dry	616 to 900

[a] California DWR rounds the Bulletin 120 forecast to the nearest thousand acre-feet. The full natural flow is provided to the nearest acre-foot, and YCWA would round California DWR's full natural flow to the nearest thousand acre-foot.

Proposed measure WR3 provides the calculation of the North Yuba Index to be used to identify the required flow schedule at the Smartsville and Marysville gages. The schedules in the proposed measure are the same as the schedules in exhibits 2, 4, and 5 of the Yuba Accord, which provides the expected frequency based on historical conditions. Table 3-18 shows the North Yuba Index thresholds and associated water year types.

Table 3-18. North Yuba Index schedules and associated thresholds (Source: YCWA, 2017a,b).

Water Year Type	Thousands of Acre-feet [a]	Historical Frequency
Schedule 1	Equal to or greater than 1,400	56%
Schedule 2	Equal to or greater than 1,040 and less than 1,400	22%
Schedule 3	Equal to or greater than 920 and less than 1,040	7%
Schedule 4	Equal to or greater than 820 and less than 920	5%
Schedule 5	Equal to or greater than 693 and less than 820	5%
Schedule 6	Equal to or greater than 500 and less than 693	4%
Conference year	Less than 500	1%

[a] The North Yuba Index is calculated as the active storage in New Bullards Bar Reservoir on September 30 of the previous water year plus New Bullards Bar Reservoir inflow to date, plus forecasted inflow through September 30 of the current water year. Forecasted inflows are based on California DWR-published Bulletin 120 in February, March, April, and May, and then thereafter whenever California DWR issues an update to Bulletin 120.

Table 3-19 shows the minimum streamflow schedules YCWA currently maintains in the Middle Yuba River, Oregon Creek, and the North Yuba River downstream of the New Colgate Development.

Table 3-19. Existing project flow requirements for Middle Yuba River, Oregon Creek, and North Yuba River downstream of New Colgate Development (Source: YCWA, 2017a).

	Flows (cfs)	
Stream	**April 15 to June 15**	**June 16 to April 14**
Middle Yuba River (below Our House Diversion Dam)	50	30
Oregon Creek (below Log Cabin Diversion Dam)	12	8
North Yuba River (below New Bullards Bar Dam)	5	5

[a] Or natural inflow, whichever is less. Maximum 24-hour fluctuations of plus or minus 10 percent are permitted for flows in the Middle Yuba River and Oregon Creek.

Proposed measure AR1 includes new flow requirements for the Middle Yuba River downstream of Our House Diversion Dam and for Oregon Creek downstream of Log Cabin Diversion Dam. The required flow would be determined by the applicable Smartsville Hydrologic Index water year type. Tables 3-20 and 3-21 show the proposed monthly required flows for the Middle Yuba River and Oregon Creek, by water year type, as included in proposed measure AR1.

YCWA maintains a year-round minimum streamflow of 5 cfs in the North Yuba River below New Bullards Bar Dam (see table 3-19). Proposed measure AR10 includes new flow requirements for North Yuba River downstream of New Bullards Bar Dam. The required flow would be determined based on the applicable Smartsville Hydrologic Index water year type. Table 3-22 presents the monthly required flows for North Yuba River downstream of New Bullards Bar Dam by water year type, as included in proposed measure AR10.

Table 3-20. Proposed project flow requirements (in cfs) for Middle Yuba River downstream of Our House Diversion Dam by Smartsville Hydrologic Index water year type (Source: YCWA, 2017a).

Month	Wet Water Year[a]	Above Normal Water Year[a]	Below Normal Water Year[a]	Dry Water Year[a]	Critically Dry Water Year[a]
October 1–31	60	60	55	50	40
November 1–30	60	60	55	50	40
December 1–31	70	60	55	50	40
January 1–31	90	75	70	50	40
February 1–29	90	75	70	50	40
March 1–31	100	90	80	55	45
April 1–30	120	100	90	70	60
May 1–31	120	100	90	70	60
June 1–30	120	100	90	70	60
July 1–31	100	80	70	60	45
August 1–31	80	70	60	50	45
September 1–30	70	60	55	50	45

[a] Or natural inflow if natural inflow is less.

Table 3-21. Proposed project flow requirements (in cfs) for Oregon Creek downstream of Log Cabin Diversion Dam by Smartsville Hydrological Index water year type (Source: YCWA, 2017a).

Month	Wet Water Year[a]	Above Normal Water Year[a]	Below Normal Water Year[a]	Dry Water Year[a]	Critically Dry Water Year[a]
October 1–31	8	8	6	6	6
November 1–30	17	15	15	10	6
December 1–31	17	15	15	10	6
January 1–31	17	15	15	10	6
February 1–29	24	19	18	12	12
March 1–31	30	30	18	12	12

Month	Wet Water Year[a]	Above Normal Water Year[a]	Below Normal Water Year[a]	Dry Water Year[a]	Critically Dry Water Year[a]
April 1–30	43	43	27	18	18
May 1–31	43	43	27	18	18
June 1–30	43	43	27	18	18
July 1–31	25	20	15	10	6
August 1–31	13	10	8	6	6
September 1–30	13	10	8	6	6

[a] Or natural inflow if natural inflow is less.

Table 3-22. Proposed project flow requirements (in cfs) for North Yuba River downstream of New Bullards Bar Dam by Smartsville Hydrological Index water year type (Source: YCWA, 2017a).

Month	Wet Water Year	Above Normal Water Year	Below Normal Water Year	Dry Water Year	Critically Dry Water Year
October 1–31	13	13	13	13	7
November 1–30	13	13	13	13	7
December 1–31	13	13	13	13	7
January 1–31	13	13	13	13	7
February 1–29	13	13	13	13	7
March 1–31	11	12	13	13	7
April 1–30	5	5	5	5	5
May 1–31	5	5	5	5	5
June 1–30	5	5	5	5	5
July 1–31	11	12	13	13	7
August 1–31	11	12	13	13	7
September 1–30	11	12	13	13	7

YCWA currently does not control the ramping rate for spill cessation flows over Our House Diversion Dam. However, under proposed measure AR2, it would control the ramping rate of spill cessation for flows over Our House Diversion Dam in non-tunnel-closure years. The spill cessation ramping rate measure would affect flows over the Our House Diversion Dam of 600 cfs or less between April 1 and July 31 in below normal, dry, and critically dry water years, and between May 1 and July 31 in wet and above normal water years (WR2). Under these conditions, the Our House Diversion Dam low-level outlet would be used to regulate Middle Yuba River flows downstream of Our House Diversion Dam. The low-level outlet valve would be used to reduce flows by a maximum of 100 cfs every 2 days for spills between 200 cfs and 600 cfs, and by a maximum of 50 cfs every 2 days for spills less than 200 cfs.

Similarly, proposed measure AR12 would control the ramping rate of spill cessation for flows over Log Cabin Diversion Dam. The spill cessation measure would affect flows over Log Cabin Diversion Dam of 100 cfs or less between April 1 and July 31. Under these conditions, the Log Cabin Diversion Dam low-level outlet would be used to regulate Oregon Creek flows downstream of Log Cabin Diversion Dam. The low-level outlet valve would be used to reduce flows by a maximum of 20 cfs every 4 days.

YCWA does not close the Lohman Ridge Tunnel as part of current project operation. Under proposed measure AR11, it would close Lohman Ridge Diversion Tunnel from October 1 through 31, when the end-of-September New Bullards Bar Reservoir storage is 600,000 acre-feet or more and if California DWR's May Bulletin 120 is a wet, above normal, or below normal water year, as defined in proposed measure WR2. The tunnel would also be closed within 2 business days of when California DWR publishes its April Bulletin 120 through September 30, if April is forecast as a wet water year as defined in proposed measure WR2 and the end of March New Bullards Bar Reservoir storage is 775,000 acre-feet or more. Concurrent with the Lohman Ridge Diversion Tunnel closure, the low-level outlet and fish release valve at Log Cabin Diversion Dam would be fully opened.

Tables 3-23 and 3-24 show the existing project flow requirements that YCWA maintains for the Yuba River downstream of the Narrows 2 Powerhouse and Narrows 2 full bypass[61] by North Yuba Index flow schedule at the Smartsville and Marysville gages.

[61] During times of full or partial powerhouse shutdowns, water is conveyed to the Yuba River through the Narrows 2 full bypass.

Table 3-23. Existing project flow requirements (cfs) for Yuba River downstream of Narrows 2 Powerhouse and Narrows 2 full bypass by North Yuba Index flow schedule[a] at the Smartsville gage 1141800 (Source: YCWA, 2017a).

Month	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
October 1–15	700	700	700	700	600	600	--
October 16–31	700	700	700	700	600	600	--
November 1–30	700	700	700	700	600	600	--
December 1–31	700	700	700	700	550	550	--
January 1–15	700	700	700	700	550	550	--
January 16–31	700	700	700	700	550	550	--
February 1–29	700	700	700	700	550	550	--
March 1–31	700	700	700	700	550	550	--
April 1–15	700	700	700	700	600	600	--
April 16–30	--	--	--	--	--	--	--
May 1–15	--	--	--	--	--	--	--
May 16–31	--	--	--	--	--	--	--
June 1–15	--	--	--	--	--	--	--
June 16–30	--	--	--	--	--	--	--
July 1–31	--	--	--	--	--	--	--
August 1–31	--	--	--	--	--	--	--
September 1–30	700	700	700	700	500	500	--

[a] North Yuba Index schedules and associated thresholds presented in table 3-17.

Table 3-24. Existing project flow requirements (cfs) for Yuba River downstream of Narrows 2 Powerhouse and Narrows 2 full bypass by North Yuba Index flow schedule at the Marysville gage 11421000 (Source: YCWA, 2017a).

Month	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
October 1–15	500	500	500	400	400	350	--
October 16–31	500	500	500	400	400	350	--
November 1–30	500	500	500	500	500	350	--
December 1–31	500	500	500	500	500	350	--
January 1–15	500	500	500	500	500	350	--
January 16–31	500	500	500	500	500	350	--

Month	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
February 1–29	500	500	500	500	500	350	--
March 1–31	700	700	500	500	500	350	--
April 1–15	1,000	700	700	600	500	350	--
April 16–30	1,000	800	700	900	600	500	--
May 1–15	2,000	1,000	900	900	600	500	--
May 16–31	2,000	1,000	900	600	400	400	--
June 1–15	1,500	800	500	400	400	300	--
June 16–30	1,500	500	500	400	400	150	--
July 1–31	700	500	500	400	400	150	--
August 1–31	600	500	500	400	400	150	--
September 1–30	500	500	500	400	400	350	--

Proposed measure AR3 would use different conference year flows for the Yuba River near Smartsville and Marysville to determine required flows downstream of Narrows 2 Powerhouse and Narrows 2 full bypass. Tables 3-25 and 3-26 present the new conference year flows for the Yuba River near Smartsville and Marysville, respectively.

Table 3-25. Proposed project flow requirements (in cfs) for Yuba River downstream of Narrows 2 Powerhouse and Narrows 2 full bypass by North Yuba Index flow schedule at the Smartsville gage 11418000 (Source: YCWA, 2017a).

Month	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
October 1–15	700	700	700	700	600	600	500
October 16–31	700	700	700	700	600	600	500
November 1–30	700	700	700	700	600	600	500
December 1–31	700	700	700	700	550	550	500
January 1–15	700	700	700	700	550	550	500
January 16–31	700	700	700	700	550	550	500
February 1–29	700	700	700	700	550	550	500
March 1–31	700	700	700	700	550	550	500
April 1–15	700	700	700	700	600	600	500
April 16–30	--	--	--	--	--	--	--
May 1–15	--	--	--	--	--	--	--
May 16–31	--	--	--	--	--	--	--

Month	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
June 1–15	--	--	--	--	--	--	--
June 16–30	--	--	--	--	--	--	--
July 1–31	--	--	--	--	--	--	--
August 1–31	--	--	--	--	--	--	--
September 1–30	700	700	700	700	500	500	500

Table 3-26. Proposed project flow requirements (in cfs) for Yuba River downstream of Narrows 2 Powerhouse and Narrows 2 full bypass by North Yuba Index flow schedule at the Marysville gage 11421000 (Source: YCWA, 2017a).

Month	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
October 1–15	500	500	500	400	400	350	350
October 16–31	500	500	500	400	400	350	350
November 1–30	500	500	500	500	500	350	350
December 1–31	500	500	500	500	500	350	350
January 1–15	500	500	500	500	500	350	350
January 16–31	500	500	500	500	500	350	350
February 1–29	500	500	500	500	500	350	350
March 1–31	700	700	500	500	500	350	350
April 1–15	1,000	700	700	600	500	350	300
April 16–30	1,000	800	700	900	600	500	245
May 1–15	2,000	1,000	900	900	600	500	245
May 16–31	2,000	1,000	900	600	400	400	245
June 1–15	1,500	800	500	400	400	300	245
June 16–30	1,500	500	500	400	400	150	150
July 1–31	700	500	500	400	400	150	150
August 1–31	600	500	500	400	400	150	150
September 1–30	500	500	500	400	400	350	150

Based on comments and recommendations, YCWA revised its AR3 proposal and filed it with its reply comments on October 10, 2017. This revised proposal adds water releases of 30,000 acre-feet from New Bullards Bar Reservoir in schedule 6 years to the proposed instream flows in tables 3-25 and 3-26. By April 10 of schedule 6 years,

YCWA would provide a proposed release schedule for the delivery of an additional 30,000 acre-feet at the Marysville gage between June 1 and August 31. This additional water would be released during periods when this water can be accounted for as Delivered Transfer Water under YCWA's December 4, 2007, Water Purchase Agreement with California DWR. YCWA would provide any refinement to the proposed schedule by May 1; the Ecological Group would notify YCWA of any proposed modifications to YCWA's schedule by May 15. If the parties do not reach agreement on the schedule by May 21, YCWA proposes to allocate the 30,000 acre-feet to achieve uniform flows at the Marysville gage during portions of the June 1 through August 31 period when such water is transferable under the Water Purchase Agreement with California DWR.

YCWA currently does not operate project facilities to control ramping rates downstream of the Englebright Dam; however, under proposed measure AR9, YCWA would implement ramping rates to reduce fluctuations in the flow of the Yuba River downstream of Englebright Dam at the Smartsville gage. YCWA would comply with proposed measure AR9 through project operation at New Bullards Bar Reservoir and the operation of the Narrows 2 Development, and by coordinating with PG&E on the operation of the Narrows 1 Powerhouse. Proposed measure AR9 would not apply: (1) in the case of emergencies during project operation; (2) to releases required by the Corps' flood control criteria; (3) to releases required to maintain a flood control buffer or for other flood control purposes; (4) to bypasses of uncontrolled flows into Englebright Reservoir; (5) during times when Englebright Dam is spilling; or (6) when releases are governed by the limits presented in table 3-29 (below).

To minimize the potential for salmonid fry and juvenile stranding year-round, flows in the Yuba River downstream of Englebright Dam would not increase at a rate of more than 500 cfs per hour, nor decrease at a rate in excess of 200 cfs per hour except during Chinook salmon and steelhead breeding and egg development periods as specified in tables 3-27, 3-28, and 3-29. Also, at no point in the year would flows change, either up or down, by more than 15 percent of the average daily flow for the month, nor would they be reduced by more than 30 percent of the previous day's flow at any time.

Table 3-27. Maximum flow reduction downstream of Englebright Dam September 2-December 31 (Source: YCWA, 2017a).

Base Flow Range (cfs)	Maximum Allowable Flow Reduction (cfs) Per Day
450–549	200
550–849	250
850–1,049	300
1,050–1,349	350
1,350–1,599	400
1,600–1,849	450

Base Flow Range (cfs)	Maximum Allowable Flow Reduction (cfs) Per Day
1,850–2,199	500
2,200–2,549	550
2,550–2,899	600
2,900–3,199	650
3.200–3,549	700
3,550–4,130	750

Note: Base flow is defined as the maximum 5-day average flow that occurs between September 2 and December 31 of the current spawning period. Between September 2 and September 5, the base flow is defined as the average daily flow on September 1.

To minimize the potential for Chinook salmon redd dewatering, from September 2 through December 31, the ramping rates shown in table 3-27 would apply. To minimize the potential for steelhead redd dewatering, from January 1 and May 31, the ramping rates shown in table 3-28 would apply.

Table 3-28. Maximum flow reduction rate downstream of Englebright Dam from January 1 to May 31 (Source: YCWA, 2017a).

Base Flow Range (cfs)	Maximum Allowable Flow Reduction (cfs) Per Day
450–499	200
500–549	250
550–649	300
650–849	350
850–1,199	400
1,200–1,449	450
1,450–1,699	500
1,700–1,899	550
1,900–2,149	600
2,150–2,399	650
2,400–2,699	700
2,700–2,949	750
2,950–3,199	800
3,200–3,449	850

Base Flow Range (cfs)	Maximum Allowable Flow Reduction (cfs) Per Day
3,450–3,899	900
3,900–4,130	950

Note: Base flow is defined as the maximum 5-day average flow that occurs between January 1 and May 31. Between January 1 and January 5, the base flow is defined as the average daily flow on December 31. From April 1 through May 31 when flow schedules 3 through 6 or conference years are in effect, the flow downstream of Englebright Dam may be reduced to the applicable minimum streamflow requirement specified in proposed measure AR3.

In addition, to enhance riparian seedling recruitment, YCWA would not reduce streamflow downstream of Englebright Dam from April 1 through July 15 to less than the larger of: (1) the applicable minimum streamflow requirement specified in proposed measure AR3; (2) the flow that would result from applying the maximum flow reduction amount specified in table 3-27; or (3) the flow that would result from applying the maximum flow reduction amount specified in table 3-29.

Table 3-29. Maximum flow reductions rates downstream of Englebright Dam corresponding to the preceding day average flow that has occurred during the period from April 1 to July 15 (Source: YCWA, 2017a).

Previous Day Average Flow Range (cfs)	Maximum Flow Reduction (cfs) Per Hour
400–999	79
1,000–1,999	150
2,000–4,200	200

Note: Releases required by this table would not be used to determine the base flow under table 3-28. In addition, flow reductions greater than those listed in this table may be used if needed to maintain Englebright Reservoir water surface elevation above 516 feet.

YCWA currently does not control the ramping rate of spill cessation flows over New Bullards Bar Dam. Under proposed measure AR4, it would implement a spill cessation ramping rate, where spills of 2,000 cfs or less from New Bullards Bar Dam from May 1 through July 31 would be reduced at a rate of 250 cfs per day until the spill had ceased.

YCWA proposes to operate the low-level outlet valves at Our House Diversion Dam and Log Cabin Diversion Dam during high-flow events between October 1 and March 21 to move sediment trapped behind the diversion dams to the Middle Yuba River and Oregon Creek, respectively (GS2). These actions would be tied to events when inflows exceed 1,500 cfs at Our House Diversion Dam and 540 cfs at Log Cabin Diversion Dam. The low-level outlet at each diversion dam would be opened fully for

9 days, closed half way on the 10th day, and then fully closed on the 11th day. The low-level outlet could be closed during the 11-day period if flow into the impoundment drops below the capacity of the low-level outlet, which is assumed to be 600 cfs at Our House Diversion Dam and 540 cfs for Log Cabin Diversion Dam.

YCWA proposes to monitor compliance with its proposed streamflow and water level conditions AR1, AR3, AR9, and WR6 under proposed measure WR4 (implement the Streamflow and Reservoir Level Compliance Monitoring Plan).

Our Analysis

In study 2.2 (Water Balance/Operations Model), YCWA developed a water balance/operations model to predict inflows and outflows at project facilities and used the model to simulate flows and water levels in project-affected reaches under current conditions and proposed operations (figures 3-13 through 3-27). For modeling purposes, YCWA defined the no-action scenario as current operations, which include all of the flow requirements in the Yuba Accord. YCWA's proposed project scenario includes all of the operational requirements and flow-related measures proposed in the amended final license application, which also includes the flow requirements in the Yuba Accord. YCWA also modeled a without-project scenario, which includes synthetic mean daily hydrology as if the project had not been constructed, but all other water projects (i.e., South Feather Water and Power Agency's South Feather Power Project [FERC No. 2088], Nevada Irrigation District's Yuba-Bear Hydroelectric Project [FERC No. 2266], and PG&E's Drum-Spaulding Project [FERC No. 2310]) in the basin are operating.

In addition, YCWA's water balance/operations model reflects future conditions under YCWA's proposed project in 2062. This dataset comprises synthetic mean daily hydrology for the geographic area immediately upstream from the project, including new license conditions and water delivery demands for the upstream projects including South Feather Water and Power Agency's South Feather Power Project (FERC No. 2088), Nevada Irrigation District's Yuba-Bear Hydroelectric Project (FERC No. 2266), and PG&E's Drum-Spaulding Project (FERC No. 2310). The synthetic flows resulting from simulations of the upstream projects are used as inflows to the project. The proposed New Colgate Powerhouse tailwater depression system and New Bullards Bar Dam flood control outlet are also incorporated into the model.

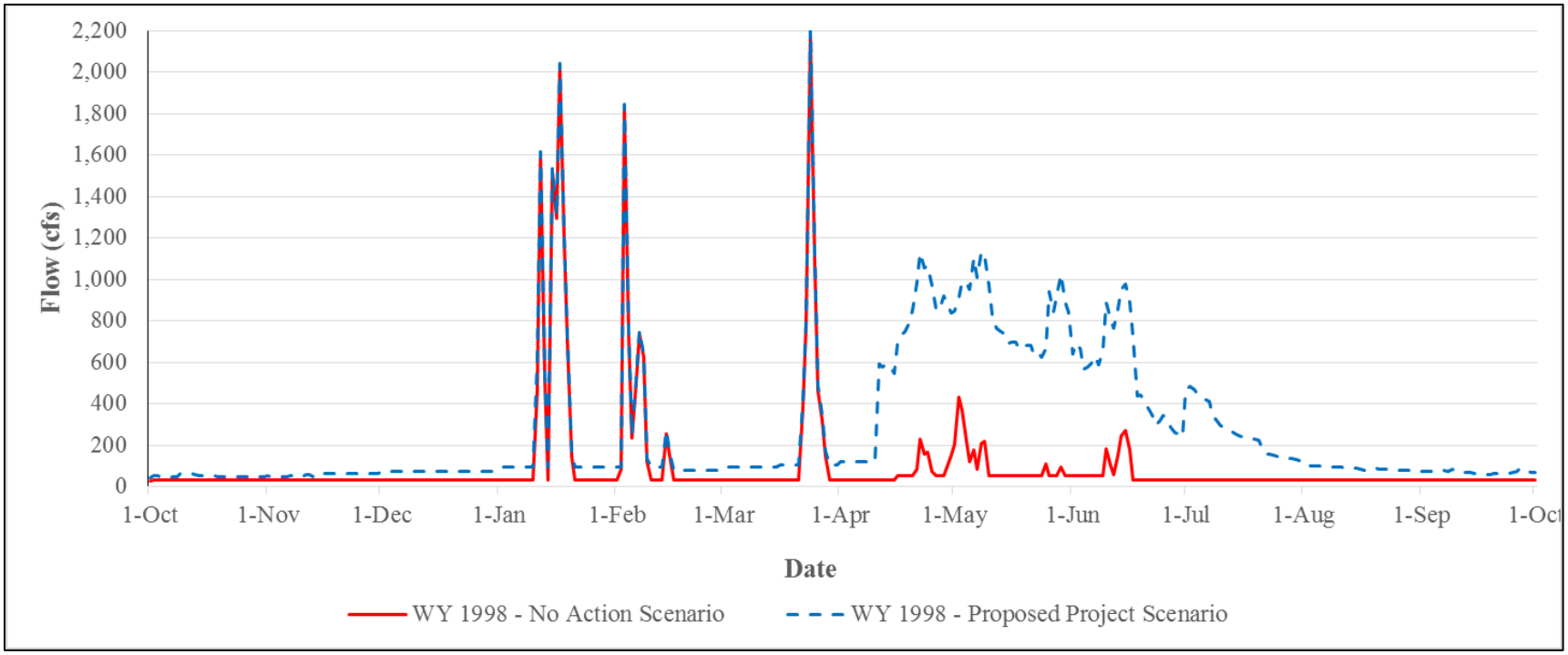

Figure 3-13. Simulated daily flows for Middle Yuba River below Our House Diversion Dam for YCWA's no action and proposed project scenario for representative wet (1998) water year (Source: YCWA, 2017a).

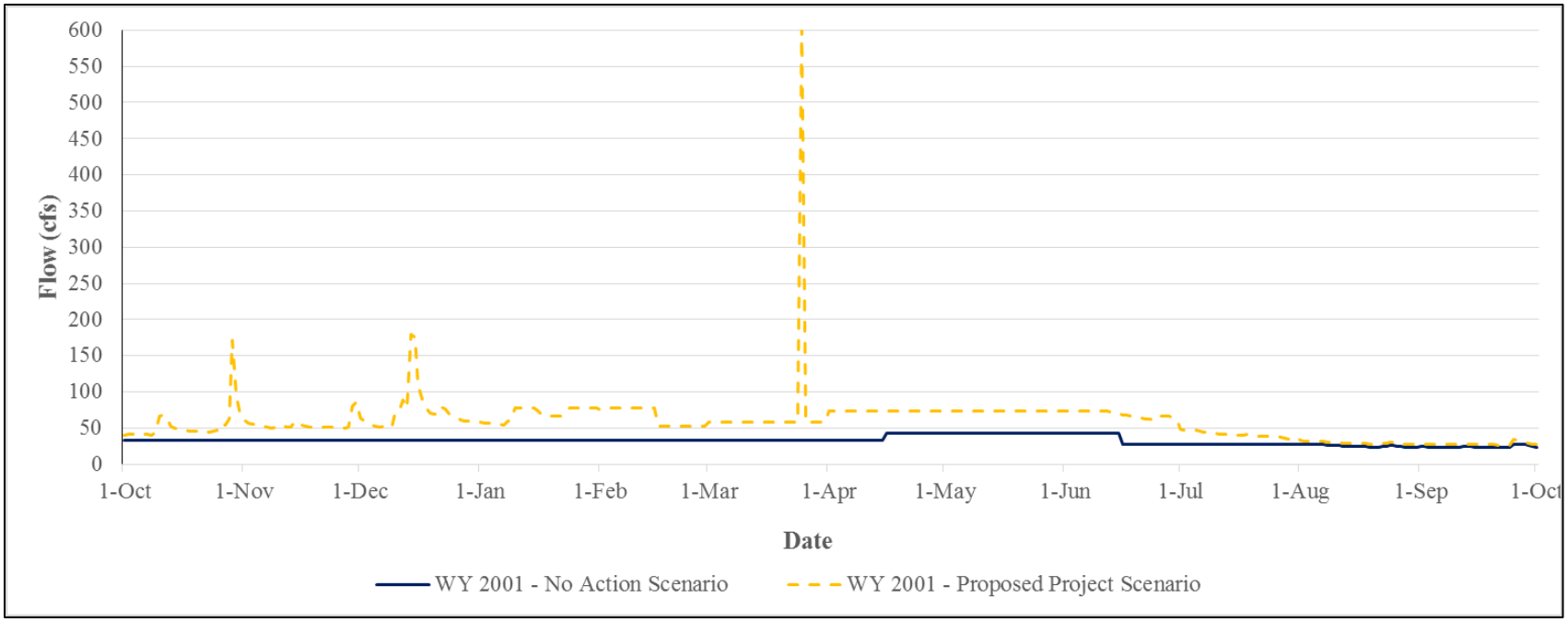

Figure 3-14. Simulated daily flows for Middle Yuba River below Our House Diversion Dam for YCWA's no action and proposed project scenario for representative dry (2001) water year (Source: YCWA, 2017a).

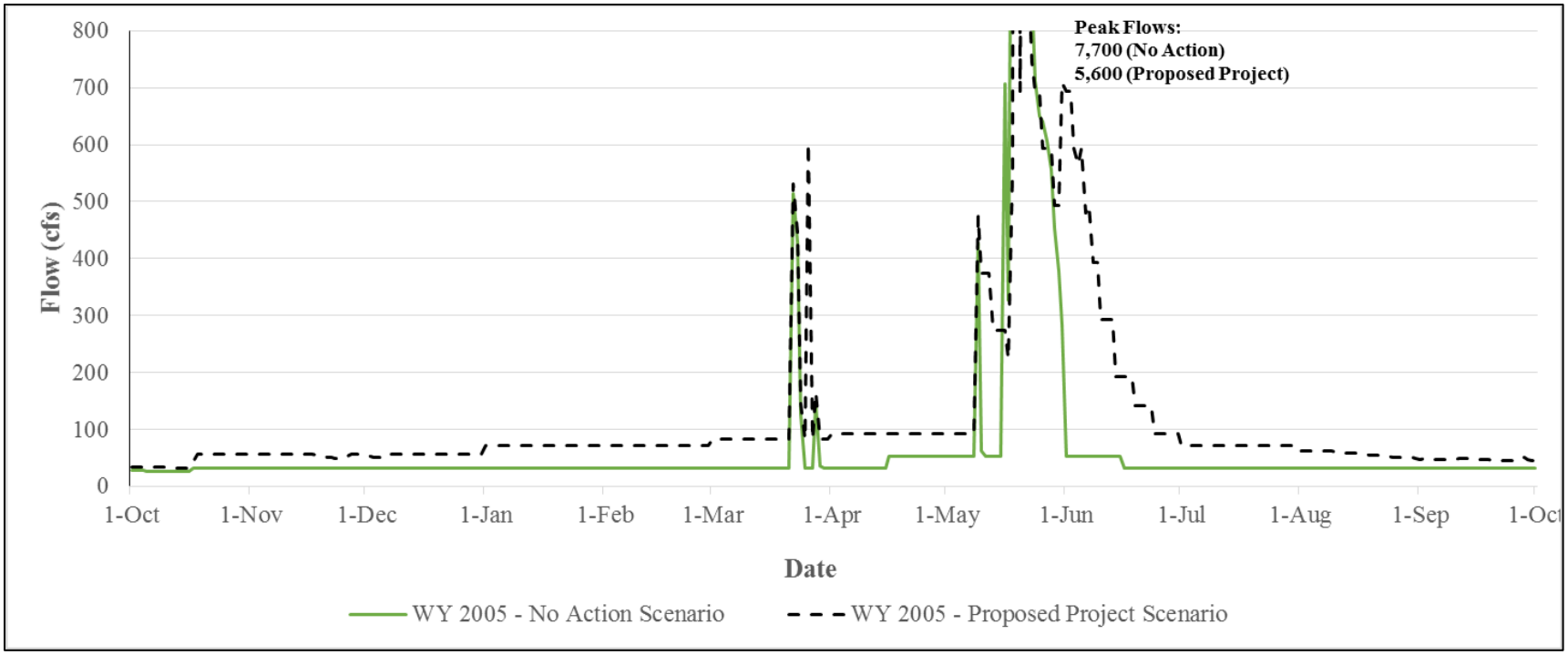

Figure 3-15. Simulated daily flows for Middle Yuba River below Our House Diversion Dam for YCWA's no action and proposed project scenario for representative normal (2005) water year (Source: YCWA, 2017a).

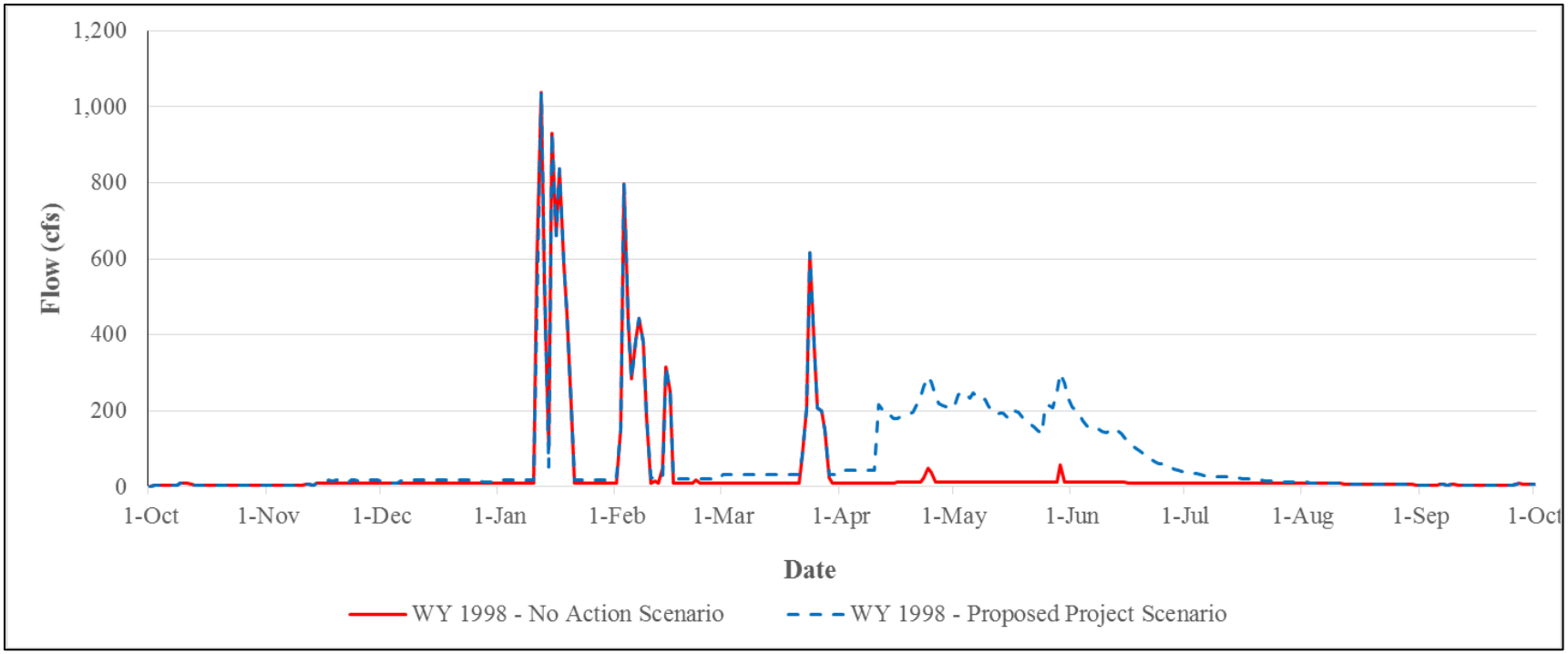

Figure 3-16. Simulated daily flows for Oregon Creek below Log Cabin Diversion Dam for YCWA's no action and proposed project scenario for representative wet (1998) water year (Source: YCWA, 2017a).

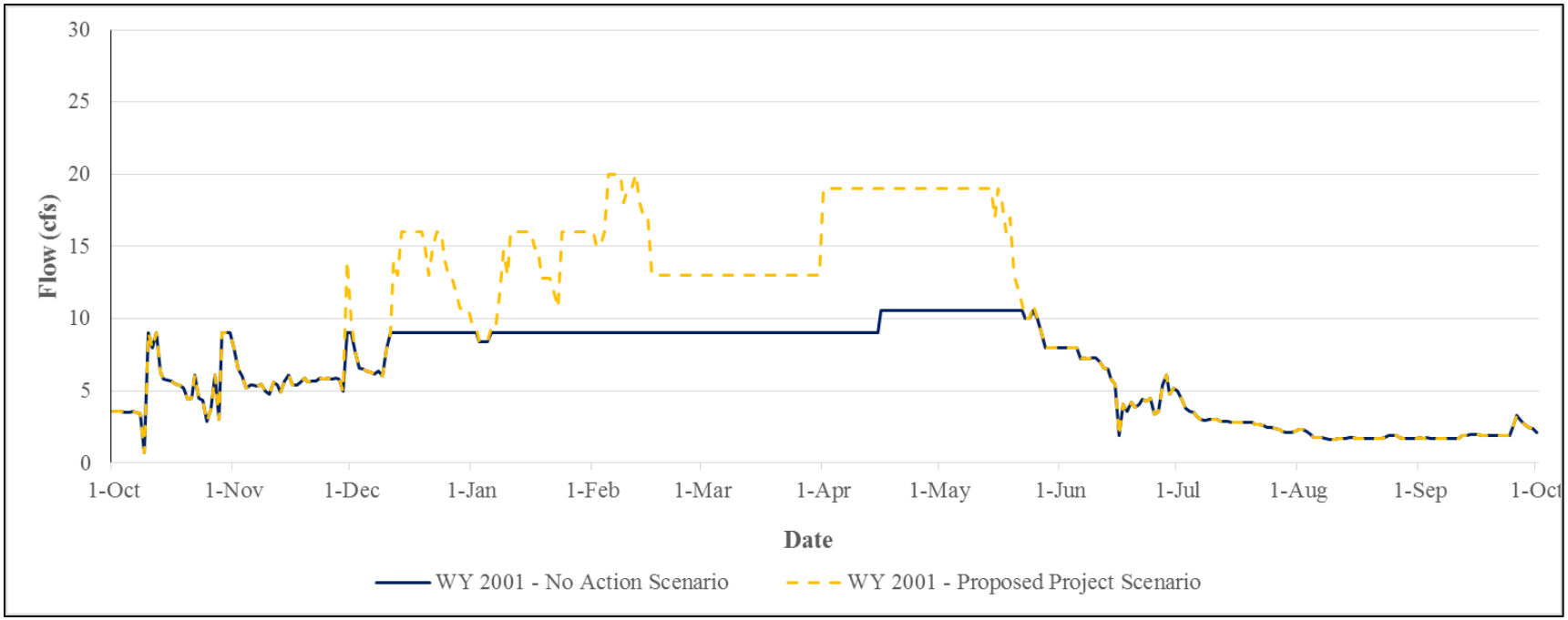

Figure 3-17. Simulated daily flows for Oregon Creek below Log Cabin Diversion Dam for YCWA's no action and proposed project scenario for representative dry (2001) water year (Source: YCWA, 2017a).

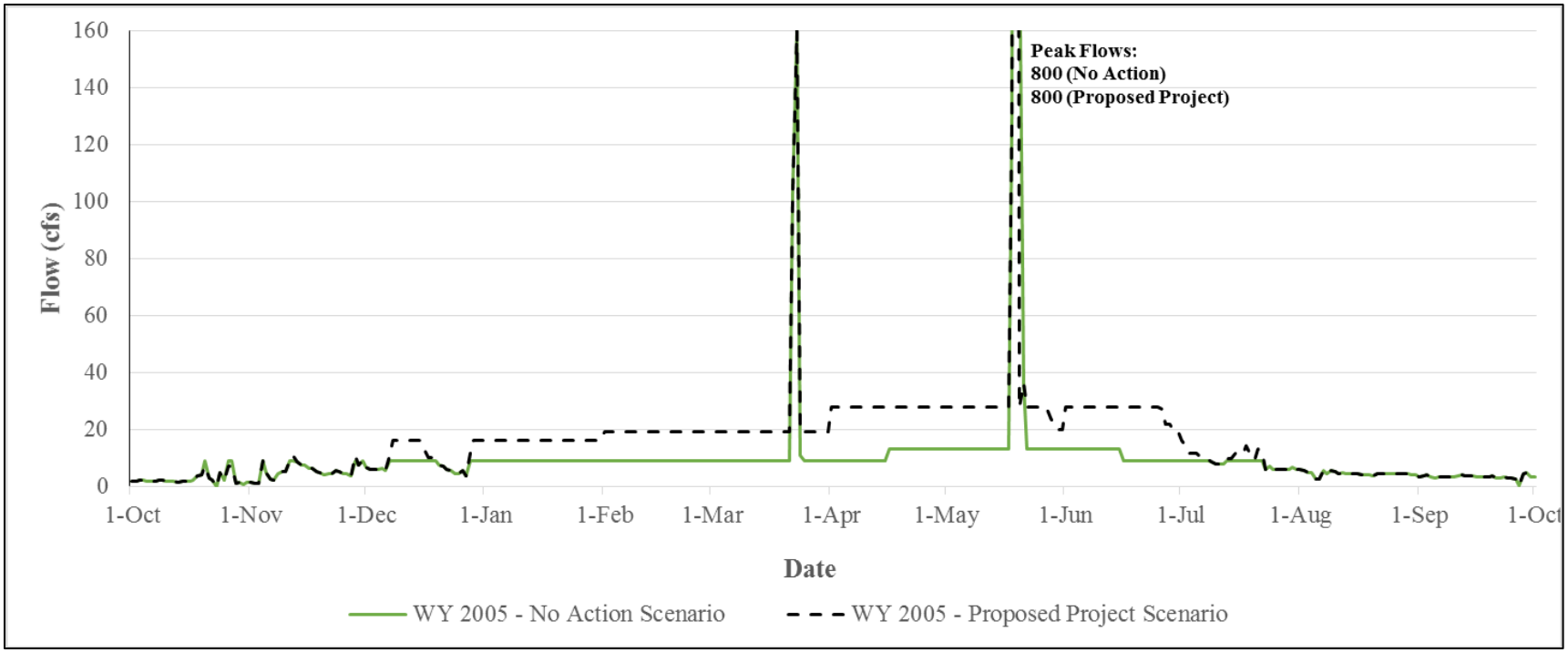

Figure 3-18. Simulated daily flows for Oregon Creek below Log Cabin Diversion Dam for YCWA's no action and proposed project scenario for representative normal (2005) water year (Source: YCWA, 2017a).

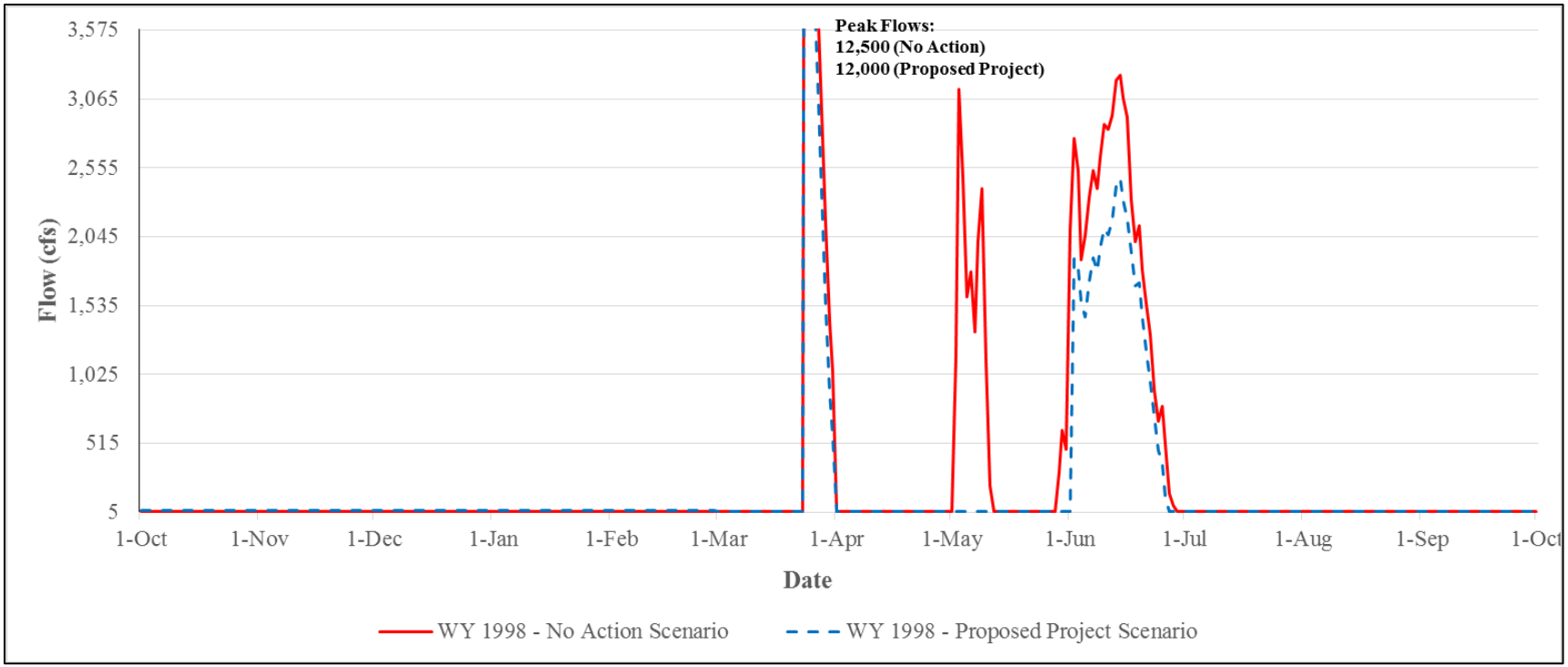

Figure 3-19. Simulated daily flows for the North Yuba River below New Bullards Bar Reservoir for YCWA's no action and proposed project scenario for representative wet (1998) water year (Source: YCWA, 2017a).

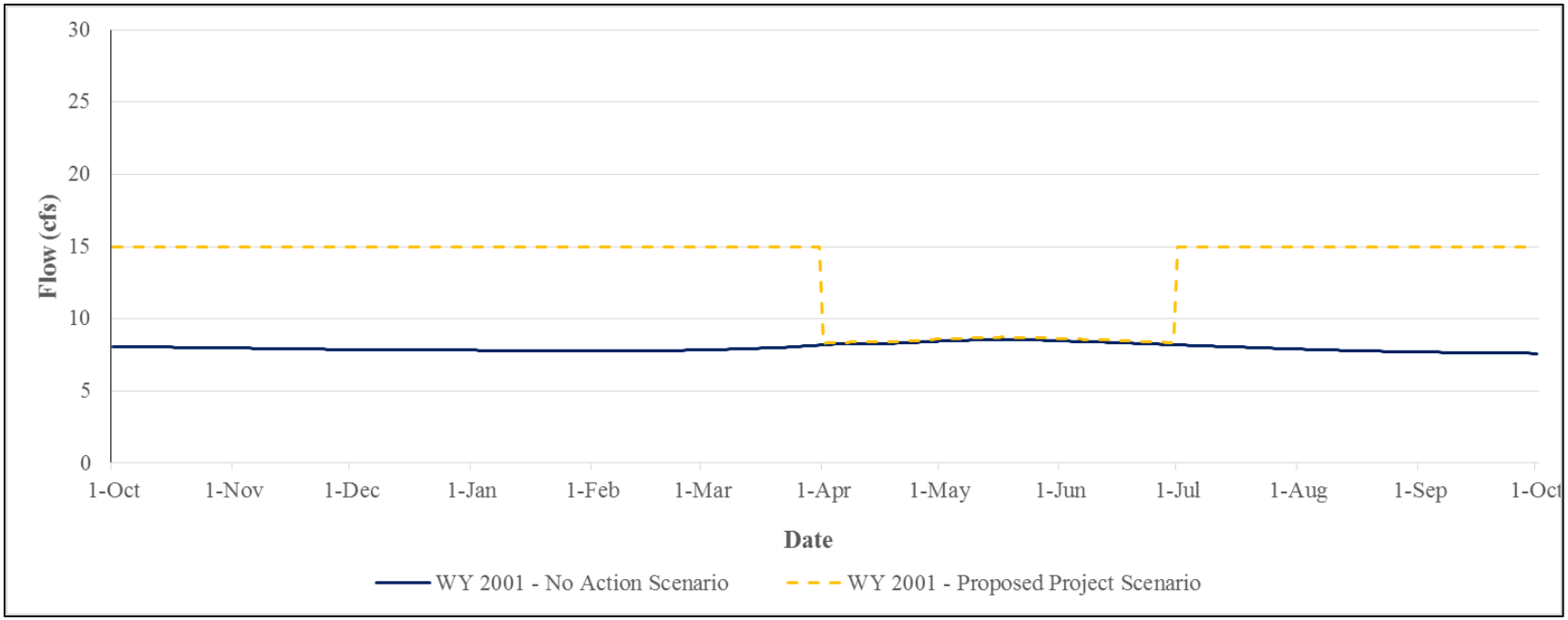

Figure 3-20. Simulated daily flows for the North Yuba River below New Bullards Bar Reservoir for YCWA's no action and proposed project scenario for representative dry (2001) water year (Source: YCWA, 2017a).

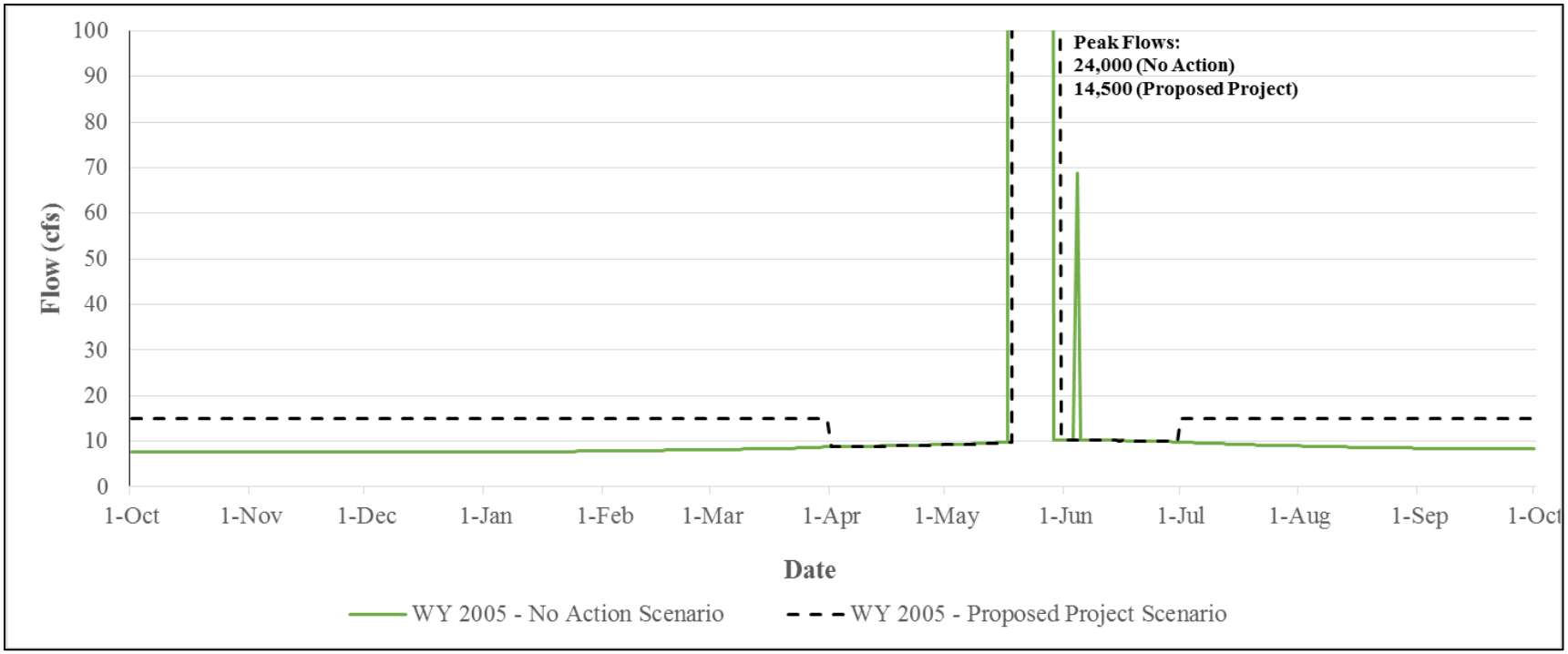

Figure 3-21. Simulated daily flows for the North Yuba River below New Bullards Bar Reservoir for YCWA's no action and proposed project scenario for representative normal (2005) water year (Source: YCWA, 2017a).

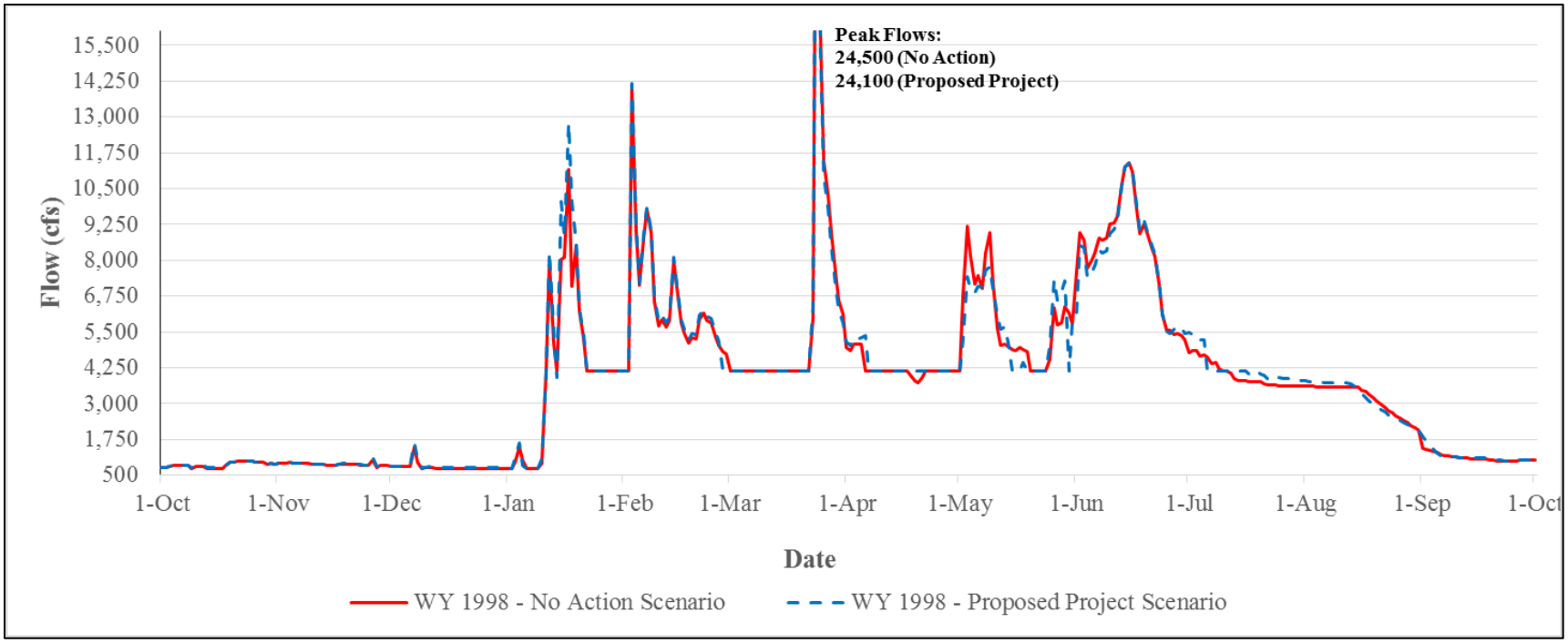

Figure 3-22. Simulated daily flows for the Yuba River near Smartsville for YCWA's no action and proposed project scenario for representative wet (1998) water year (Source: YCWA, 2017a).

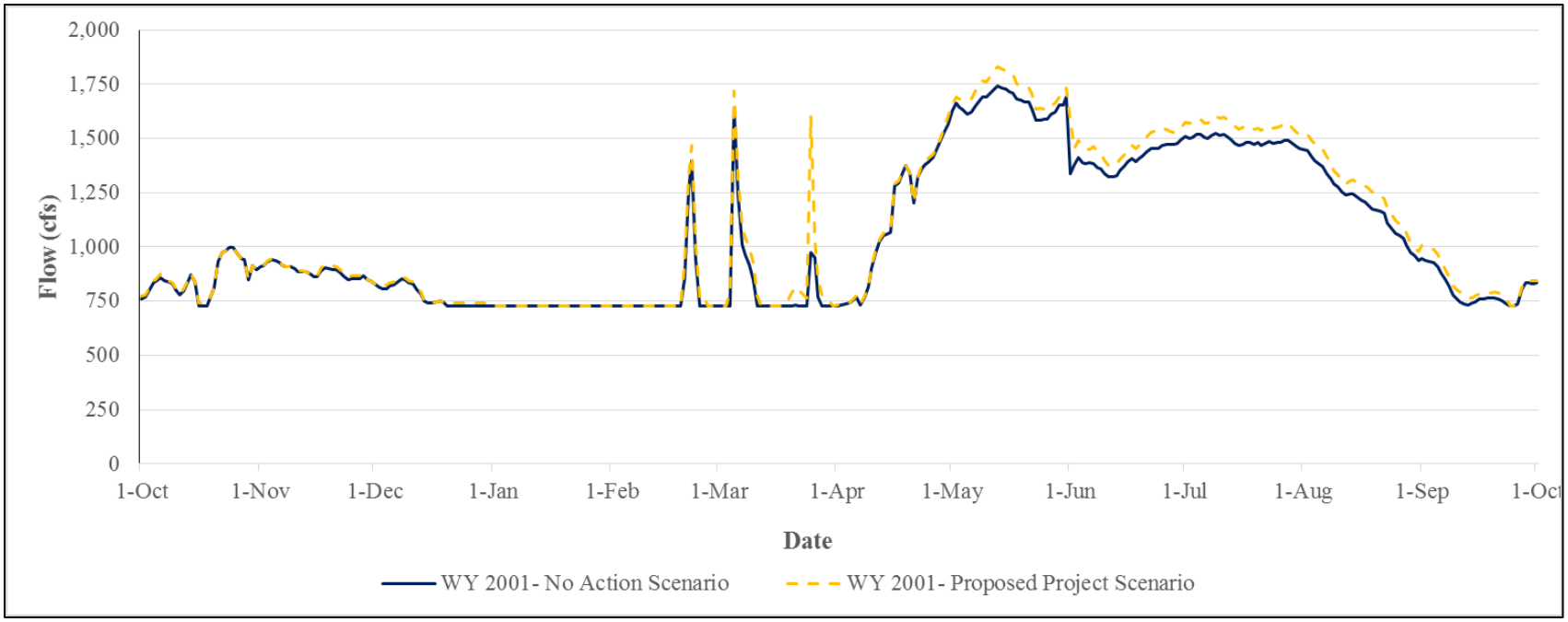

Figure 3-23. Simulated daily flows for the Yuba River near Smartsville for YCWA's no action and proposed project scenario for representative dry (2001) water year (Source: YCWA, 2017a).

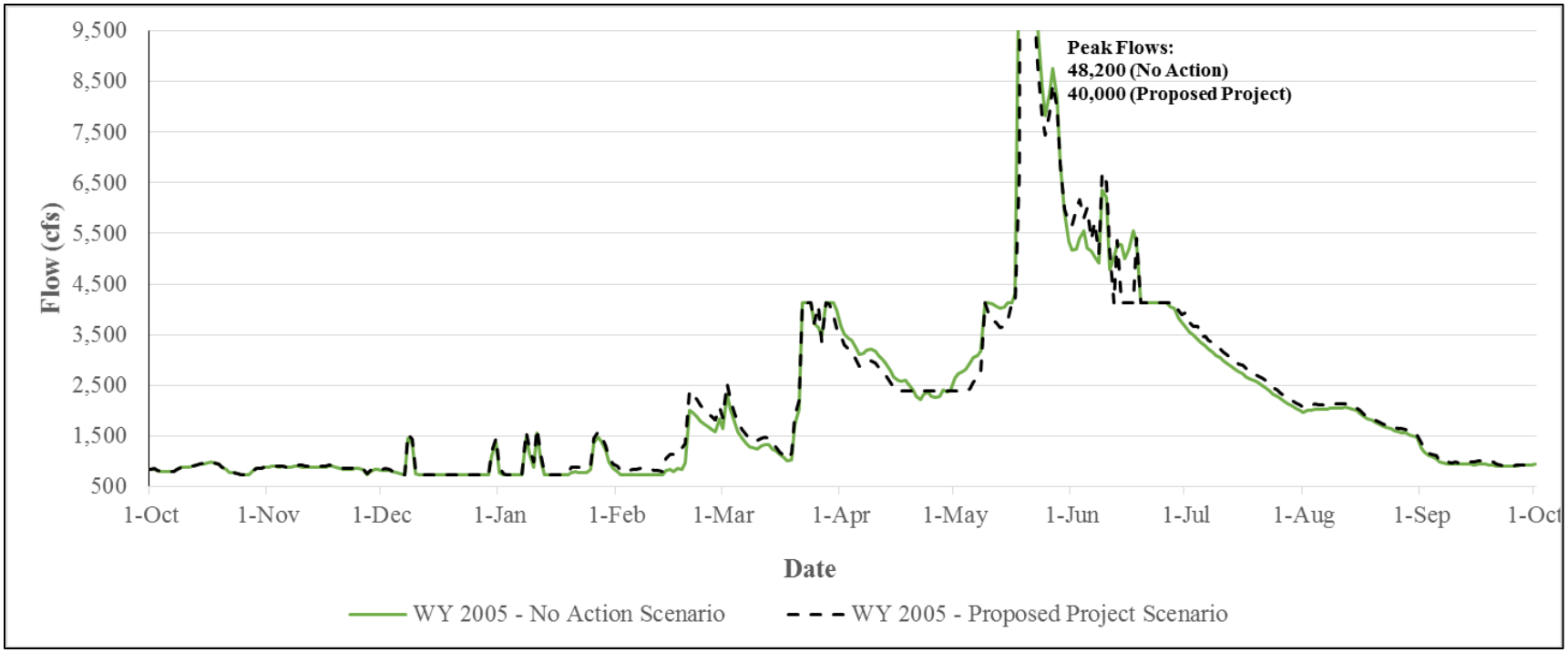

Figure 3-24. Simulated daily flows for the Yuba River near Smartsville for YCWA's no action and proposed project scenario for representative normal (2005) water year (Source: YCWA, 2017a).

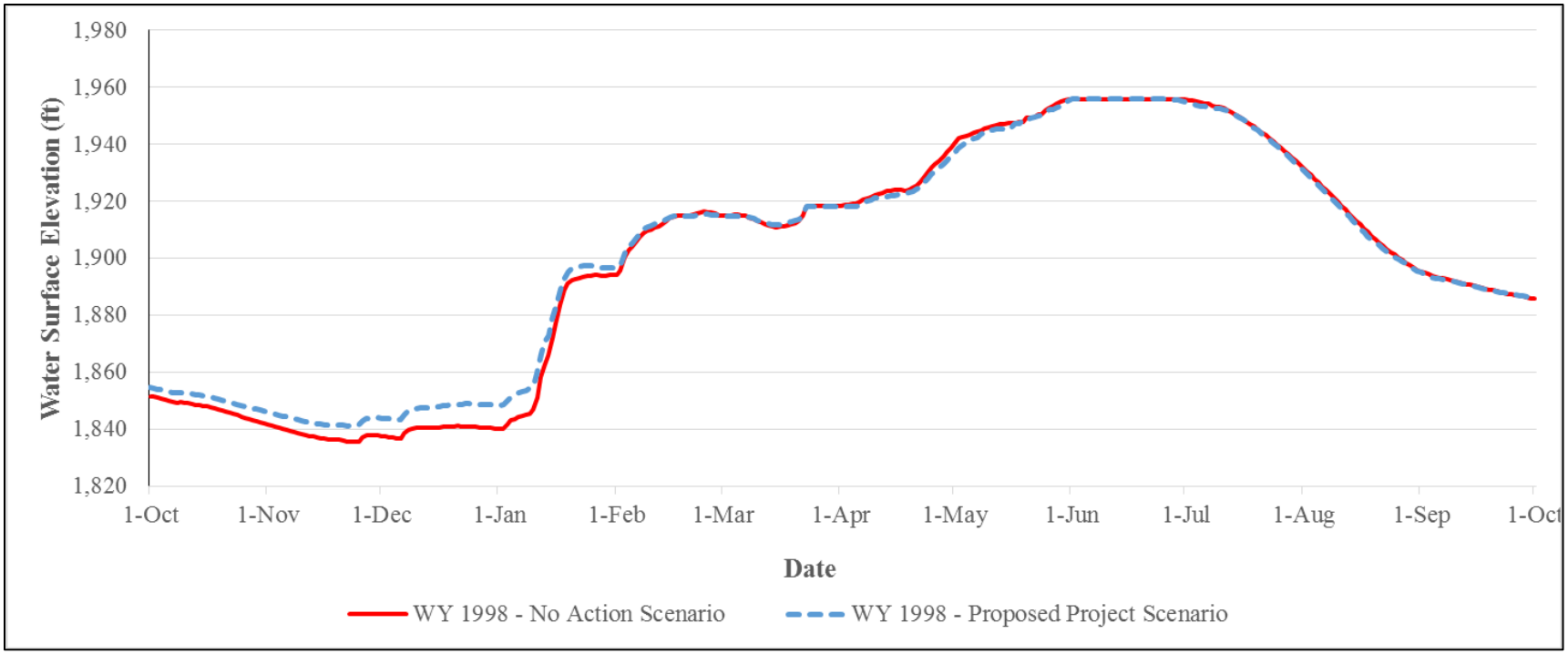

Figure 3-25. Simulated daily New Bullards Bar Reservoir water surface elevation for YCWA's no action and proposed project scenario for representative wet (1998) water year (Source: YCWA, 2017a).

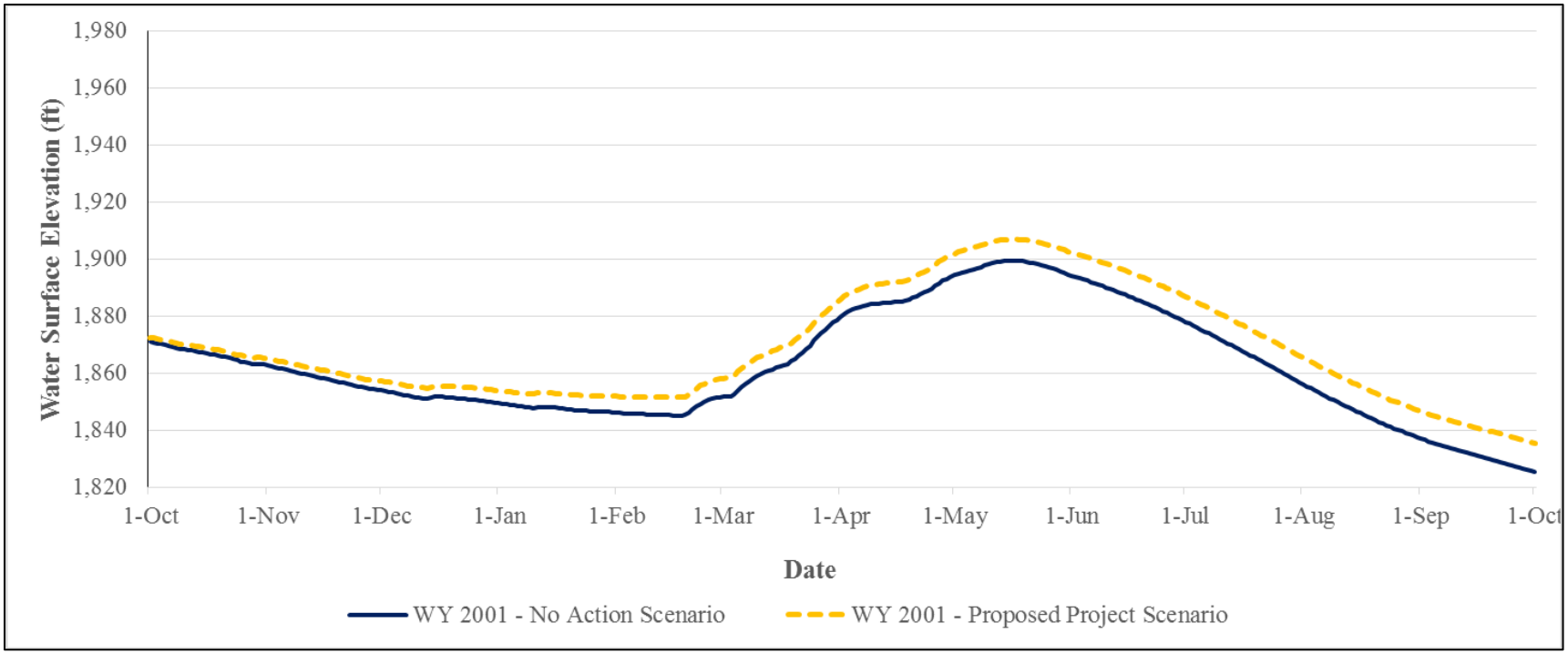

Figure 3-26. Simulated daily New Bullards Bar Reservoir water surface elevation for YCWA's no action and proposed project scenario for representative dry (2001) water year (Source: YCWA, 2017a).

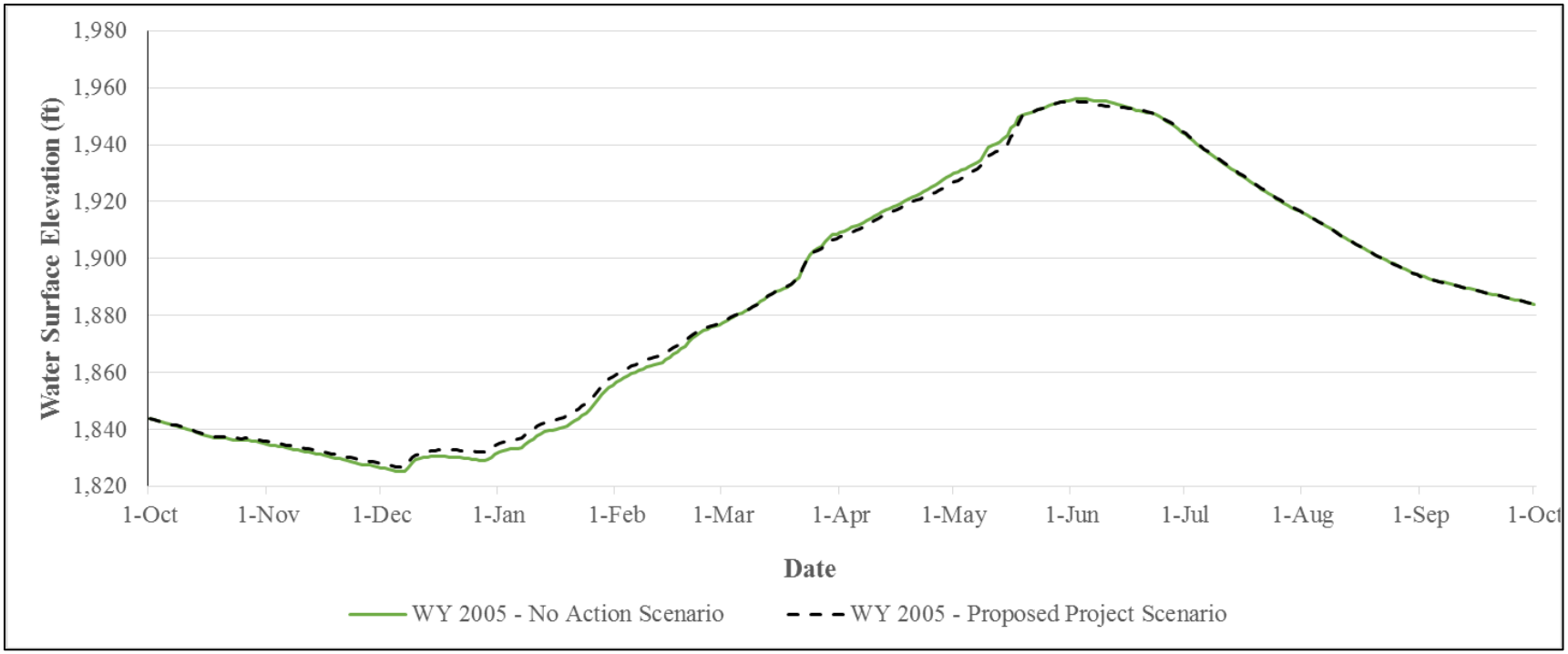

Figure 3-27. Simulated daily New Bullards Bar Reservoir water surface elevation for YCWA's no action and proposed project scenario for representative normal (2005) water year (Source: YCWA, 2017a).

Simulated daily flows for the Middle Yuba River below Our House Diversion Dam, Oregon Creek below Log Cabin Diversion Dam, North Yuba River below New Bullards Bar Reservoir, and the Yuba River near Smartsville are presented in figures 3-13 through 3-24 for YCWA's no action and proposed project scenario for representative wet, dry, and normal water years. Simulated daily New Bullards Bar Reservoir water surface elevation for YCWA's no action and proposed project scenario is presented in figures 3-25 through 3-27 for representative wet, dry, and normal water years. Effects of these changes in project flows and reservoir water levels on specific resources are addressed in following sections.

Water Year Type Determination

Our House Diversion Dam, Log Cabin Diversion Dam, and New Bullards Bar Dam

California DWR and other water management agencies and hydropower projects in the region account for hydrologic variability by establishing water year types that guide water allocation decisions. The water year type determination at the project would govern how instream flow releases are adjusted based on the surrounding river basin conditions.

YCWA proposes to implement a water year classification scheme for project-affected stream reaches upstream of Englebright Reservoir, including Middle Yuba River below Our House Diversion Dam, Oregon Creek below Log Cabin Diversion Dam, and North Yuba River below New Bullards Bar Reservoir (WR2). YCWA would use the Smartsville Hydrologic Index water year determination to implement proposed measures AR1, AR2, AR4, AR10, AR11, and AR12, depending on water year type. Table 3-17, above, defines water year types for the Smartsville Hydrologic Index.

California DWR's Bulletin 120, *Water Year Conditions in California,* is a publication issued four times a year, in the second week of February, March, April, and May, forecasting the volume of seasonal runoff from the state's major watersheds. It provides summaries of precipitation, snowpack, reservoir storage, and runoff to define water year type classifications.

YCWA's proposed water year types under the Smartsville Hydrologic Index would be based on California DWR's water year forecast of unimpaired runoff in the Yuba River at Smartsville as set forth in Bulletin 120. The forecast would apply from the 16th day of that month through the 15th day of the next month. From May 16 through October 15, the water year type would be based on DWR's forecast published in May. From October 16 through February 15 of the following year, the water year type would be based on the sum of California DWR's monthly full natural flow for the full water year for the Yuba River near Smartsville, as made available by California DWR on the California Data Exchange Center. If California DWR does not make the full natural flow for the full water year available until after October 15 but prior to or on October 31, from 3 days after the date the full natural flow is made available until February 15 of the

following year, the water year type would be based on the sum of California DWR's monthly full natural flow for the full water year as made available. If California DWR does not make available the final full natural flows by October 31, the water year type from November 1 through February 15 of the following year would be based on California DWR's May Bulletin 120.

YCWA's proposal to implement the Smartsville Hydrologic Index water year type classification scheme for project-affected stream reaches above Englebright Reservoir is specified by Forest Service (4(e) condition 31) and Water Board (4(e) condition 4), and recommended by California DFW (10(j) recommendation 2.1), Forest Service (10(a) recommendation 1), and FWS.

Our Analysis

Existing license conditions presented in section 2.1.4, *Existing Environmental Measures*, describe current minimum streamflow schedules and guide project operation for project-affected stream reaches above Englebright Reservoir. YCWA's proposed flow measures would increase existing minimum flows and create a new set of complex flow and water management conditions that would guide proposed project operation. Typically, the multifaceted water management requirements (e.g., water diversions, water rights, and coordinated operations with other hydroelectric facilities) of the project region require establishing a water year type classification scheme to account for the hydrologic variability of the Yuba River Watershed.

This measure establishes five water year types that would trigger various conditions (e.g., minimum flow releases) in the new license. YCWA proposes a categorization of water year types based on the historical distribution (90-, 50-, and 10-percent exceedance) of unimpaired annual runoff in the Yuba River at Smartsville. Establishing water year type thresholds based on historical runoff hydrology accounts for overall basin wetness and inflows, allowing YCWA to operate the project in a manner that most closely correlates with the natural hydrograph of the Yuba River.

YCWA's proposal to establish a Smartsville Hydrologic Index based on California DWR's forecasts for annual unimpaired flow volume in the Yuba River at Smartsville to establish minimum flows in the North Yuba River, Middle Yuba River, and Oregon Creek would be appropriate given that inflows from the upstream watershed are controlled by precipitation and snowpack. This type of index is also used at nearby projects, including the Yuba-Bear Hydroelectric Project (FERC No. 2266) and the Drum-Spaulding Project (FERC No. 2310).

Narrows 2 Powerhouse and Narrows 2 Full Bypass

Inter-annual variability in precipitation and runoff is an important natural condition to which aquatic communities are adapted, and it can affect community resilience and diversity. YCWA proposes to implement a water year classification scheme (the North Yuba Index) for project-affected stream reaches downstream of Englebright Reservoir, including the Yuba River downstream of the combined releases of

Narrows 2 Powerhouse and Narrows 2 full bypass (WR3). YCWA proposes to use the North Yuba Index to implement proposed conditions of any new license that depend on water year type and concern flows in project-affected stream reaches (AR3 and AR10). Water year types (referred to as schedules 1-5 and conference years) for YCWA's proposed North Yuba Index are defined in table 3-18, above.

YCWA would determine the applicable water year type using the California DWR-published Bulletin 120, in February, March, April, and May, and then thereafter whenever California DWR issues an update to the Bulletin 120. In addition to the Bulletin 120 forecast, the North Yuba Index would be defined by specific project parameters, including New Bullards Bar Reservoir inflows and storage amounts.[62]

Forecasted inflow to New Bullards Bar Reservoir would be determined each month using statistically derived linear coefficients, applied to the measured inflow to New Bullards Bar Reservoir; the California DWR's Bulletin 120 for February, March, April, and May; and subsequent updates of forecasts of unimpaired flow of the North Yuba River at Goodyears Bar (USGS gage 11413000) and at the Yuba River at Smartsville (USGS gage 11418000). California DWR's forecast published in February, March, and April, would apply from the 16th day of that month to the 15th day of the next month. After May 16, the North Yuba Index would be recalculated for each subsequent Bulletin 120 update, and would apply until 2 days after the next update. The North Yuba Index determined by the final Bulletin 120 update for the water year would remain in effect until February 14 of the following water year.

In addition, when the current water year type is a schedule 5, 6, or conference year and the total volume of inflow to New Bullards Bar Reservoir from October 1 through January 31 is less than 220,000 acre-feet, YCWA would not reevaluate the applicable water type in February of the following water year.

California DFW and FWS agree with YCWA's proposal to implement the North Yuba Index water year type classification scheme for project-affected stream reaches below Englebright Reservoir.

Our Analysis

Proposed measure WR3 would determine water year types based on the North Yuba Index, an indicator of the amount of water available in the North Yuba River at New Bullards Bar Reservoir to achieve flows in the lower Yuba River. The use of the North Yuba Index, established during the development of the Yuba Accord, allows YCWA to take advantage of carryover storage in New Bullards Bar Reservoir. YCWA uses stored water in New Bullards Bar Reservoir to plan for and ensure water deliveries

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[62] Calculations defining the North Yuba Index are located in YCWA's amended license application in appendix E2, *Proposed Conditions*, section E2.3.3, on pages E2-21 through E2-23.

to in-basin customers in drier water year types, as well as provide higher instream flows in the lower Yuba River than would be possible if only using an individual year water year type classification.

The North Yuba Index is determined, in part, by using California DWR's Bulletin 120 forecast of unimpaired flow and an assumption of average precipitation for future conditions. A higher level of variability exists in California DWR's February forecasts, compared to March, April, and May forecasts because February is early in the wet season for the project region. According to both California DFW and the Water Board, California DWR's current methodology of using an average forward-looking precipitation estimate can overestimate future precipitation in a dry climate cycle (i.e., a drought). In drought conditions, an assumption of average precipitation for the future condition could result in a change from the previous years' higher water year type (schedule 5 and 6) to a lower flow schedule February water year type (schedule 1–4) that is meant for wetter conditions. When this occurs, it increases YCWA's minimum flow requirement at the Smartsville gage from 550 cfs to 700 cfs and would result in the release of an additional 8,500 acre-feet of water from New Bullards Bar Reservoir.

YCWA's proposal to modify the existing North Yuba Index and forego reevaluating water year type in February of the following year, when the current water year type is a schedule 5, 6, or conference year and the total volume of inflow to New Bullards Bar Reservoir from October 1 through January 31 is less than 220,000 acre-feet, is intended to avoid a required minimum flow release increase when flows would then be reduced by a March California DWR Bulletin 120 forecast showing a drier water year type. Table 3-30 shows the count and percent of occurrences of past North Yuba Index water types for water years 1970 through 2016. Over the past 47 water years, 97 percent of North Yuba Index forecasts have resulted in water year types of schedule 4 or lower (wetter conditions). Schedule 5, 6, or conference year forecasts are expected to occur around 3 percent of the time, with conference years expected to occur around 1 percent of the time. Hydrologic conditions requiring YCWA to implement its proposal would be infrequent.

As noted above, California DFW and other resource agencies agree that California DWR's current methodology of using an average forward-looking precipitation estimate can overestimate future precipitation and subsequent runoff in a dry climate cycle. As such, California DFW and FWS agree that YCWA should forego reevaluating water year type in February of the following year, when the current water year type is a schedule 5, 6, or conference year and the total volume of inflow to New Bullards Bar Reservoir from October 1 through January 31 is less than 220,000 acre-feet.

Table 3-30. North Yuba Index for water years 1970–2016 (Source: California DWR, 2017).

Water Year Classification	Index Value (thousand acre-feet)	Count (number of water years) [a]	Percent of Occurrence
Schedule 1	Equal to or greater than 1,400	29	62
Schedule 2	Equal to or greater than 1,040 and less than 1,400	9	20
Schedule 3	Equal to or greater than 920 and less than 1,040	5	11
Schedule 4	Equal to or greater than 820 and less than 920	2	4
Schedule 5	Equal to or greater than 693 and less than 820	1	1.5
Schedule 6	Equal to or greater than 500 and less than 693	0	0
Conference year	Less than 500	1	1.5

[a] Water years 2011 through 2016 based on estimated staff calculations.

YCWA anticipates annual water demands for consumptive uses (e.g., irrigation diversions) to increase by 20,000 acre-feet per year with the completion of nearby irrigation projects in southern Yuba County. YCWA's proposal would result in additional water storage in New Bullards Bar Reservoir. YCWA could use this additional storage to meet a portion of other regional water demand needs during critical dry water years. In some circumstances (i.e., when California DWR's Bulletin 120 forecasts a wet February followed by a dry March), YCWA would be correct in not releasing additional water, and water that otherwise would have been lost could benefit agricultural resources. By choosing to forego the reevaluation of the water year type in February during a drought and/or multiple critically dry years based on California DWR forecasts as recommended by YCWA and as supported by the commenting agencies, YCWA would more closely mimic the natural hydrograph of the Yuba River.

Coordinated Operations

YCWA and PG&E currently try to coordinate releases from the Narrows 2 Powerhouse, full bypass and partial bypass, and PG&E's Narrows 1 Powerhouse (which is located immediately downstream of YCWA's Narrows 2 Powerhouse) in a mutual effort to comply with the Article 33 streamflow requirements for the Yuba River

Development Project. However, YCWA and PG&E are not required to coordinate operations.

YCWA proposes to develop and implement a plan to coordinate operations of the project with PG&E's Narrows 1 Powerhouse (FERC No. 1403) to assure implementation of YCWA's other proposed flow-related measures (GEN4). YCWA would develop the coordinated operations plan in consultation with PG&E. YCWA would file the plan with the Commission and implement those portions of the plan that apply to YCWA project operation. YCWA proposes to consult with the Commission if YCWA and PG&E are unable to reach agreement on a coordinated operations plan.

YCWA's proposal to implement the coordinated operations plan for the project is recommended by California DFW (10(j) recommendation 2.8) and specified by Water Board (preliminary 401 condition 28). The Water Board also specifies the submittal of status updates during the development of the coordinated operations plan.

Our Analysis

PG&E's Narrows 1 Powerhouse is located on the opposite side of the Yuba River, about 0.25-mile downstream of YCWA's Narrows 2 Powerhouse. Both powerhouses receive water from Englebright Reservoir and measure license compliance at streamflow gages on the Yuba River downstream of the facilities. While the projects operate in close coordination, developing and implementing a coordinated operations plan is not necessary to ensure implementation of the Yuba River Development Project license conditions. Both PG&E and YCWA have contracts with the Corps that regulate releases through the respective projects. YCWA would continue to be required to meet the terms of its contract with the Corps and the terms of any new license, irrespective of how PG&E operates the Narrows 1 Powerhouse. Therefore, we have not identified any environmental benefit to a coordinated operations plan.

Flood Control

Flood control for the Yuba River was one of the primary reasons for the construction of New Bullards Bar Dam. The project controls about half of the flood flows of the Yuba River Watershed, with the remainder of the runoff left largely uncontrolled. YCWA estimates that without the project, the peak flow for the 100-year flood on the Yuba River at Marysville could reach 260,000 cfs.[63] Under existing conditions, the peak flow for the 100-year flood event would be about 153,000 cfs.

To increase flood protection and enhance floodplain functions and habitat, YCWA proposes to continue to operate New Bullards Bar Reservoir for flood control (WR6) and

[63] The without-project hydrology dataset used in YCWA's operations model includes mean daily hydrology as if the project had not been constructed (i.e., no project facilities in place, but all other water projects in the basin are operating).

to use the proposed auxiliary flood control outlet in advance of extreme flood conditions for better flood management. YCWA anticipates the increased flexibility in flood management would allow for a reduction in flood flows and a reduced flood stage at Marysville and at the Feather River confluence. In YCWA's response to the Commission's March 4, 2014, letter requesting clarification on the operation of the proposed auxiliary flood control outlet, YCWA notes that the new outlet would be operated under two specific scenarios.

- The new flood control outlet would be operated if a large storm event is forecasted to occur within the near future, and the combination of New Bullards Bar Reservoir storage and the contributing watershed to New Bullards Bar Reservoir are in a state that the storm event would necessitate large releases from New Bullards Bar Reservoir. Under this scenario, the proposed outlet would be used to make releases from New Bullards Bar Reservoir in anticipation of the storm event, to reduce the subsequent required peak release from the reservoir.
- If a large storm event is forecasted to occur within the near future, and there is a concern that the required peak release from New Bullards Bar Dam would coincide with the peak release from California DWR's Lake Oroville Project (FERC No. P-2100), the proposed outlet would be used to make releases from New Bullards Bar Reservoir in anticipation of the storm event, so the peak flow would occur earlier than it would otherwise have occurred. This would allow for better management of flood operations from Oroville Reservoir.

The proposed auxiliary flood control outlet would have a discharge capacity ranging from 45,000 cfs at the bottom of the New Bullards Bar Reservoir flood pool (1,918 feet) to 66,000 cfs when the reservoir is at the NMWSE (1,956 feet). However, YCWA notes the existing New Bullards Bar Dam spillway would continue to serve as the primary flood management release facility for the New Bullards Bar Reservoir.

FWN supports YCWA's proposed measure to continue to operate New Bullards Bar Reservoir for flood control.

Our Analysis

New Bullards Bar Reservoir reserves 170,000 acre-feet for flood control between mid-September and the end of May each year. Continuing to operate the project for flood control aids in keeping flows in the lower Yuba River within the levee design capacity of 135,000 cfs.

YCWA's proposal to construct a flood control outlet at an elevation of 1,865 feet, which is 37 feet lower than the crest of the existing New Bullards Bar Dam spillway, would provide YCWA with an additional 100,000 acre-feet of flood reservation that is currently unavailable because of the existing spillway elevation. This additional flood space would result from YCWA's ability to release stored water in anticipation of a large storm event. This would provide YCWA with greater flexibility in flood management

operations during larger flood events along the Yuba, Feather, and Sacramento River systems and reduce the magnitude of peak flood flows and associated adverse effects on downstream aquatic habitat and property.

Drought Management

Drought management often requires variance to one or more license conditions to meet other water supply needs. YCWA proposes to implement the Drought Management Plan (WR9) filed with its amended application, which it designed to ensure that drought management measures requiring a variance to license conditions would be implemented in a timely, efficient, and effective manner. Drought management measures in the plan include: (1) relief from the minimum flow requirements downstream of project facilities (AR3), when these requirements prevent appropriate management of water supplies during critical drought conditions; (2) relief from flow reduction criteria (AR 9) when these criteria prohibit flow reductions that are necessary to implement the lower water year type required minimum flows; (3) relief from recession or ramp-down requirements at Log Cabin or Our House Diversion Dams (AR2); (4) relief from the required minimum pool elevation in New Bullards Bar Reservoir (WR5) to provide the ability to draw reservoir storage below 1,730 feet to not less than 1,650 feet to meet required instream flows and irrigation diversions; and (5) relief from recreation flow releases at Our House Diversion Dam (RR3).

YCWA's proposal would implement the drought management plan under any one of the following conditions: (1) the Governor of State of California declares a drought emergency for the State or areas of the Yuba River Basin; (2) the Water Board enacts specific regulations for the purpose of managing drought conditions in the state or the Yuba River Basin; (3) a schedule 6 or conference year water year type occurs; (4) when end-of-September storage in New Bullards Bar Reservoir is less than 450,000 acre-feet; or (5) if in the January to March period, snowpack development to date is below 60 percent of average.

If YCWA anticipates that one of more of the drought trigger conditions may occur, it would notify the Commission and the appropriate agencies. If YCWA's drought concerns persist, and it proposes to implement a drought management option requiring a variance to one or more of its proposed license conditions, YCWA would provide the Commission and the appropriate agencies a specific drought management plan by no later than March 15. If anytime between January 1 and March 30, YCWA's drought concerns abate, YCWA would advise the Commission and the appropriate agencies that it does not anticipate preparing and requesting approval for a specific drought management plan. In each calendar year in which YCWA implements the proposed drought management plan, it would discuss implementation of the plan at the annual agency meeting described in GEN1.

California DFW (10(j) recommendation 2.15), FWS (10(j) recommendation 14), and BLM (10(a) recommendation 6) recommend revising the proposed drought

management plan to include, at a minimum: (1) a drought definition that is relevant to the Yuba River Watershed, and (2) utilization of a trigger only for extreme drought conditions. California DFW and FWS do not believe YCWA's proposed conditions, "(1) the Governor of State of California declares a drought emergency for the State or areas of the Yuba River Basin; (2) the Water Board enacts specific regulations for the purpose of managing drought conditions in the State or the Yuba River Basin," are specific enough to enact a drought management plan for the project area.

The Water Board (preliminary 401 condition 23) specifies the development and implementation of a drought management plan that outlines overarching guidance for operations during multi-year drought conditions. The Water Board's plan includes the development of a schedule to initiate consultation with the Water Board and the ecological group regarding any potential drought-related license or certification variances. If particular conditions are likely to require variance in extended drought periods, the Water Board could include a drought management term in such conditions. The Water Board does not believe single drier water year types should warrant the development of a drought plan because they are already addressed through the designation of water year types (e.g., conference year).

Forest Service (4(e) condition 54) specifies a drought management plan be developed in consultation with the Forest Service, the Water Board, other commenting agencies, and other interested parties. The Forest Service's plan includes the following: (1) an appropriate definition of a drought specific to the Yuba River Development Project; (2) YCWA's process for notification of drought concern; (3) YCWA's proposed drought response measures; (4) potential impacts on resources (i.e., fish and wildlife species, water quality, vegetation, and recreation); (5) monitoring that would be conducted by YCWA to identify the impacts of any drought-related variance; (6) a description of how and when YCWA's drought variance would expire; (7) YCWA's process for discussing drought conditions, potential license variances, and related drought response measures with the Forest Service and other parties; (8) the process by which YCWA would obtain approval from the TNF and PNF supervisors for any variances from Forest Service 4(e) conditions in any future license[64]; and (9) YCWA's plan revision process throughout the license term.[65]

Our Analysis

Downstream of project facilities, the operational guidelines of the existing project determine the water levels and streamflows in the North Yuba River, Middle Yuba River,

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[64] We consider this component of 4(e) condition 54 to be administrative and do not analyze it as an environmental measure.

[65] This condition was included with Forest Service's final 4(e) conditions filed on September 27, 2018.

Yuba River, and Oregon Creek. Drought conditions could make it difficult for YCWA to meet all license requirements, such as minimum flow, flood storage, and irrigation deliveries. These issues could be compounded during multiple critically dry years. Implementing the proposed drought management plan would provide a mechanism for YCWA to balance competing needs.

However, YCWA's proposal to implement the plan under either statewide or single-year water type drought definitions could result in applying drought-related operations at times when conditions in the Yuba River Basin do not warrant such operations. Consistent with the Water Board's recommendation, using available data specific to the project, including current storage in New Bullards Bar Reservoir, watershed snowpack and soil moisture conditions, current and projected operating requirements for instream flows and water supply deliveries, weather forecasts, and other project operation limitations, would provide insight into potential triggers for drought management options more relevant to the Yuba River Watershed.

While the commenting agencies agree with the development of a project-specific drought management plan, they disagree with some aspects of the proposed plan, specifically the conditions under which the plan would be implemented and the details of the consultation, review, and approval processes. Revising YCWA's Drought Management Plan to include agency consultation and recommendations that specify the conditions under which a drought management plan would be enacted would allow YCWA to coordinate project operation during drought conditions with land managers that may be implementing environmental programs in the watershed. Defining in the plan the process by which YCWA would notify stakeholders of drought conditions, assess potential effects on resources, describe how YCWA would monitor such effects, and describe the conditions necessary to discontinue drought management would provide an appropriate framework for addressing concerns associated with extremely low water periods and minimize effects on fish and wildlife.

Effects of Proposed Operations on Water Temperature

YCWA proposes to modify flow releases at project structures that could affect water temperature. Currently, YCWA diverts water from Oregon Creek and the Middle Yuba River to New Bullards Bar Reservoir using the Lohman Ridge and Camptonville Diversion Tunnels; manages New Bullards Bar Reservoir water levels to retain snowmelt from springtime runoff for flood control, water supply, recreation, hydropower, and environmental benefits; provides minimum instream flows to the North Yuba River using a low-level outlet; and provides flows to New Colgate Powerhouse.[66] YCWA proposes

[66] Currently, water releases just downstream of New Bullards Bar Dam are supplied through the low-level outlet, and New Colgate Powerhouse is supplied with water via the lower of two intakes. Table 2-1 provides the elevations of these intakes.

to change minimum instream flows (AR1, AR3, and AR10), periodically close the Lohman Ridge Diversion Tunnel (AR11), and control project spills (AR2, AR4, and AR12), leaving other current operations in place. In addition, management of New Bullards Bar Reservoir water levels (WR5 and WR6) has the potential to influence the temperature of water drafted for New Colgate Powerhouse and water released into the 8.2-mile-long bypassed reach between New Bullards Bar Dam and New Colgate Powerhouse.

Commenting agencies also recommend changes in project operation that could affect water temperature. The Forest Service (4(e) condition 32) and California DFW (10(j) recommendation 2.3) both recommend the same minimum flow downstream of Our House and Log Cabin Diversion Dams as YCWA proposes (AR1). In its letter filed August 25, 2017, FWS comments that it supports YCWA's proposed measure AR1. However, the Forest Service (10(a) recommendation 2), FWS (10(j) recommendation 11), BLM (10(a) recommendation 10), and California DFW (10(j) recommendation 2.4) all recommend that YCWA maintain higher minimum flows than YCWA proposes (see table 3-32, below) for the North Yuba River downstream of New Bullards Bar Dam. The Water Board (preliminary 401 condition 1) specifies that it would likely condition the North Yuba River below New Bullards Bar Dam, Oregon Creek below Log Cabin Diversion Dam, Middle Yuba River below Our House Diversion Dam, and Yuba River below Englebright Dam with minimum instream flows in light of the whole record, but does not specify any minimum flows. In addition, the Water Board suggests evaluating minimum flows for the North Yuba River below New Bullards Bar Dam (table 3-33, below), specific minimum flows for the lower Yuba River (table 3-46, below), and minimum flows for January through June, ranging from 35 to 75 percent of unimpaired flows.

The agencies also make specific recommendations for management of water temperatures in the Yuba River. FWS (10(j) recommendation 13) and California DFW (10(j) recommendation 2.7) call for YCWA to use the upper intake at New Bullards Bar Dam to supply water to New Colgate Powerhouse during March, April, and May, and consult with the ecological group to determine whether the upper or lower powerhouse intakes should be used during June through September. The overall goal of these recommendations is to provide warmer water temperatures during these months to enhance growth of resident and anadromous salmonids. The measure would also result in storage of cold water in the reservoir through the summer months (instead of releasing it through the lower intake, when the upper intake is used in those months), allowing YCWA to use the lower intake in fall, with the goal of reducing water temperatures at that time. YCWA would provide documentation of when each intake for New Colgate Powerhouse was used in the annual water temperature report. FWN expresses support for these 10(j) recommendations.

Water Board preliminary 401 condition 8 focuses on providing a thermal regime that would be favorable to biota year-round downstream of New Colgate Powerhouse and Englebright Dam. Preliminary 401 condition 8 states that the Water Board would likely

specify the operation and maintenance of the upper and lower intakes for New Colgate Powerhouse but may alternatively rely on consultation with the ecological group, specified in preliminary 401 condition 26, to determine the operation of the upper and lower intakes.

YCWA states that the upper intake is only operable at a New Bullards Bar Reservoir elevation of 1,881.2 feet mean sea level or higher, and that it has not been used since 1993 (HDR and Grinnell, 2017a).

Our Analysis

Our analysis in this section focuses on the potential effects of operational changes on water temperature. We discuss the potential use of the New Colgate Powerhouse upper intake in the next section, *Use of the Upper Intake for New Colgate Powerhouse to Control Downstream Water Temperatures*.

YCWA used three water temperature models to simulate water temperature in project-affected reaches of Oregon Creek and the North Yuba, Middle Yuba, and mainstem Yuba Rivers. YCWA describes each model and its calibration and validation, and notes limitations of the models (YCWA, 2013e). All three models were developed using the Corps' model platforms as described below:

- The upper model was developed on a HEC-5Q platform to simulate temperatures in New Bullards Bar Reservoir, Oregon Creek, Middle Yuba River, Lohman Ridge and Camptonville Diversion Tunnels, North Yuba River, and Yuba River downstream to Englebright Reservoir. Output from this model was used as input to the Englebright model.
- The Englebright model was developed on a CE-QUAL-W2 platform to simulate temperatures from below the New Colgate Powerhouse (RM 34.1) through Englebright Reservoir downstream to the Smartsville gage at RM 23.9. Output from this model was used as input to the lower model.
- The lower model was developed on a HEC-5Q platform to simulate temperatures in the Yuba River between the Smartsville gage (RM 23.9) and the confluence with the Feather River.

In its response to comments on the amended final license application (HDR and Grinnell, 2017a), YCWA states that the upper model was not capable of simulating use of the upper intake for New Colgate Powerhouse, as recommended by the agencies. However, YCWA revised the model by incorporating a dual intake that made it possible to simulate withdrawals through either the upper or lower intake for New Colgate Powerhouse. We discuss the effects of using the upper intake in the next section. Our evaluation of the thermal effects from project operation is based on simulated mean temperatures for the no-action and proposed project scenarios using the lower intake in the dual intake model, provided by YCWA in its response to comments on the amended final license application. For reference, reach locations are displayed in figure 3-28.

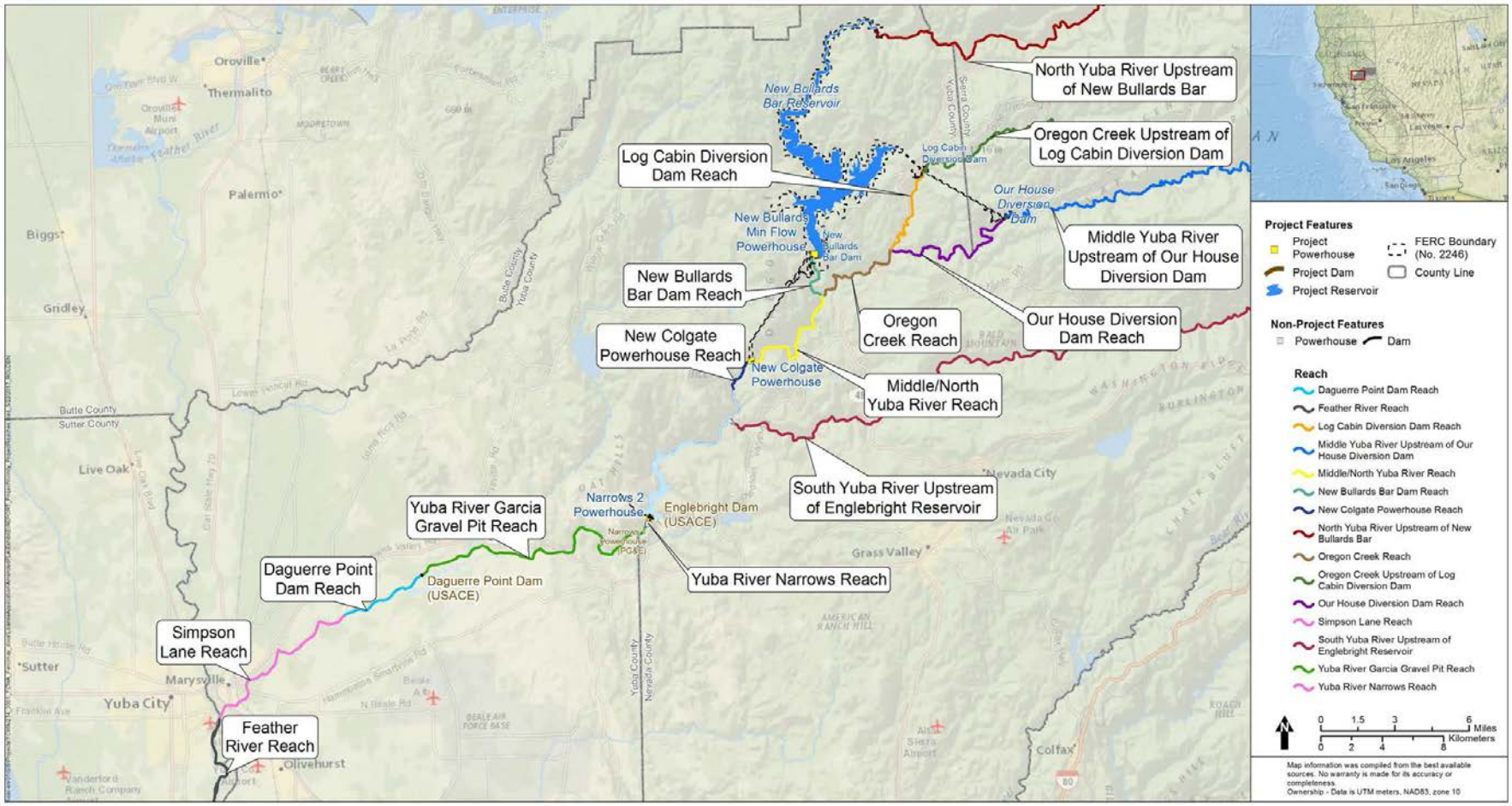

Figure 3-28. Study area reaches for YCWA water temperature modeling (Source: YCWA, 2017a).

The new auxiliary flood control outlet on New Bullards Bar Dam would have little influence on water temperature because water released through the outlet would come from near the reservoir's surface, similar to current spillway releases. The new auxiliary flood control outlet would only extend spill periods by a short time, and spills would be attenuated as water flows downstream; therefore, any effect from the flood control outlet on the river's thermal regime below New Bullards Bar Dam would be minimal.

To evaluate the effect of the proposed project on water temperature and consistency with water quality standards, we focus on temperature requirements for sensitive aquatic species (salmonids) in a manner similar to Water Board's policy for determining 303(d) listings (Water Board, 2015). The following analysis includes monthly mean temperatures as a general indicator of seasonal trends, the frequency of daily mean temperature exceeding 20.0°C as an indicator of sub-optimal conditions for salmonids, and the frequency that daily mean temperature is between 12.0°C and 20.0°C as an indicator of conditions supporting salmonid growth (Interior, 2017; YCWA, 2017c). Appendix A, *Simulated Water Temperatures under Various Project Operations*, provides the results of analyzing simulated stream temperatures for the proposed project and flows and operations recommended by the agencies.

Tables A-1 and A-2 (see appendix A) show simulated monthly mean temperatures for existing conditions (base case) and proposed project scenarios. This comparison shows that YCWA's proposed operations would generally maintain or reduce stream temperatures in Oregon Creek, Middle Yuba River, and the Yuba River downstream of the New Colgate Powerhouse. However, the project would generally release slightly warmer water into the North Yuba River in fall and winter months that could result in warmer conditions in portions of the 8.2-mile-long bypassed reach between New Bullards Bar Dam and New Colgate Powerhouse, depending on inflows from the Middle Yuba River. The maximum temperature increase would be only 1.3°C in December. Downstream of New Colgate Powerhouse, proposed operations would generally result in slightly cooler water temperatures during the winter months and slightly warmer temperatures in the summer months. However, all temperature changes in this reach would be less than 0.5°C.

Tables A-3 and A-4 (appendix A) present the frequency that simulated daily mean temperatures exceed 20°C for existing conditions and proposed project scenarios. This comparison shows that proposed operations would reduce the frequency that temperatures exceed 20°C in Oregon Creek, the Middle Yuba River, and the 8.2-mile-long bypassed reach between New Bullards Bar Dam and New Colgate Powerhouse; but the frequency of exceeding 20°C would remain nearly unchanged for the Yuba River downstream of New Colgate Powerhouse (where 20°C is seldom exceeded). The largest reduction in the frequency of exceeding 20°C would occur in Oregon Creek during July and August, due to reduced diversion of warmer water from the Middle Yuba River to Oregon Creek via the Lohman Ridge Diversion Tunnel and increased minimum flows in the Middle Yuba River.

Tables A-5 and A-6 (appendix A) show the frequency that simulated daily mean temperatures are between 12 and 20°C for existing conditions and proposed project scenarios. This comparison shows that proposed operations would have little overall effect on the frequency of temperatures favorable for salmonid growth at most locations, but would shift the timing of when they occur. The largest beneficial changes would occur as a result of reducing temperatures to less than 20°C in Oregon Creek during July and August. The largest reduction in frequency of daily mean temperatures between 12°C and 20°C would occur in Oregon Creek and the Middle Yuba River during April, but this is a cooler month at the beginning of the growing season.

Tables A-7 and A-8 (appendix A) present the results of temperature simulations for the agency-recommended minimum flow regimes. These recommended regimes at Our House and Log Cabin Diversion Dams are the same as proposed by YCWA (AR1), but are higher for the North Yuba River downstream of New Bullards Bar Dam (see table 3-32 below). These simulations assume the continued use of the lower intake for New Colgate Powerhouse. As expected, tables A-7 and A-8 show the effect of the higher coldwater releases in the North Yuba and Yuba Rivers, with few days exceeding 20°C in the North Yuba River.

We evaluate the water-temperature effects of the Water Board's suggested minimum flows in the subsections *Effects of Flow Regulation on Aquatic Habitat Upstream of Englebright Dam* and *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*.

Use of the Upper Intake for New Colgate Powerhouse to Control Downstream Water Temperatures

YCWA proposes to continue to use only the lower intake during operation of New Colgate Powerhouse. Since 1993, at the recommendation of FWS and California DFW, all controlled releases of water, with the exception of spills at New Bullards Bar Reservoir, have been from the lowest outlet for each powerhouse. Generation releases have only been provided through the low-level outlet at an invert elevation of 1,444.5 feet, which supplies New Bullards Bar Minimum Flow Powerhouse, and the lower intake with a centerline elevation of 1,627.5 feet, which provides water to New Colgate Powerhouse.[67] The upper intake has a centerline elevation of 1,808.0 feet, about 180 feet higher than the lower intake and 364 feet higher than the low-level outlet.

FWS (10(j) recommendation 13) and California DFW (10(j) recommendation 2.7) recommend that YCWA operate the New Colgate Powerhouse upper intake during

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[67] Although YCWA states that the low-level outlet was consistently used to release water for power generation at New Colgate Powerhouse between September 1993 and implementation of the Yuba Accord in 2006, it appears they meant the lower intake for New Colgate Powerhouse.

March through May and consult with the ecological group that would be created by YCWA's proposed measure GEN1 during its annual meeting in April, to determine which intake should be used during each month in the remainder of the year. FWN supports these 10(j) recommendations. Water Board (preliminary 401 condition 8) specifies that it would likely condition the operation and maintenance of the upper and lower intakes for New Colgate Powerhouse. Alternatively, the Water Board may rely on the ecological group consultation (specified in preliminary 401 condition 26) to determine the operation of the upper and lower intake.

FWS and California DFW state that their recommendations would save cold water in the spring during the first months of reservoir stratification so that more cold water would be available for use later in the season to sustain spring-run Chinook salmon holding in the lower Yuba River. In addition, FWS states that this recommendation would enable the thermal regime in the North and lower Yuba River to support greater growth and reproduction of both resident and anadromous salmonids. In its response to comments filed October 10, 2017, YCWA notes that use of the lower intake does not deplete water from the coldwater pool (hypolimnion) in New Bullards Bar Reservoir, and that use of the upper intake would not affect temperature in the bypassed reach between New Bullards Bar Dam and New Colgate Powerhouse. YCWA also states that the upper intake is currently not in working condition, would require substantial repairs and refurbishment to be operable, and, based on the Corps' technical guidance (Corps, 1980), would not be operable when the water surface elevation of New Bullards Bar Reservoir is below 1881.2 feet mean sea level.[68]

In its comments on the draft EIS, the Water Board requests an evaluation of the 2012–2016 period, indicating use of the upper intake may have more pronounced water-temperature benefits than the 1970–2010 period evaluated in the draft EIS (Water Board, 2018a).

Our Analysis

Our evaluation of effects on water temperature from using the upper intake for New Colgate Powerhouse focuses on the operating limits of the upper intake and the thermal effects of using the upper intake in March through May, as recommended by FWS, California DFW, FWN, and the Water Board, instead of the lower intake as proposed by YCWA.

Table 3-31 provides an evaluation of simulated New Bullards Bar Reservoir water levels to indicate the frequency that they would prevent use of the upper intake for New Colgate Powerhouse for various operational scenarios, including existing conditions,

[68] The Corps' Hydraulic Design of Reservoir Outlet Works (Corps, 1980) provides design guidance to prevent undesirable vortices that may draw air and surface debris into power plant intakes.

YCWA-proposed, and agency-recommended project operations. The frequency that the upper intake could be used during March through May (shaded cells in table 3-31) would vary by month. The reservoir level would limit operation of the upper intake more often in March than in April and May, with greater limitations in other months, generally increasing through the summer months, and in relatively dry years or years following dry years. As expected, an evaluation of 2012–2016 measurements indicates reservoir levels during this series of low-flow years would limit use of the upper intake more frequently in spring and summer than would occur typically. Figure 3-29 demonstrates the variability between reservoir water levels by year and shows use of the upper intake would be limited in March–May in low-flow years immediately following low-flow years (e.g., 1977, 1988, and 2008).

Although this analysis suggests that agency-recommended flows would limit use of the upper intake more often, this may be caused by the approach used to model the scenarios.[69]

Table 3-31. Percent of time that the upper intake for New Colgate Powerhouse would be unusable, based on simulated New Bullards Bar Reservoir water levels for four operational scenarios,[a] for water years 1970–2010 (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).

	Water Year 1970–2010 Simulated Levels				
Month	**Existing Conditions**	**YCWA Proposed Operations[b]**	**Recommended Agency Flows with use of Lower Intake[c]**	**Recommended Agency Flows with use of Upper Intake in March through May[c]**	**2012–2016 Measured Levels[d]**
Oct	77%	81%	86%	82%	100%
Nov	93%	92%	94%	94%	80%
Dec	83%	84%	86%	85%	60%
Jan	70%	70%	78%	76%	80%
Feb	55%	58%	65%	61%	56%
Mar	22%	23%	31%	29%	40%

[69] Although YCWA's simulated reservoir levels suggest the flows recommended by the agencies would prevent use of the upper intakes more often than YCWA's proposed flows, this is based on using New Bullards Bar Reservoir storage to meet the higher flows, rather than reducing generation at New Colgate Powerhouse. YCWA's analysis also includes unexplained differences in reservoir levels for recommended flows with use of the different intakes, even though flows should be the same (table 3-31).

Month	Water Year 1970–2010 Simulated Levels: Existing Conditions	YCWA Proposed Operations[b]	Recommended Agency Flows with use of Lower Intake[c]	Recommended Agency Flows with use of Upper Intake in March through May[c]	2012–2016 Measured Levels[d]
Apr	5%	6%	13%	10%	29%
May	5%	5%	11%	9%	22%
Jun	7%	6%	20%	19%	40%
Jul	17%	18%	33%	33%	40%
Aug	28%	30%	42%	39%	59%
Sep	42%	43%	56%	50%	71%

[a] Minimum operational level is 1,881.2 feet.

[b] The two model scenarios for the YCWA proposed operations using the lower intake year-round, and the upper intake in March through May and lower intake remainder of year, had the same frequencies for each month.

[c] The two model scenarios evaluated for the agency recommended flows using the lower intake year-round, and the upper intake in March through May and lower intake remainder of year, had frequencies that differed. These different values are caused by simulated water levels that differ by up to 21.9 feet in February 13, 1970 through December 10, 1977 and up to 1.5 feet in February 7, 1980 through April 4, 1982.

[d] The analysis of 2012–2016 is limited to measured levels because no model results are available for these years. Refer to figure 3-30 (below) for differences between years.

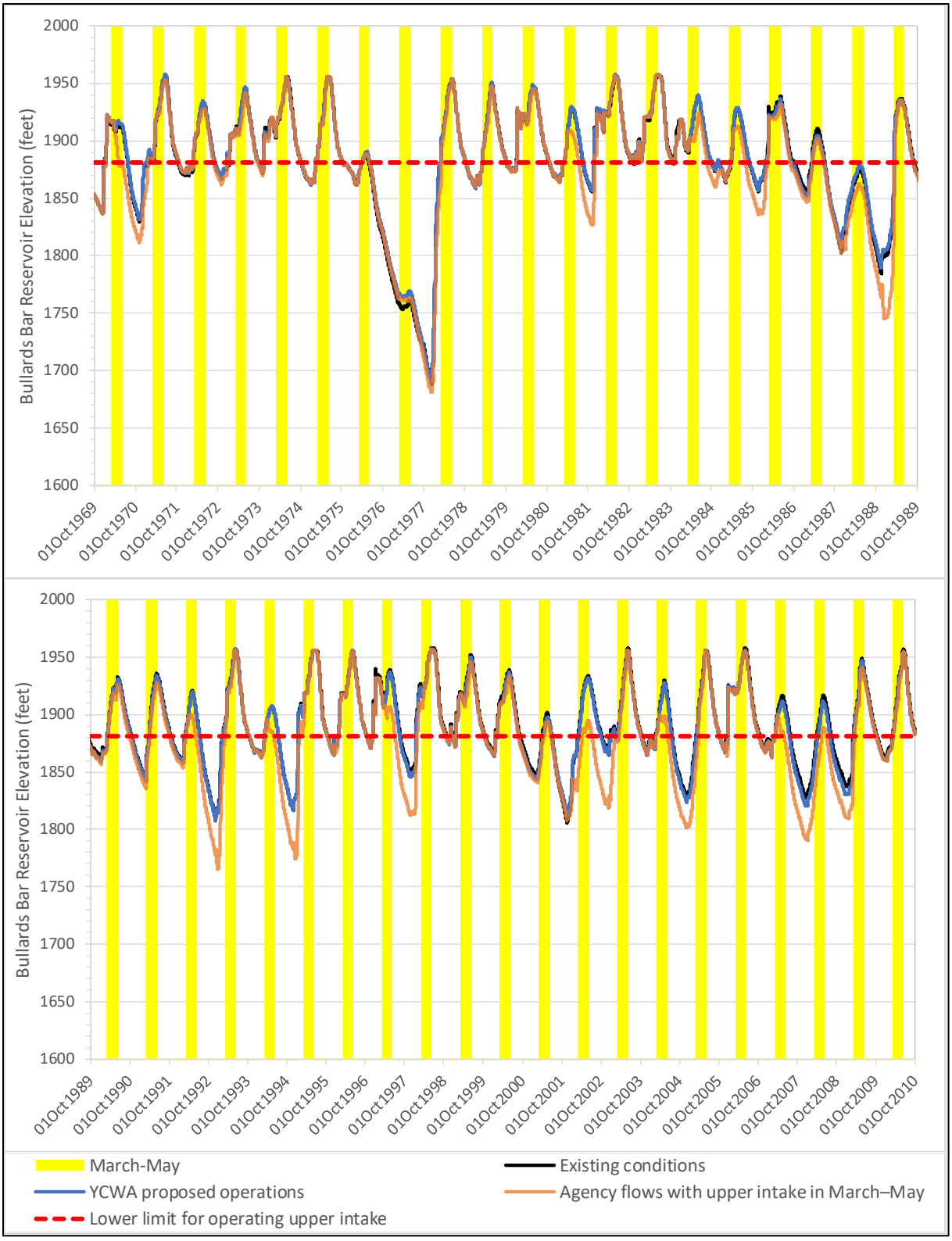

Figure 3-29. Simulated New Bullards Bar Reservoir elevations in water years 1970–2010 (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).

As noted in comments on the draft EIS by the Water Board (2018a) and California DFW (2018), the 2012–2016 period includes a series of very low-flow years that resulted in 7-day average of the daily maximum temperatures in the lower Yuba River that were not suitable for various salmonid lifestages in 2014 and 2015.[70] In response to requests to evaluate this extended drought, we analyzed if New Bullards Bar Reservoir elevations would have supported use of the upper intakes and used this information to evaluate potential effects on lower Yuba River temperatures. Figure 3-30 shows that reservoir levels would support use of the upper intake any time in March through July of 2012, 2013, and 2016. However, the reservoir level would prevent use of the upper intake in 2014 during about half of the March–May period that FWS and California DFW recommend, and on all days from May 29, 2014, through February 16, 2016. These limitations on operating the upper intake in March–May of 2014 and 2015 demonstrate the inability of using this strategy to cool the lower Yuba River during latter years of similar multi-year droughts.

We evaluated the effects of using both the upper and lower intakes on water temperature employing the same parameters used to evaluate the effects of the proposed operation on water temperature (i.e., mean monthly temperature, the frequency of exceeding 20°C, and frequency of temperatures between 12 and 20°C) and present the results in appendix A (tables A-7, A-8, A-9 and A-10). All frequencies are based on daily average temperatures. Comparing simulated mean monthly temperatures for agency-recommended flows using the upper New Colgate Powerhouse intake in March through May to simulated temperatures for proposed operation indicates only a small increase in New Colgate Powerhouse release temperatures in March through May, ranging from 0.8 to 1.2°C, and a reduction during the remainder of the year (when only the lower intake would be used). The largest reduction in powerhouse release simulated monthly mean temperature would be 0.7°C. As water proceeds 0.1 mile downstream to RM 34.1, the reduction in simulated mean monthly temperature compared to proposed operations is reduced to 0.3°C.

[70] Although a fish kill occurred in the lower Yuba River in 2015, it was caused by an extreme ramping event on February 8, 2015, not water temperature (FERC, 2016).

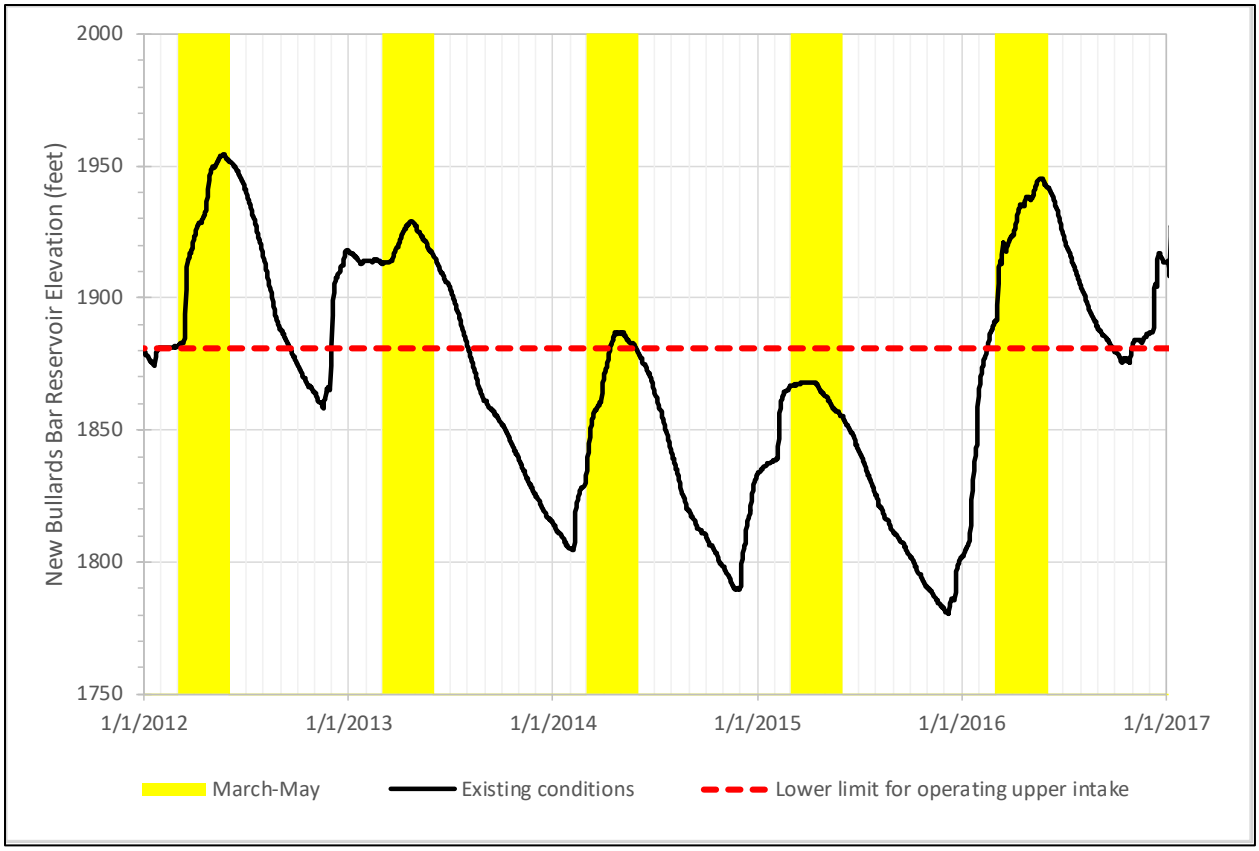

Figure 3-30. New Bullards Bar Reservoir elevations in 2012–2016 as they relate to potential use of the upper intake at New Bullards Bar Dam (Source: CDEC, 2018, as modified by staff).

In its comments on the draft EIS, California DFW indicates that its upper intake withdrawal recommendation was specifically designed to save coldwater pool for use during the spring and fall-run Chinook spawning season and incubation period. California DFW also provides three figures illustrating the effects of using the lower intake only and using both intakes during the spring (March through May) on modeled water temperatures during 2004 (a below normal water year). As seen in figures A-1 through A-3 in appendix A, California DFW's modelling results for 2004 show that using the upper intake during spring would increase the amount of time that water temperatures are suitable for spring and fall-run Chinook salmon spawning and egg incubation and would further extend the amount of Chinook spawning habitat with suitable temperatures downstream of Englebright Dam.

In response to these comments, we analyzed the median number of days that lower Yuba River simulated daily mean temperature meet lower Yuba River water temperature objectives (RMT, 2010) for spring-run and fall-run Chinook salmon spawning and incubation in the various Yuba River Index water year types and include this information in figures A-4 through A-8 in appendix A. As illustrated in these figures, using only the lower intake to provide YCWA's proposed flows would result in water temperatures that

are very similar to existing conditions, except during dry years, when there would be fewer days (up to less than 15 days) available for spring-run Chinook salmon spawning and incubation (figure A-5). Using both intakes to provide YCWA's proposed flows would result in a slight increase in the number of days (approximately 5 to 10 more) available for spring and fall-run Chinook spawning and incubation during most water years. Using only the lower intake to provide the agencies' recommended flows would result in the fewest number of days available for spawning and incubation. Finally, using both intakes to provide the agencies' recommended flows would result in a substantial increase in the number of days available for Chinook spawning and incubation during most water year types.

Results of these temperature model simulations and their effects on coldwater fish are further discussed below under *Effects of Flow Regulation on Aquatic Habitat Upstream of Englebright Dam*.

The agencies are concerned that the continued use of the lower intake for New Colgate Powerhouse during March through May could deplete the coldwater pool in the reservoir, preventing its use as a source for coldwater releases later in the summer and fall. The agencies' collaboration with YCWA during the pre-application filing process included balancing the thermal needs of *O. mykiss* upstream and downstream of the warmwater inflow from the Middle Yuba River during the summer. The seasonal pattern of stratification in New Bullards Bar Reservoir would severely limit the ability to reserve cold water in the reservoir by switching use to the upper intake for New Colgate Powerhouse in spring. In March and April the reservoir is isothermal, and by May some stratification may begin, but that stratification is strongest in mid-summer (July/August), which is when an isolated pool of cold water (the hypolimnion) would be present. In the draft EIS, we state that monitoring results in the Yuba River indicate there is no evidence that the coldwater pool has been depleted by the existing operations of exclusively using the lowermost intake for New Colgate Powerhouse and the low-level outlet at New Bullards Bar Dam for the minimum flow turbine. However, after reevaluating this issue, we note that temperature charts for Yuba River locations below Englebright Dam (about 10 miles downstream of the New Colgate Powerhouse) suggest the coldwater pool in New Bullards Bar Reservoir may have been depleted in the critical years of 2014 and 2015, which immediately followed the dry year of 2013 (California DFW, 2017a; Interior, 2017; Water Board, 2017c).[71] That said, model results also indicate that YCWA's proposed operations would not normally deplete water from the coldwater pool

[71] Our reevaluation suggests that the depletion of New Bullards Bar Reservoir coldwater pool only occurs in a dry or critical year that immediately follows a dry or critical year, and that this depletion is primarily a result of reservoir drawdown from flow management, not the use of the lower intake for New Colgate Powerhouse.

in New Bullards Bar Reservoir.[72] Typically, cold water would continue to be released into the North Yuba River, which in turn would continue to be tempered by the warmer inflow at the confluence with the Middle Yuba River.

If the upper intake for New Colgate Powerhouse were functional, temperature modeling indicates: the temperature of water released into the upper end of the 8.2-mile-long bypassed reach between New Bullards Bar Dam and New Colgate Powerhouse would remain virtually the same,[73] and New Colgate Powerhouse discharge temperature would change seasonally. However, these changes in powerhouse discharge temperatures would be limited to a slight increase in March through May and a slight decrease in other months. Comparing the simulated temperatures for YCWA's proposed operations using the lower intake to the agency-recommended use of the upper intake show that both approaches would result in the same overall frequency of daily mean temperatures between 12°C and 20°C, with limited sub-optimal conditions for salmonid spawning, incubation, and rearing. Simulated daily mean temperatures for New Colgate Powerhouse discharge for YCWA's proposed operation (year-round use of the lower intake) reached a maximum of only 14.4°C, and 99 percent of the values were 11°C or less. This indicates that continued use of the lower intake would seldom deplete the pool of cold water in New Bullards Bar Reservoir (the hypolimnion) or result in warmer discharges from the New Colgate Powerhouse.

Water Temperature Monitoring

Water temperature monitoring data can be used to verify compliance with license requirements and to determine whether environmental measures required by the license should be modified.

YCWA proposes to implement its Water Temperature Monitoring Plan (WR7) with the rationale that this monitoring would result in a long-term record of water

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[72] Simulated mean monthly temperatures for proposed operation range from 6.7 to 8.3°C for the North Yuba River just below New Bullards Bar Dam and 7.0°C to 9.6°C for New Colgate Powerhouse discharge (tables A-1 and A-2), and the daily mean temperature exceeded 1 percent of the time for these sites is 9.4°C and 11.3°C, respectively. These results are expected because New Bullards Bar Dam releases flow to the North Yuba River using the low-level outlet from an invert elevation of 1,444.5 feet, while the lower intake for New Colgate Powerhouse is at elevation 1,627.5 feet, compared to the upper intake elevation of 1,808 feet.

[73] This bypassed reach consists of 2.4 miles of the North Yuba River between New Bullards Bar Dam and the confluence with the Middle Yuba River and 5.8 miles of the Yuba River down to the New Colgate Powerhouse.

temperature in the project area that would be useful as general information and would help explain ecological perturbations observed during the license term. This monitoring is proposed to occur annually for the duration of a new license period.

YCWA proposes to monitor water temperature at 15-minute intervals within an accuracy of ±0.2ºC at 14 stream locations. Each site's instrumentation and frequency of site visits depends on whether the site would also be used for streamflow gaging. Each streamflow gaging station would use a continuous water temperature recorder connected to a probe located in moving water within the gage pool to provide real-time temperature and flow data. YCWA would visit these stations at least once each year to confirm they are operating properly. Each station not associated with a streamflow gage would consist of two loggers to independently record water temperatures. With the exception of a single river margin monitoring location downstream of Daguerre Point Dam, the stations not associated with a streamflow gage would be downloaded at least every other month between May and November.[74] The river margin monitoring location downstream of Daguerre Point Dam would be installed in May of schedule 5, 6, and conference years, visited every other month three times, and removed in October of the same year.

This plan also proposes vertical profiles in New Bullards Bar Reservoir and Englebright Reservoir at one location near the corresponding dams once each month from April through September.[75] Reservoir monitoring would include vertical profiles of water temperature and DO concentration and a Secchi depth measurement for each site visit. Vertical profiles would be measured to a depth of 300 feet or the bottom, whichever is less, at 10-foot intervals for small temperature gradients, and at 5-foot or smaller intervals at depths with large temperature gradients, or where measuring an interflow or an underflow.

YCWA's proposed Water Temperature Monitoring Plan is recommended by California DFW (10(j) recommendation 2.24), specified for locations on or directly affecting NFS lands (Forest Service 4(e) condition 44), and recommended for non-NFS lands (Forest Service 10(a) recommendation 14).

With the exception of inflow to the project area, YCWA's proposed Water Temperature Monitoring Plan is consistent with Water Board preliminary 401 condition 14, which specifies a water temperature monitoring plan to monitor water flowing into the project area and in project reservoirs, although provides few details for the plan.

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[74] This would occur if flow conditions permit safe access to the location and reasonable access to retrieve and re-deploy the recorder.

[75] It appears that YCWA intends to use the same procedures for monitoring both reservoirs, although the plan does not provide details for monitoring in Englebright Reservoir.

Our Analysis

YCWA proposes to monitor water temperature with the intent of developing a long-term record of water temperature in the project area so that it could be used to help explain ecological perturbations observed during the license term. YCWA's proposed monitoring sites would be spread throughout waterbodies where the project influences water temperature. With the exception of two stations on the margin of the Yuba River upstream and downstream of Daguerre Point Dam, all of the proposed stations were monitored between 2009 and 2012.

As discussed in *Effects on Water Temperature*, YCWA's proposed flow-related measures are expected to generally maintain or reduce water temperatures in project-affected waters and support resident and anadromous coldwater fishes, similar to what has occurred under existing operations. There appear to be few benefits from requiring water temperature monitoring to verify the status quo or the probable improvements in water temperature that would occur and no value, from a license compliance perspective, to a comprehensive, long-term water temperature record that would result from YCWA's proposal and the Water Board's specification.

Water Quality Monitoring

YCWA proposes to implement its Water Quality Monitoring Plan (WR8) to sample *in situ*, general, and recreation water quality; and bioaccumulation, with the intent of identifying unexpected water quality issues under a new license, periodically obtaining in-depth water quality, and periodic bacteriologic sampling to assure safe water-contact recreation. Monitoring sites would be located above, within, and below project-affected reaches of the North Yuba, Middle Yuba, mainstem Yuba Rivers; and Oregon Creek.

In situ measurements of water temperature, DO concentration, pH, specific conductance, and a measure of water clarity[76] would be recorded from the surface of streams and from just below the surface and in the hypolimnion of reservoirs. *In situ* measurements would be made at 15 stream sites and 3 sites each in New Bullards Bar Dam and Englebright reservoirs[77] during either August or September of years 1 through 3 of the new license. YCWA's Water Quality Monitoring Plan states that completion and operation of two new facilities: (1) New Bullards Bar Dam low-level outlet and (2) the New Colgate Powerhouse tailwater depression system would trigger *in situ* measurements in the North Yuba River upstream of New Bullards Bar Reservoir (RM 23.7) and in the Yuba River at Rice Crossing 1.4 miles downstream of the New

[76] Measure of water clarity would be turbidity in streams and Secchi depth in reservoirs.

[77] With the exception of a Middle Yuba River site at RM 1.5, all monitoring sites were sampled for relicensing.

Colgate Powerhouse. Based on the lack of a discussion of a new Bullards Bar Dam low-level outlet in exhibits A and E of the amended final license application, we conclude that YCWA intended to reference the proposed new auxiliary flood control outlet at New Bullards Bar Dam instead of a New Bullards Bar Dam low-level outlet. In the first 2 years of operation of these two new facilities, *in situ* measurements would be conducted within one week before operation, immediately following operation, and 10 to 14 days after operation.

General sampling would include collecting samples from the surface of streams, and from just below the surface and in the hypolimnion of reservoirs at the same 15 stream sites and 6 reservoir sites as *in situ* measurements, and analyzed for dissolved and suspended solids, organic carbon, inorganic ions, nutrients, and metals. However, the years for *in situ* measurements and general sampling are not scheduled to always coincide with one another. YCWA's sampling schedule for general monitoring is the first below normal or drier water year[78] and the second year of a back-to-back dry/critically dry water year series. YCWA also includes provisions for general sampling in year 5 of the license if a below normal or drier WY does not occur in the two previous years, and in year 15 of the license if a back-to-back dry/critically dry water year series does not occur between year 6 and 14 of the new license.

Recreation water quality parameters would be sampled in near-shore surface waters in three coves of New Bullards Bar Reservoir and in the impoundments of Our House and Log Cabin Diversion Dams on 5 days within a 30-day period spanning Independence Day. Samples would be collected and analyzed for total coliform, fecal coliform, *E. coli*, and total petroleum hydrocarbons in the gasoline range, and visual observations would be used to detect evidence of oil and grease on the water. YCWA would sample New Bullards Bar Reservoir in years 1 through 3 of the new license, in each year a FERC Form 80[79] is due, and in the year following the first and second time that FERC Form 80s are due. YCWA's sampling schedule for the Our House and Log Cabin Diversion Dam impoundments would be year 1 of the new license, the first below normal or drier water year in years 4 through 9, and the second year of a back-to-back dry/critically dry water year series that occurs in years 11 through 19 and years 21 through 29. YCWA's plan includes provisions for sampling in year 10 if a below normal

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[78] All water year types for water quality sampling would be based on the above Englebright water year types.

[79] The Commission requires licensees to collect data on recreation facilities at their projects and submit it on a Form 80, which is filed with the Commission every 6 years. On Form 80, licensees must provide the total of daytime and nighttime recreation visits at the project and assess the capacity at each recreation facility to determine if the facility is overused, underused, or at the ideal use.

or drier water year does not occur between years 4 through 9; and in year 20 and 30 of the new license if a back-to-back dry/critically dry water year series does not occur between years 11 through 19 or between years 21 through 29, respectively.

YCWA's bioaccumulation sampling would consist of collecting target aquatic organisms from New Bullards Bar Reservoir and the Our House and Log Cabin Diversion Dam impoundments and analyzing their tissue for mercury, arsenic, copper, selenium, and silver. Target organisms would be rainbow trout in all three waterbodies, and include kokanee salmon, black bass, and freshwater crayfish in New Bullards Bar Reservoir.[80] YCWA would conduct bioaccumulation sampling in August or September, concurrent with stream fish monitoring proposed in its Upper Yuba River Aquatic Monitoring Plan (AR7). New Bullards Bar Reservoir would be sampled in years 1 through 3, and in each year a FERC Form 80 is due. The Our House and Log Cabin Diversion Dam impoundments would be sampled in year 1 and every other year a FERC Form 80 is due.

YCWA's proposed Water Quality Monitoring Plan is recommended by California DFW 10(j) recommendation 2.25, specified for locations on or directly affecting NFS lands in Forest Service 4(e) condition 45, and recommended for non-NFS lands in Forest Service 10(a) recommendation 15.

Water Board preliminary 401 condition 13 specifies a water quality monitoring plan, which includes monitoring *in situ* conditions, water chemistry, recreation-related water quality, and bioaccumulation components. These requirements are consistent with YCWA's Water Quality Monitoring Plan. In addition, preliminary 401 condition 13 specifies that YCWA notify the Water Board immediately at any point when monitoring suggests water quality conditions exceed Basin Plan water quality objective(s).

Our Analysis

As discussed in section 3.3.2.1, existing water quality data document that:

- Project-affected streams are consistent with Basin Plan objectives.
- Fecal coliform and *E. coli* concentrations are consistent with their corresponding Basin Plan objective and EPA guidance level (EPA, 2012), respectively, during high-recreational-use periods.
- DO was occasionally less than the 7.0 mg/L Basin Plan objective in the hypolimnion of New Bullards Bar Reservoir and Englebright Reservoir.[81]

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[80] Crayfish would only be targeted every other sampling year.

[81] In New Bullards Bar Reservoir, the low DO values occurred near the bottom in Madrone Cove and near the elevation of the lower New Colgate Powerhouse intake near the dam.

- Exceedances of the CTR's levels occurred in New Bullards Bar Reservoir for copper and in Englebright Reservoir for copper, aluminum, nickel, and silver.

YCWA's proposed project operation would not substantially change New Bullards Bar Reservoir water levels in most years, and the change would be limited to about 10 feet. Although YCWA proposes to construct new and modify existing facilities for releasing water downstream of project dams, these facilities would continue to draft water from about the same depths as under existing conditions. The exception would be the proposed new auxiliary flood control outlet at New Bullards Bar Dam that would only be used to supplement spills through the existing project spillway. We do not expect proposed project operation to substantially change the hydraulics or water quality in the project reservoirs or impoundments, or the water quality of their releases. Low DO near reservoir bottoms may continue to contribute to the release of mercury and other metals from sediments and subsequently lead to bioaccumulation in aquatic organisms, some of which may be consumed by humans. However, effects of the proposed project operation are expected to result in water quality that is at least as good as under existing conditions. Therefore, the Basin Plan objective of 7 mg/L for DO is expected to continue to be met in the Yuba River below the New Colgate Powerhouse even when DO is slightly less than 7 mg/L in New Bullards Bar Reservoir near the lower New Colgate Powerhouse intake. In addition, operation of YCWA's proposed New Colgate Powerhouse tailwater depression system is not expected to adversely affect water quality.

Proposed project operation could change DO in project-affected stream reaches relative to existing operation, through two primary mechanisms: (1) water temperature effects on the potential for water to retain oxygen, and (2) effects of stream turbulence on reaeration rates. Proposed project operation would generally reduce water temperature (see appendix A) and thereby increase the potential for water to retain oxygen in project-affected reaches, and increases in minimum flows would subsequently increase reaeration rates. Therefore, we expect proposed project operation to result in DO concentrations that are slightly greater than under existing conditions.

Proposed project operation is also not expected to measurably influence coliform concentrations, and YCWA's proposal to install and enhance restroom and septic leach field facilities would further protect against human waste contamination. Furthermore, YCWA would periodically assess recreational use and any need for the project's recreation facilities to be upgraded or added to maintain a safe environment for recreational use during any license term.

High levels of mercury bioaccumulation have been reported for kokanee from New Bullards Bar Reservoir; rainbow trout harvested from New Bullards Bar Reservoir and the impoundments of the Log Cabin and Our House Diversion Dams; and rainbow trout, smallmouth bass, pikeminnow, and Sacramento sucker from the North Yuba, Middle Yuba, and mainstem Yuba Rivers (YCWA, 2012a; OEHHA, 2018). Although concentrations of mercury and other metals sometimes increase in newly constructed impoundments, this is less likely to occur in the existing project impoundments, which

have been in place for decades, or stream reaches downstream of them. It is unclear how additional bioaccumulation data would be used to guide project operation.

Based on the above, there appear to be few benefits from requiring YCWA to monitor water quality of any type or bioaccumulation in aquatic organisms. There would be no value, from a license compliance perspective, to the water quality monitoring that would result from YCWA's proposal, the Water Board and Forest Service's specifications, and California DFW and the Forest Service's recommendations.

Hazardous Materials Management

Construction of new project facilities, modification of existing project facilities, and routine and non-routine maintenance could affect water quality if pollutants (e.g., fuels, lubricants, herbicides, pesticides, and other hazardous materials) are discharged into project waterways or contaminated sediments are disturbed.

To minimize potential contamination of project waters, YCWA proposes to implement its Hazardous Materials Management Plan (WR1), which addresses the storage, use, and transportation of hazardous materials used within the proposed FERC project boundary, with special emphasis on NFS land. YCWA's plan addresses prevention of hazardous substance spills, ensures equipment to contain and cleanup any spills are within an hour from each YCWA-maintained facility located on NFS land, and lists notification procedures and contact information for the TNF, PNF, California DFW, and National Resource Damage Assessment of the FWS. YCWA's plan also commits to a work-specific spill prevention and control plan for new construction performed by contractor(s), and states that management of herbicides and pesticides would be in accordance with state and county regulations.

California DFW recommends YCWA's proposed Hazardous Materials Management Plan in its 10(j) recommendation 1.4. The Forest Service would require its implementation on NFS lands and on lands directly affecting NFS lands (4(e) condition 21) and recommends its implementation on non-NFS lands (10(a) recommendation 7). In addition, Forest Service (4(e) condition 22) specifies restrictions on the use of pesticides on NFS lands or areas affecting NFS lands; these restrictions are evaluated in section 3.3.3.2, in the subsection *Vegetation Management*.

The Water Board (preliminary 401 condition 25) states that it would likely specify that YCWA develop, in consultation with relevant resource agencies, a plan for storage, use, transportation, and disposal of hazardous materials in the project area. Preliminary 401 condition 25 specifies this plan should address locating primary and secondary containment of hazardous chemicals away from watercourses, appropriate measures and equipment to prevent any hazardous material spill from spreading, and protocols to prevent adverse effects on beneficial uses in the event of a hazardous-material spill.

FWS states that it conceptually supports YCWA's proposed Hazardous Materials Management Plan but comments that additional measures may be required for handling pesticides on non-NFS lands to protect federally listed and sensitive species. FWS

(10(j) recommendation 6) states that FWS's FERC Coordinator for the Bay-Delta Fish and Wildlife Office should be added to the spill notification list to facilitate a determination on whether emergency consultation is necessary for potential effects on federally listed species.

The potential for project-related construction to disturb contaminated soils and sediments and mitigation to limit these events and their associated adverse effects on water quality are discussed in section 3.3.1.2, in the subsection *Erosion during Construction and Project Operation*. Effects of sediment management, including monitoring for metals, are discussed in section 3.3.2.2, in the subsection *Managing Sediment and Large Woody Material in the North and Middle Yuba River and Oregon Creek*.

Our Analysis

A plan for hazardous substance control would prevent accidental spills and address any discharges of hazardous substances to project lands and waters. Specifically, this plan would address the prevention of hazardous substance spills, ensure protocols and equipment are in place to contain and cleanup any spills, and ensure appropriate notification procedures are followed.

YCWA's proposed measures would manage some of the risks associated with the project's use of hazardous materials by defining locations for hazardous materials used for the project; ensuring YCWA staff receive training for managing hazardous materials, and cleaning up any hazardous material spills. The plan also would describe the associated consultation, reporting, and notification processes. However, the proposed plan does not specify primary and secondary containment of hazardous materials, mitigation measures to prevent any hazardous material spill from spreading, or provide assurance that adequate spill cleanup materials are available within an hour of project facilities on non-NFS lands. Revising the plan to include specifications for primary and secondary containment of hazardous materials would provide assurance that the frequency and magnitude of spills would be minimized. Adding insight on the protocol used for addressing spills would ensure that appropriate spill cleanup procedures would be conducted, and providing an appropriate time limit to access cleanup materials from project facilities on all project lands would ensure timely initial response for cleanup of spills. In addition, adding FWS's FERC Coordinator to the notification contact list would facilitate FWS's awareness of any hazardous material spill that has the potential to adversely affect federally listed species.

Subsequent to the publication of the draft EIS, YCWA proposed modifications to its Hazardous Materials Management Plan (comments on draft EIS, filed July 30, 2018) consistent with the additional staff measures.

Overall, the proposed plan with the modifications discussed above would minimize any negative effects on water quality and aquatic resources within the project area that may result from accidental hazardous substance spills.

Effects of Flow Regulation on Aquatic Habitat Upstream of Englebright Dam

YCWA proposes to implement measures AR1 and AR10 to maintain minimum streamflows downstream of Our House and Log Cabin Diversion Dams and downstream of New Bullards Bar Dam (tables 3-20 through 3-22). YCWA's proposed minimum flows, which vary by water year type, would be maintained at all times, with the following exceptions: (1) for short periods and upon consultation with and approval by FWS, California DFW, and the Water Board, (2) due to an emergency, and (3) for one 4-hour period each calendar year at each dam to perform required testing of the low-level outlet (i.e., sluiceway) gates. YCWA's proposed minimum flows in Middle Yuba River and in Oregon Creek would be monitored at USGS gages 11408880 and 11409400, respectively, and minimum flows in the North Yuba River would be monitored at USGS gage 11413517 (North Yuba River low-flow release below New Bullards Bar Dam, California) (table 3-4 in section 3.3.2.1). Minimum streamflows would be measured in cfs once every 15 minutes at the compliance gages, and these 15-minute measurements would be averaged into hourly measurements that would be recorded and reported to USGS and the Commission.

Forest Service (4(e) condition 32) and California DFW (10(j) recommendation 2.3) both contain the same minimum flow requirements downstream of Our House and Log Cabin Diversion Dams as proposed by YCWA (AR1). In its letter filed August 25, 2017, FWS comments that it supports YCWA's proposed measure AR1.

Forest Service (10(a) recommendation 2), FWS (10(j) recommendation 11), BLM (10(a) recommendation 10), and California DFW (10(j) recommendation 2.4) all recommend that YCWA maintain the higher minimum flows shown in table 3-32 for the North Yuba River downstream of New Bullards Bar Dam. The agencies' recommendations include the same provisions for allowing temporary modified streamflows as listed in YCWA's proposal above, except for provision (3), which is not included in the agencies' recommendations. The agencies' recommendations also list the Forest Service as an entity for consultation and approval during periods of temporary streamflow modification. The Forest Service, FWS, BLM, and California DFW recommend the same streamflow compliance protocols and gage locations as YCWA.

The Water Board (preliminary 401 condition 1) specifies that it would likely condition the North Yuba River below New Bullards Bar Dam, Oregon Creek below Log Cabin Diversion Dam, Middle Yuba River below Our House Diversion Dam, and Yuba River below Englebright Dam with minimum instream flows in light of the whole record, but does not specify a minimum flow. The Water Board (2017c) states that current flow and habitat conditions in the North Yuba River do not appear to support native fauna and suggests the Commission evaluate flow releases that range from flows proposed by YCWA to the maximum flow proposal made for the North Yuba River below New Bullards Bar Dam (table 3-33).

Table 3-32. Proposed and recommended minimum flows (cfs) by water year type for the North Yuba River downstream of New Bullards Bar Dam (Source: staff).

Entity	Critically Dry	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
YCWA					
October 1–30	7	13	13	13	13
November 1–30	7	13	13	13	13
December 1–31	7	13	13	13	13
January 1–31	7	13	13	13	13
February 1–29	7	13	13	13	13
March 1–31	7	13	13	12	11
April 1–30	5	5	5	5	5
May 1–31	5	5	5	5	5
June 1–30	5	5	5	5	5
July 1–31	7	13	13	12	11
August 1–31	7	13	13	12	11
September 1–30	7	13	13	12	11
Forest Service, FWS, BLM, and California DFW					
October 1–30	30	30	30	30	30
November 1–30	30	30	30	30	30
December 1–31	30	30	30	30	30
January 1–31	30	30	30	30	30
February 1–29	30	30	30	30	30
March 1–31	30	30	30	30	30
April 1–30	60	60	60	60	60
May 1–31	60	60	60	60	60
June 1–30	60	60	60	60	60
July 1–31	40	40	40	40	40
August 1–31	40	40	40	40	40
September 1–30	30	30	30	30	30

Table 3-33. Water Board suggested range of minimum flows (cfs) by water year type for the North Yuba River downstream of New Bullards Bar Dam (Source: Water Board, 2017c).

Period	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
October 1–30	7–90	13–90	13–90	13–90	13–90
November 1–30	7–90	13–90	13–90	13–90	13–90
December 1–31	7–90	13–90	13–90	13–90	13–90
January 1–31	7–90	13–90	13–90	13–90	13–90
February 1–29	7–100	13–100	13–100	13–100	13–100
March 1–31	7–120	13–120	13–120	12–120	11–250
April 1–30	5–140	5–140	5–140	5–220	5–300
May 1–31	5–120	5–120	5–120	5–220	5–300
June 1–30	5–120	5–120	5–120	5–220	5–300
July 1–31	7–100	13–100	13–100	12–100	11–150
August 1–31	7–90	13–90	13–90	12–90	11–90
September 1–30	7–90	13–90	13–90	12–90	11–90

Our Analysis

Release of minimum instream flows downstream of the New Bullards Bar Dam, Our House Diversion Dam, and Log Cabin Diversion Dam influence aquatic habitat availability and water temperatures in these downstream reaches. We discuss the effects on each reach individually, below.

North Yuba River and Yuba River—Current minimum flow releases of 5 cfs into the North Yuba River downstream of New Bullards Bar Dam provide between 10 percent and 63 percent of the maximum weighted usable area (WUA) for rainbow trout, depending on the lifestage (table 3-34).[82] Under the minimum flows proposed by YCWA in measure AR10, rainbow trout maximum WUA would increase by 3 percent to 20 percent from current conditions (table 3-35) in most months, while flows and habitat conditions would be unchanged from April through June. Under the minimum flows

[82] Weighted usable area is an index that describes overall habitat suitability within a study area.

recommended by the Forest Service, FWS, BLM, and California DFW, rainbow trout maximum WUA would increase by 33 percent to 61 percent from current conditions (table 3-35). The percent change in maximum WUA for the range of minimum flows that the Water Board suggests is provided in table 3-36. The lower set of minimum flows that the Water Board suggests are the same as YCWA's proposal; therefore, the corresponding change in rainbow trout maximum WUA would be the same as described above. Under the Water Board's highest set of this range of minimum flows, rainbow trout maximum WUA would increase by 32 percent to 81 percent from current conditions. A modest increase in number of rainbow trout occupying the bypassed reach of the North Yuba River downstream of New Bullards Bar Dam may occur with YCWA's proposed minimum flows increasing WUA (up to 20 percent increase from current conditions) in this reach. However, other physical parameters (e.g., water temperature) and ecological factors (e.g., predation and food availability) could reduce the number of trout that inhabit any new area despite increases in WUA.

Table 3-34. Percent of maximum weighted usable area for rainbow trout in the North Yuba River downstream of New Bullards Bar Dam under existing minimum flow releases[a] (Source: YCWA, 2013a, as modified by staff).

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
Rainbow Trout—Adult Lifestage					
October	10%	10%	10%	10%	10%
November	10%	10%	10%	10%	10%
December	10%	10%	10%	10%	10%
January	10%	10%	10%	10%	10%
February	10%	10%	10%	10%	10%
March	10%	10%	10%	10%	10%
April	10%	10%	10%	10%	10%
May	10%	10%	10%	10%	10%
June	10%	10%	10%	10%	10%
July	10%	10%	10%	10%	10%
August	10%	10%	10%	10%	10%
September	10%	10%	10%	10%	10%
Rainbow Trout—Spawning Lifestage					
April	44%	44%	44%	44%	44%

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
May	44%	44%	44%	44%	44%
June	44%	44%	44%	44%	44%
Rainbow Trout—Juvenile Lifestage					
October	63%	63%	63%	63%	63%
November	63%	63%	63%	63%	63%
December	63%	63%	63%	63%	63%
January	63%	63%	63%	63%	63%
February	63%	63%	63%	63%	63%
March	63%	63%	63%	63%	63%
April	63%	63%	63%	63%	63%
May	63%	63%	63%	63%	63%
June	63%	63%	63%	63%	63%
July	63%	63%	63%	63%	63%
August	63%	63%	63%	63%	63%
September	63%	63%	63%	63%	63%

[a] YCWA's current minimum flow release downstream of New Bullards Bar Dam is 5 cfs.

Table 3-35. Percent of change in maximum weighted usable area relative to existing conditions (table 3-34) for rainbow trout in the North Yuba River downstream of New Bullards Bar Dam under YCWA's proposed minimum flows and Forest Service, FWS, BLM, and California DFW recommended minimum flows[a] (Source: YCWA, 2013a, as modified by staff).

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
Rainbow Trout—Adult Lifestage					
October	3%, 38%	14%, 38%	14%, 38%	14%, 38%	14%, 38%
November	3%, 38%	14%, 38%	14%, 38%	14%, 38%	14%, 38%
December	3%, 38%	14%, 38%	14%, 38%	14%, 38%	14%, 38%

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
January	3%, 38%	14%, 38%	14%, 38%	14%, 38%	14%, 38%
February	3%, 38%	14%, 38%	14%, 38%	14%, 38%	14%, 38%
March	3%, 38%	14%, 38%	14%, 38%	12%, 38%	11%, 38%
April	0%, 61%	0%, 61%	0%, 61%	0%, 61%	0%, 61%
May	0%, 61%	0%, 61%	0%, 61%	0%, 61%	0%, 61%
June	0%, 61%	0%, 61%	0%, 61%	0%, 61%	0%, 61%
July	3%, 48%	3%, 48%	3%, 48%	12%, 48%	11%, 48%
August	3%, 48%	3%, 48%	3%, 48%	12%, 48%	11%, 48%
September	3%, 38%	14%, 38%	14%, 38%	12%, 38%	11%, 38%
Rainbow Trout—Spawning Lifestage					
April	0%, 41%	0%, 41%	0%, 41%	0%, 41%	0%, 41%
May	0%, 41%	0%, 41%	0%, 41%	0%, 41%	0%, 41%
June	0%, 41%	0%, 41%	0%, 41%	0%, 41%	0%, 41%
Rainbow Trout—Juvenile Lifestage					
October	6%, 33%	20%, 33%	20%, 33%	20%, 33%	20%, 33%
November	6%, 33%	20%, 33%	20%, 33%	20%, 33%	20%, 33%
December	6%, 33%	20%, 33%	20%, 33%	20%, 33%	20%, 33%
January	6%, 33%	20%, 33%	20%, 33%	20%, 33%	20%, 33%
February	6%, 33%	20%, 33%	20%, 33%	20%, 33%	20%, 33%
March	6%, 33%	20%, 33%	20%, 33%	18%, 33%	17%, 33%
April	0%, 37%	0%, 37%	0%, 37%	0%, 37%	0%, 37%
May	0%, 37%	0%, 37%	0%, 37%	0%, 37%	0%, 37%
June	0%, 37%	0%, 37%	0%, 37%	0%, 37%	0%, 37%
July	6%, 35%	20%, 35%	20%, 35%	18%, 35%	17%, 35%
August	6%, 35%	20%, 35%	20%, 35%	18%, 35%	17%, 35%
September	6%, 33%	20%, 33%	20%, 33%	18%, 33%	17%, 33%

[a] Percent values are shown for YCWA's proposed minimum flows followed by the resource agencies' recommended minimum flows.

Table 3-36. Percent of change in maximum weighted usable area relative to existing conditions (table 3-34) for rainbow trout in the North Yuba River downstream of New Bullards Bar Dam under the Water Board's range of minimum flows (Source: YCWA, 2013a, as modified by staff).

Month	Critically Dry Water Year[a]	Dry Water Year[a]	Below Normal Water Year[a]	Above Normal Water Year[a]	Wet Water Year[a]
Rainbow Trout—Adult Lifestage					
October	3%, 70%	14%, 70%	14%, 70%	14%, 70%	14%, 70%
November	3%, 70%	14%, 70%	14%, 70%	14%, 70%	14%, 70%
December	3%, 70%	14%, 70%	14%, 70%	14%, 70%	14%, 70%
January	3%, 70%	14%, 70%	14%, 70%	14%, 70%	14%, 70%
February	3%, 71%	14%, 71%	14%, 71%	14%, 71%	14%, 71%
March	3%, 74%	14%, 74%	14%, 74%	12%, 74%	11%, 79%
April	0%, 75%	0%, 75%	0%, 75%	0%, 78%	0%, 81%
May	0%, 74%	0%, 74%	0%, 74%	0%, 78%	0%, 81%
June	0%, 74%	0%, 74%	0%, 74%	0%, 78%	0%, 81%
July	3%, 71%	3%, 71%	3%, 71%	12%, 71%	11%, 76%
August	3%, 70%	3%, 70%	3%, 70%	12%, 70%	11%, 70%
September	3%, 70%	14%, 70%	14%, 70%	12%, 70%	11%, 70%
Rainbow Trout—Spawning Lifestage					
April	0%, 56%	0%, 56%	0%, 56%	0%, 41%	0%, 32%
May	0%, 56%	0%, 56%	0%, 56%	0%, 41%	0%, 32%
June	0%, 56%	0%, 56%	0%, 56%	0%, 41%	0%, 32%
Rainbow Trout—Juvenile Lifestage					
October	6%, 35%	20%, 35%	20%, 35%	20%, 35%	20%, 35%
November	6%, 35%	20%, 35%	20%, 35%	20%, 35%	20%, 35%
December	6%, 35%	20%, 35%	20%, 35%	20%, 35%	20%, 35%
January	6%, 35%	20%, 35%	20%, 35%	20%, 35%	20%, 35%
February	6%, 35%	20%, 35%	20%, 35%	20%, 35%	20%, 35%
March	6%, 34%	20%, 34%	20%, 34%	18%, 34%	17%, 32%

Month	Critically Dry Water Year[a]	Dry Water Year[a]	Below Normal Water Year[a]	Above Normal Water Year[a]	Wet Water Year[a]
April	0%, 34%	0%, 34%	0%, 34%	0%, 32%	0%, 33%
May	0%, 34%	0%, 34%	0%, 34%	0%, 32%	0%, 33%
June	0%, 34%	0%, 34%	0%, 34%	0%, 32%	0%, 33%
July	6%, 35%	20%, 35%	20%, 35%	18%, 35%	17%, 34%
August	6%, 35%	20%, 35%	20%, 35%	18%, 35%	17%, 35%
September	6%, 35%	20%, 35%	20%, 35%	18%, 35%	17%, 35%

[a] Values are presented from lowest to highest flow.

In its letter filed on August 25, 2017, FWS states that during the development of its recommended minimum instream flows, it worked with BLM, the Forest Service, California DFW, and the Water Board to balance the benefits of higher releases for more instream habitat with the need to keep appropriate temperatures for rainbow trout in the bypassed reach between New Bullards Bar Dam and the North Yuba-Middle Yuba River confluence. The agencies determined that a summer release of 40 cfs in July and August would provide that temperature balance, while improving habitat conditions in the bypassed reach downstream of the confluence. In its comments on the draft EIS, the Forest Service indicates that it and the other resource agencies reached a compromise between making temperatures too cold in the bypassed reach from New Bullards Bar Dam to the North Yuba-Middle Yuba River confluence while still providing enough cold water through this same reach to provide a benefit to the bypassed reach downstream of the confluence to the New Colgate Powerhouse. Based on simulated median monthly flows in the bypassed reach downstream of the confluence, the agencies' recommended minimum flow releases would provide up to about 25 percent more maximum WUA for adult rainbow trout from June through September, compared to YCWA's proposed minimum flow releases. However, the agencies' recommended minimum flow release would also provide up to about 13 percent less maximum WUA for juvenile rainbow trout during the same months, compared to YCWA's proposed minimum flow releases.

Alternative minimum flows can affect a reservoir's water surface elevation differently. According to YCWA's modeling results, the agencies' recommended higher minimum flows downstream of New Bullards Bar Dam would not lower the water surface elevation in New Bullards Bar Reservoir at a faster rate over time than the minimum flows proposed by YCWA. However, as shown in tables 3-32 and 3-33, the Water Board's range of recommended flows is up to about eight times higher than those recommended by the Forest Service, FWS, BLM, and California DFW, and up to 60 times higher than those proposed by YCWA. Consequently, the upper range of flows

recommended by the Water Board would have the greatest effect on New Bullards Bar Reservoir elevation compared to all other alternative flow regimes.

Middle Yuba River and Oregon Creek—Current minimum flow releases downstream of Log Cabin and Our House Diversion Dams (see section 2.1.4) provide between 47 and 99 percent of the maximum WUA for rainbow trout in Oregon Creek, and between 59 and 100 percent in Middle Yuba River (tables 3-37 and 3-38). Under the minimum flows proposed by YCWA in measure AR1, which are the same as flows specified by the Forest Service, recommended by California DFW, and supported by FWS, rainbow trout maximum WUA would decrease under certain water year types during certain months, but would increase overall by up to 40 percent from current conditions for certain lifestages (tables 3-39 and 3-40). Therefore, proposed and recommended minimum flows would adequately protect aquatic habitat in Middle Yuba River and Oregon Creek.

Table 3-37. Percent of maximum weighted usable area for rainbow trout in the Oregon Creek downstream of Log Cabin Diversion Dam under existing minimum flow releases (Source: YCWA, 2013a, as modified by staff).

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
Rainbow Trout—Adult Lifestage					
October 1–30	85%	85%	85%	85%	85%
November 1–30	85%	85%	85%	85%	85%
December 1–31	85%	85%	85%	85%	85%
January 1–31	85%	85%	85%	85%	85%
February 1–29	85%	85%	85%	85%	85%
March 1–31	85%	85%	85%	85%	85%
April 1–14	85%	85%	85%	85%	85%
April 15–30	94%	94%	94%	94%	94%
May 1–31	94%	94%	94%	94%	94%
June 1–15	94%	94%	94%	94%	94%
Jun 16–30	85%	85%	85%	85%	85%
July 1–31	85%	85%	85%	85%	85%
August 1–31	85%	85%	85%	85%	85%
September 1–30	85%	85%	85%	85%	85%

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
Rainbow Trout—Spawning Lifestage					
April 1–14	47%	47%	47%	47%	47%
April 15–30	64%	64%	64%	64%	64%
May 1–31	64%	64%	64%	64%	64%
June 1–15	64%	64%	64%	64%	64%
June 16–30	47%	47%	47%	47%	47%
Rainbow Trout—Juvenile Lifestage					
October 1–30	94%	94%	94%	94%	94%
November 1–30	94%	94%	94%	94%	94%
December 1–31	94%	94%	94%	94%	94%
January 1–31	94%	94%	94%	94%	94%
February 1–29	94%	94%	94%	94%	94%
March 1–31	94%	94%	94%	94%	94%
April 1–14	94%	94%	94%	94%	94%
April 15–30	99%	99%	99%	99%	99%
May 1–31	99%	99%	99%	99%	99%
June 1–15	99%	99%	99%	99%	99%
June 16–30	94%	94%	94%	94%	94%
July 1–31	94%	94%	94%	94%	94%
August 1–31	94%	94%	94%	94%	94%
September 1–30	94%	94%	94%	94%	94%

Table 3-38. Percent of maximum weighted usable area for rainbow trout in the Middle Yuba River downstream of Our House Diversion Dam under existing minimum flow releases (Source: YCWA, 2013a, as modified by staff).

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
Rainbow Trout—Adult Lifestage					
October	59%	59%	59%	59%	59%
November	59%	59%	59%	59%	59%
December	59%	59%	59%	59%	59%
January	59%	59%	59%	59%	59%
February	59%	59%	59%	59%	59%
March	59%	59%	59%	59%	59%
April 1–14	59%	59%	59%	59%	59%
April 15–30	81%	81%	81%	81%	81%
May	81%	81%	81%	81%	81%
June 1–15	81%	81%	81%	81%	81%
June 16–30	59%	59%	59%	59%	59%
July	59%	59%	59%	59%	59%
August	59%	59%	59%	59%	59%
September	59%	59%	59%	59%	59%
Rainbow Trout—Spawning Lifestage					
April 1–14	79%	79%	79%	79%	79%
April 15–30	90%	90%	90%	90%	90%
May	90%	90%	90%	90%	90%
June 1–15	90%	90%	90%	90%	90%
June 16–30	79%	79%	79%	79%	79%
Rainbow Trout—Juvenile Lifestage					
October	97%	97%	97%	97%	97%
November	97%	97%	97%	97%	97%
December	97%	97%	97%	97%	97%
January	97%	97%	97%	97%	97%

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
February	97%	97%	97%	97%	97%
March	97%	97%	97%	97%	97%
April 1–14	97%	97%	97%	97%	97%
April 15–30	100%	100%	100%	100%	100%
May	100%	100%	100%	100%	100%
June 1–15	100%	100%	100%	100%	100%
Jun 16–30	97%	97%	97%	97%	97%
July	97%	97%	97%	97%	97%
August	97%	97%	97%	97%	97%
September	97%	97%	97%	97%	97%

Table 3-39. Percent of maximum weighted usable area for rainbow trout in the Oregon Creek downstream of Log Cabin Diversion Dam under YCWA proposed and resource agencies recommended minimum flow releases (Source: YCWA, 2013a, as modified by staff).

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
Rainbow Trout—Adult Lifestage					
October	80%	80%	80%	86%	86%
November	80%	91%	97%	97%	98%
December	80%	91%	97%	97%	98%
January	80%	91%	97%	97%	98%
February	94%	94%	98%	99%	100%
March	94%	94%	98%	100%	100%
April	98%	98%	100%	98%	98%
May	98%	98%	100%	98%	98%
June	98%	98%	100%	98%	98%
July	80%	91%	97%	99%	100%

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
August	80%	80%	86%	91%	92%
September	80%	80%	86%	91%	92%
Rainbow Trout—Spawning Lifestage					
April	79%	79%	91%	98%	98%
May	79%	79%	91%	98%	98%
June	79%	79%	91%	98%	98%
Rainbow Trout—Juvenile Lifestage					
October	93%	93%	93%	93%	93%
November	93%	97%	100%	100%	100%
December	93%	97%	100%	100%	100%
January	93%	97%	100%	100%	100%
February	99%	99%	99%	99%	98%
March	99%	99%	99%	96%	96%
April	100%	100%	97%	92%	92%
May	100%	100%	97%	92%	92%
June	100%	100%	97%	92%	92%
July	93%	97%	100%	99%	98%
August	93%	93%	93%	97%	99%
September	93%	93%	93%	97%	99%

Table 3-40. Percent of maximum weighted usable area for rainbow trout in the Middle Yuba River downstream of Our House Diversion Dam under YCWA proposed and resource agencies recommended minimum flow releases (Source: YCWA, 2013a, as modified by staff).

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
Rainbow Trout—Adult Lifestage					
October	71%	81%	84%	87%	87%
November	71%	81%	84%	87%	87%
December	71%	81%	84%	87%	92%
January	71%	81%	92%	93%	97%
February	71%	81%	92%	93%	97%
March	75%	84%	95%	97%	99%
April	87%	92%	97%	99%	100%
May	87%	92%	97%	99%	100%
June	87%	92%	97%	99%	100%
July	75%	87%	92%	95%	97%
August	75%	81%	87%	92%	95%
September	75%	81%	84%	87%	92%
Rainbow Trout—Spawning Lifestage					
April	93%	97%	100%	100%	98%
May	93%	97%	100%	100%	98%
June	93%	97%	100%	100%	98%
Rainbow Trout—Juvenile Lifestage					
October	100%	100%	99%	99%	99%
November	100%	100%	99%	99%	99%
December	100%	100%	99%	99%	97%
January	100%	100%	97%	96%	93%
February	100%	100%	97%	96%	93%
March	100%	99%	95%	93%	91%
April	99%	97%	93%	91%	87%

Month	Critically Dry Water Year	Dry Water Year	Below Normal Water Year	Above Normal Water Year	Wet Water Year
May	99%	97%	93%	91%	87%
June	99%	97%	93%	91%	87%
July	100%	99%	97%	95%	91%
August	100%	100%	99%	97%	95%
September	100%	100%	99%	99%	97%

Table 3-41 shows that both YCWA's proposed minimum flows and the flow recommendation by the agencies (i.e., the recommended minimum flows and the use of the upper intake for New Colgate Powerhouse from March through May) would act to reduce the percentage of time that simulated daily mean water temperatures exceed 20°C in Oregon Creek, Middle Yuba River, North Yuba River, and Yuba River, compared to existing conditions.[83] However, the greatest reduction in simulated temperatures exceeding 20°C would be with the agencies' flow recommendation in the Yuba River at RM 39.7. Downstream of New Colgate Powerhouse, neither YCWA's proposed minimum flows nor the agencies' flow recommendation would substantially change the percentage of time that water temperatures in the Yuba River downstream to the confluence with the Feather River would exceed 20°C. Changes are observed only in the lowermost stations, and the maximum difference between YCWA's proposal and the agencies' recommendation is predicted to be 3 percent. In response to requests by the Water Board (2018a), the final EIS was revised. Table 3-41 and figures 3-31 and 3-32 provide the number of years and water year types in which exceedances of 20°C would occur under the four scenarios. Figures 3-31 and 3-32 also provide a frequency analysis of the number of days that exceed 20°C.

[83] Use of the upper or lower intake for the New Colgate Powerhouse intake would only affect water temperatures at and downstream of the New Colgate Powerhouse discharge.

Table 3-41. Percent of time that simulated daily mean temperature exceed 20°C for various operational scenarios, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).

Location	Existing Conditions	YCWA Proposed Operations	Agency Recommended Flows with use of Lower Intake	Agency Recommended Flows with use of Upper Intake in March through May
Oregon Creek[a]				
RM 4.2[b]	12%	3%	3%	3%
RM 0.1[b]	36%	32%	32%	32%
Middle Yuba River[a]				
RM 12.6[b]	18%	18%	18%	18%
RM 4.8[b]	23%	22%	22%	22%
RM 4.6[b]	25%	23%	23%	23%
RM 0.1[b]	28%	26%	26%	26%
North Yuba River[a]				
RM 2.3	0%	0%	0%	0%
RM 0.1[c]	2%	<1%	0%	0%
Yuba River[a]				
RM 39.7[d]	24%	21%	4%	4%
RM 34.4[b]	28%	26%	20%	19%
New Colgate Powerhouse Discharge	0%	0%	0%	0%
Yuba River				
RM 34.1	0%	0%	0%	0%
RM 23.9	0%	0%	0%	0%
RM 23.0	0%	0%	0%	0%
RM 17.7	0%	0%	0%	0%
RM 16.2[e]	<1%	0%	<1%	<1%
RM 13.8[e]	<1%	<1%	<1%	<1%
RM 11.8[e]	<1%	<1%	<1%	<1%
RM 11.6[e]	1%	<1%	1%	<1%

Location	Existing Conditions	YCWA Proposed Operations	Agency Recommended Flows with use of Lower Intake	Agency Recommended Flows with use of Upper Intake in March through May
RM 6.2[f]	1%	1%	1%	1%
RM 0.7[g]	10%	11%	13%	12%

[a] Use of the upper or lower intake for the New Colgate Powerhouse intake would have no effect on water temperatures in these reaches, and percentages shown for agency-recommended flows are for those flows in Oregon Creek, Middle Yuba River, and North Yuba River.

[b] Exceedances of 20.0°C occur in all 41 modeled years for all four scenarios.

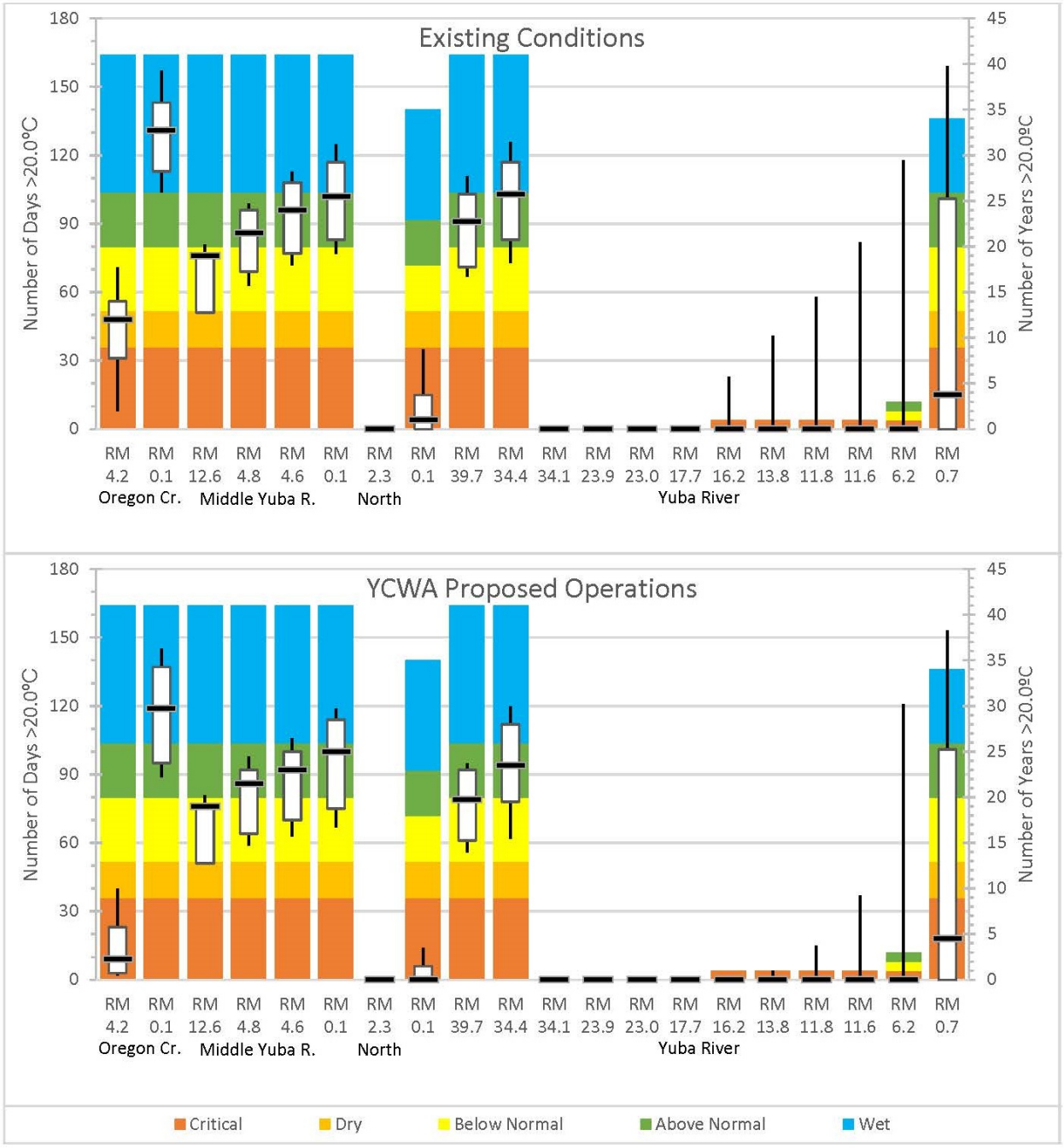
[c] Exceedances of 20.0°C occur in 35 of the 41 modeled years and for each Yuba River Index type for both the existing conditions and YCWA proposed operations.

[d] Exceedances of 20.0°C occur in all 41 modeled years for existing conditions and YCWA proposed operation, in 32 years for agency-recommended flows, and in 31 years for agency-recommended flows with use of the upper intake in March–May. Under all scenarios, exceedances of 20.0°C occur in all Yuba River Index types.

[e] Exceedances of 20.0°C only occur in 1977, a critical year with the lowest estimated unimpaired flow for the Smartsville gage.

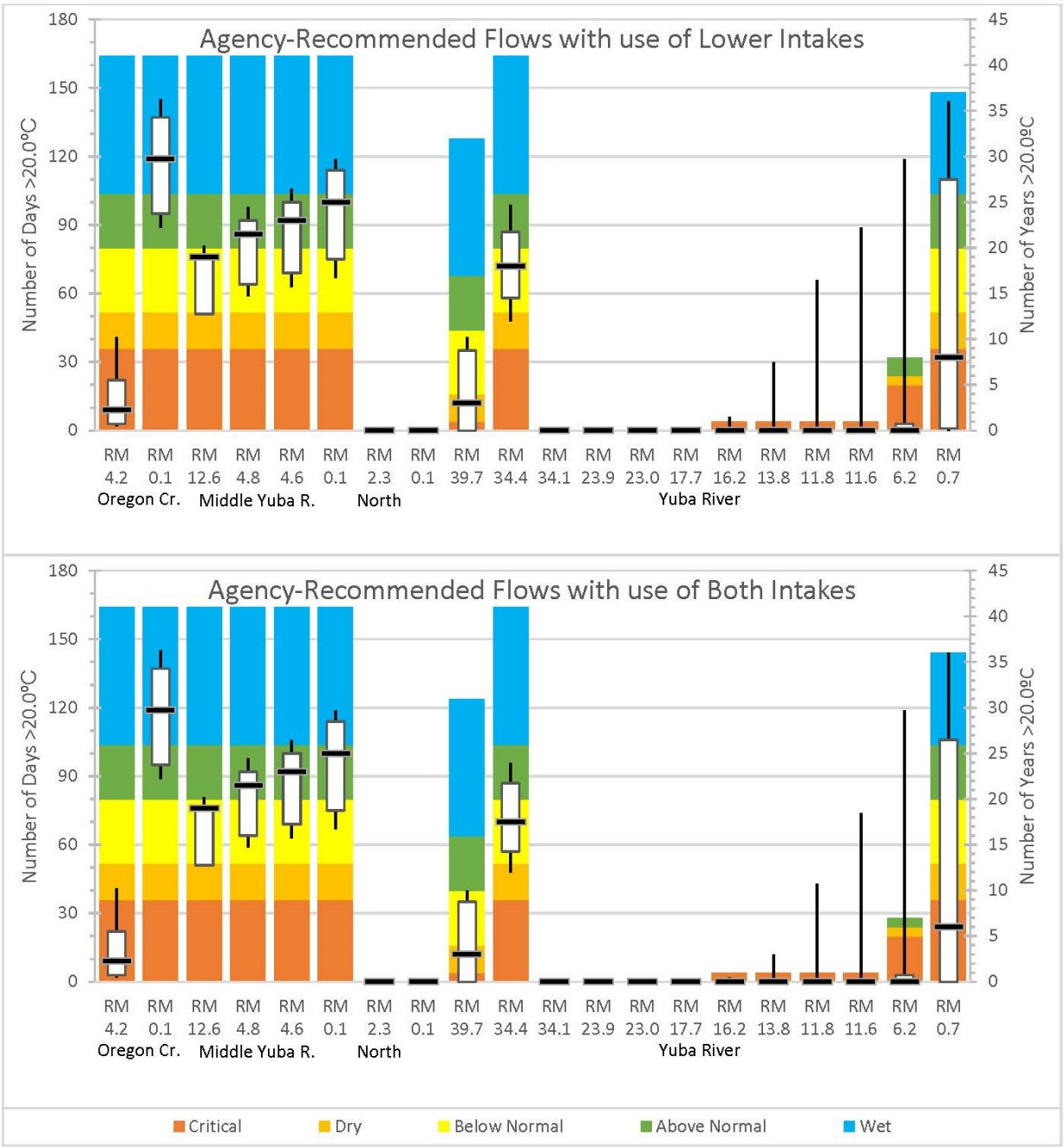
[f] Exceedances of 20.0°C occur in 3 years for existing conditions and YCWA proposed operation, 8 years for agency-recommended flows, and 7 years for agency-recommended flows with use of the upper intake. These exceedances occur in all Yuba River Index types except wet.

[g] Exceedances of 20.0°C occur in 34 to 37 years, depending on operations.



Notes: Number of days: median is horizontal line, maximum is top of line, minimum is bottom of line, 10 and 90 percent are top and bottom of bar, respectively.
Based on existing conditions, the number of years for the water year types are: 9 critical , 4 dry, 7 below normal, 6 above normal, and 15 wet.

Figure 3-31. Frequency by location and water year type of simulated daily mean temperature 20.0ºC exceedances for existing conditions and YCWA proposed operations, in water years 1970–2010 (Source: HDR and Grinnell, 2017b,c).



Notes: Use of both intakes consists of using upper intake in March–May when possible.
Number of days: median is horizontal line, maximum is top of line, minimum is bottom of line, 10 and 90 percent are top and bottom of bar, respectively.
Based on existing conditions, the number of years for the water year types are: 9 critical, 4 dry , 7 below normal, 6 above normal, and 15 wet.

Figure 3-32. Frequency by location and water year type of simulated daily mean temperature 20.0ºC exceedances for agency recommended flows with use of lower and both New Colgate Powerhouse intakes, for water years 1970–2010 (Source: HDR and Grinnell, 2017d).

Table 3-42 shows that both YCWA's proposed minimum flows and the agencies' recommended flows would increase the percentage of time that water temperatures are between 12°C and 20°C by approximately the same amount downstream of Log Cabin Diversion Dam, compared to existing conditions, but that this level of benefit to Oregon Creek would not persist by the time water reaches the Middle Yuba River confluence (RM 0.1). Additionally, neither YCWA nor the agencies' proposed flows would change the percent of time that water temperatures are between 12°C and 20°C in the Middle Yuba River, compared to existing conditions. In the North Yuba River between New Bullards Bar Dam and the confluence with the Middle Yuba River, YCWA's proposed minimum flows would slightly reduce (to 43 percent) the time that temperatures are within this range, while the agencies' flow recommendation would decrease this to only 1 percent of the time. This reflects higher volume releases of colder water from the dam, resulting in water temperatures less than 12°C more of the time. Although YCWA's proposed operation would have negligible effects on the frequency of suitable temperature for salmonids in the Yuba River between the North Yuba River-Middle Yuba River confluence and New Colgate Powerhouse, the agencies' recommended flows, with or without use of the upper intake, would increase the frequency of suitable temperatures for salmonids in this reach. Figures 3-33 and 3-34 show that the agencies' recommended minimum flow releases during June through September would provide a greater frequency of daily mean water temperature of 12ºC to 20ºC in the bypassed reach from the North Yuba-Middle Yuba River confluence to New Colgate Powerhouse, compared to YCWA's proposed flow releases. From October through May, YCWA's proposed flow releases would provide daily mean temperatures of 12ºC to 20ºC in this subreach at either a greater or equal frequency[84] than the agencies' recommended minimum flow releases. Figures 3-35 and 3-36 show that the effects discussed above for the North Yuba River would occur in all water year types; whereas, the effects on the Yuba River would be largest in critical and dry water years and much smaller in above normal and wet water years. In the Yuba River downstream of New Colgate Powerhouse to the confluence with Feather River, both the proposed and recommended flows would maintain similar frequencies of water temperatures (in the range of 12°C to 20°C) compared to existing conditions.

[84] In November through February, this subreach's daily mean temperatures would nearly always remain less than 12ºC under both YCWA's proposed and the agencies' recommended flow releases.

Table 3-42. Percent of time that simulated daily mean temperature are between 12 to 20°C for various operational scenarios, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).

Location	Existing Conditions	YCWA Proposed Operations	Agency Recommended Flows with use of Lower Intakes	Agency Recommended Flows with use of Upper Intakes in March through May
Oregon Creek[a]				
RM 4.2	26%	32%	33%	33%
RM 0.1	23%	22%	21%	21%
Middle Yuba River[a]				
RM 12.6	23%	23%	23%	23%
RM 4.8	24%	23%	23%	23%
RM 4.6	24%	23%	23%	23%
RM 0.1	24%	23%	22%	22%
North Yuba River[a]				
RM 2.3	0%	0%	0%	0%
RM 0.1	46%	43%	1%	1%
Yuba River[a]				
RM 39.7	26%	26%	39%	39%
RM 34.4	27%	26%	30%	31%
New Colgate Powerhouse Discharge	0%	1%	1%	1%
Yuba River				
RM 34.1	1%	1%	1%	1%
RM 23.9	21%	22%	28%	21%
RM 23.0	24%	26%	30%	25%
RM 17.7	37%	39%	40%	39%
RM 16.2	40%	42%	43%	42%

Location	Existing Conditions	YCWA Proposed Operations	Agency Recommended Flows with use of Lower Intakes	Agency Recommended Flows with use of Upper Intakes in March through May
RM 13.8	45%	47%	47%	47%
RM 11.8	48%	50%	49%	50%
RM 11.6	49%	50%	50%	51%
RM 6.2	56%	57%	56%	57%
RM 0.7	53%	52%	49%	52%

[a] Use of the upper or lower intake for the New Colgate Powerhouse intake would have no effect on water temperatures in these reaches, and percentages shown for agency-recommended flows are for those flows in Oregon Creek, Middle Yuba River, and North Yuba River.

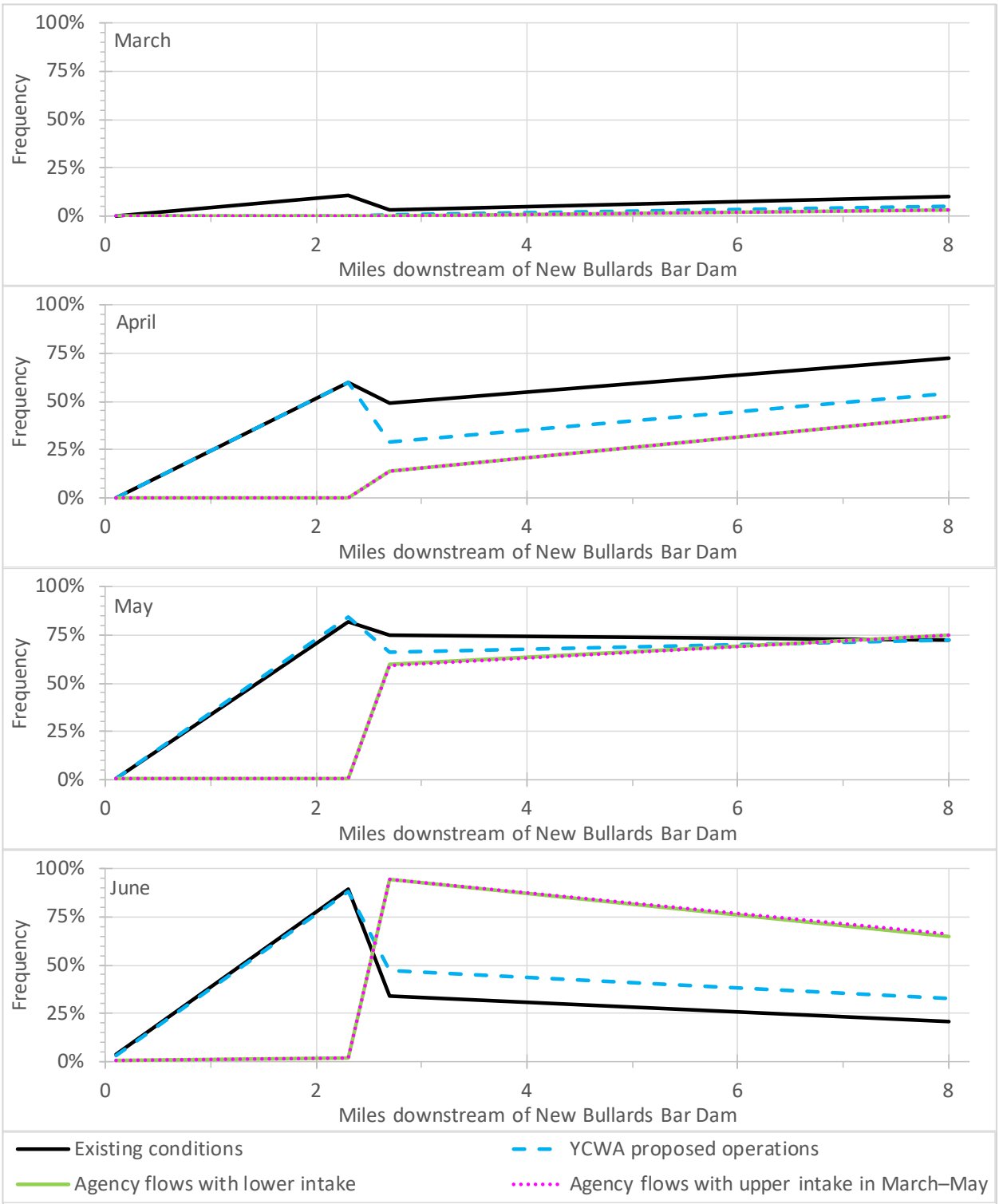


Figure 3-33. Monthly frequency of simulated daily mean temperature of 12ºC to 20ºC between New Bullards Bar Dam and New Colgate Powerhouse for four operational scenarios, March to June (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).

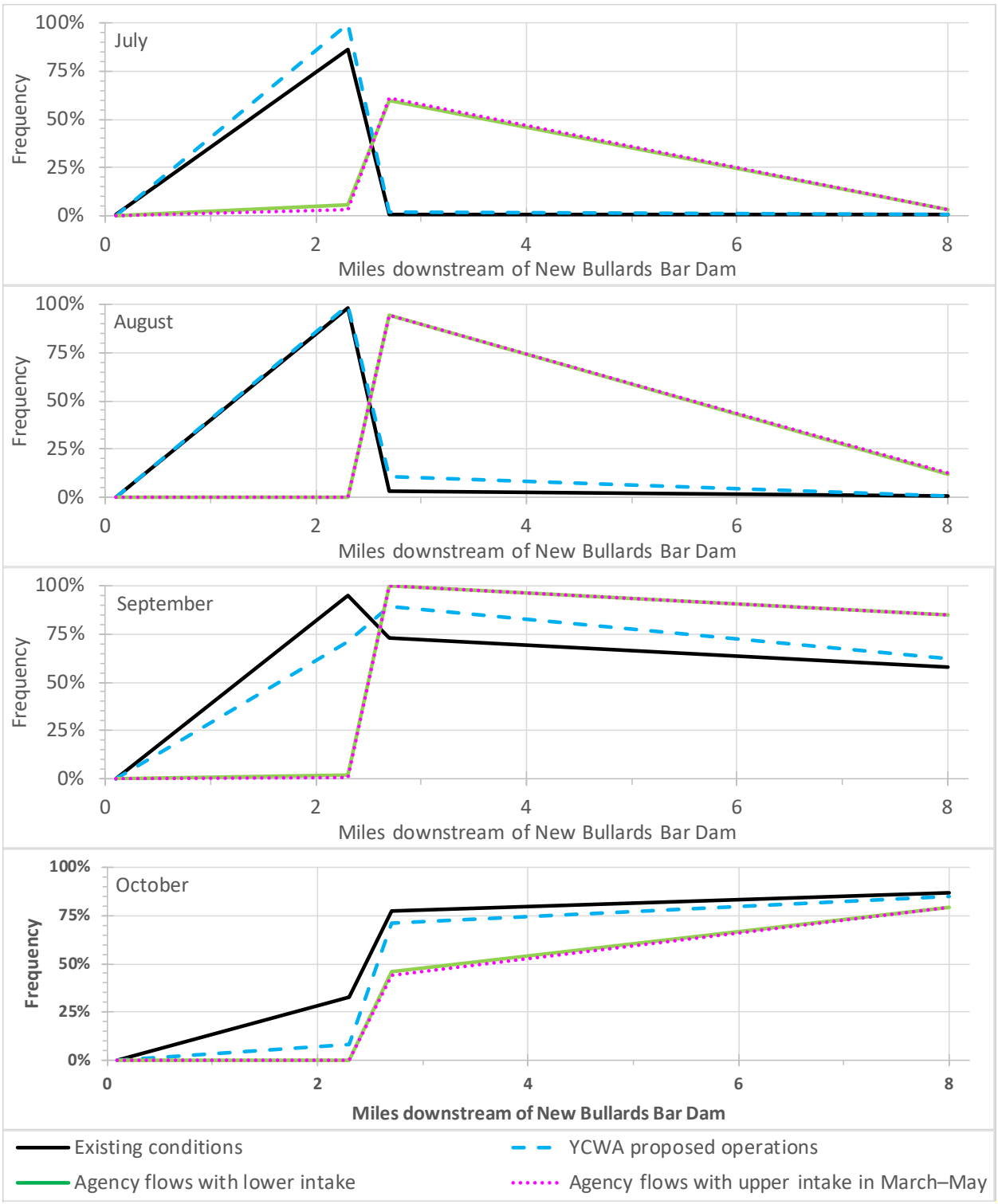
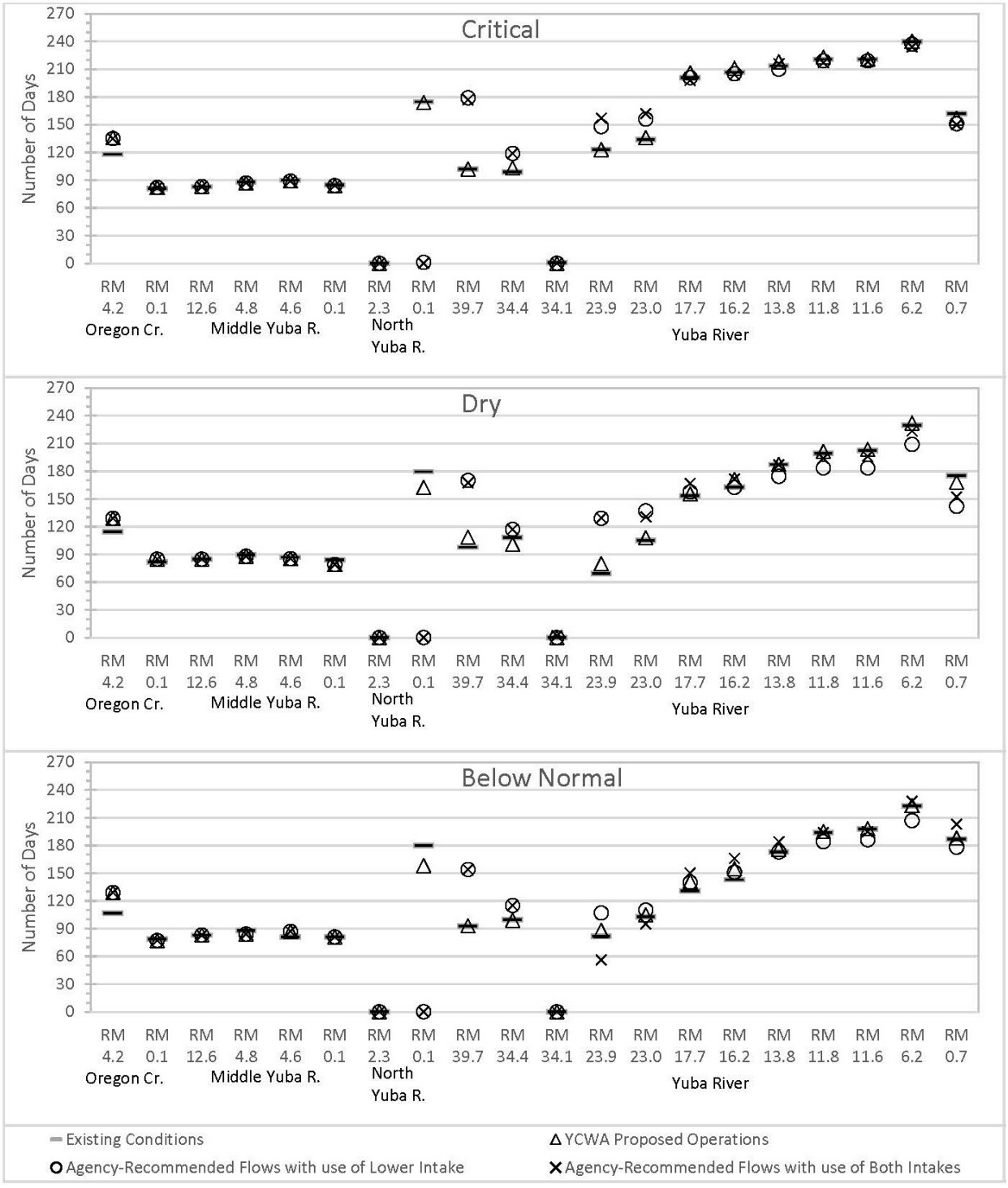
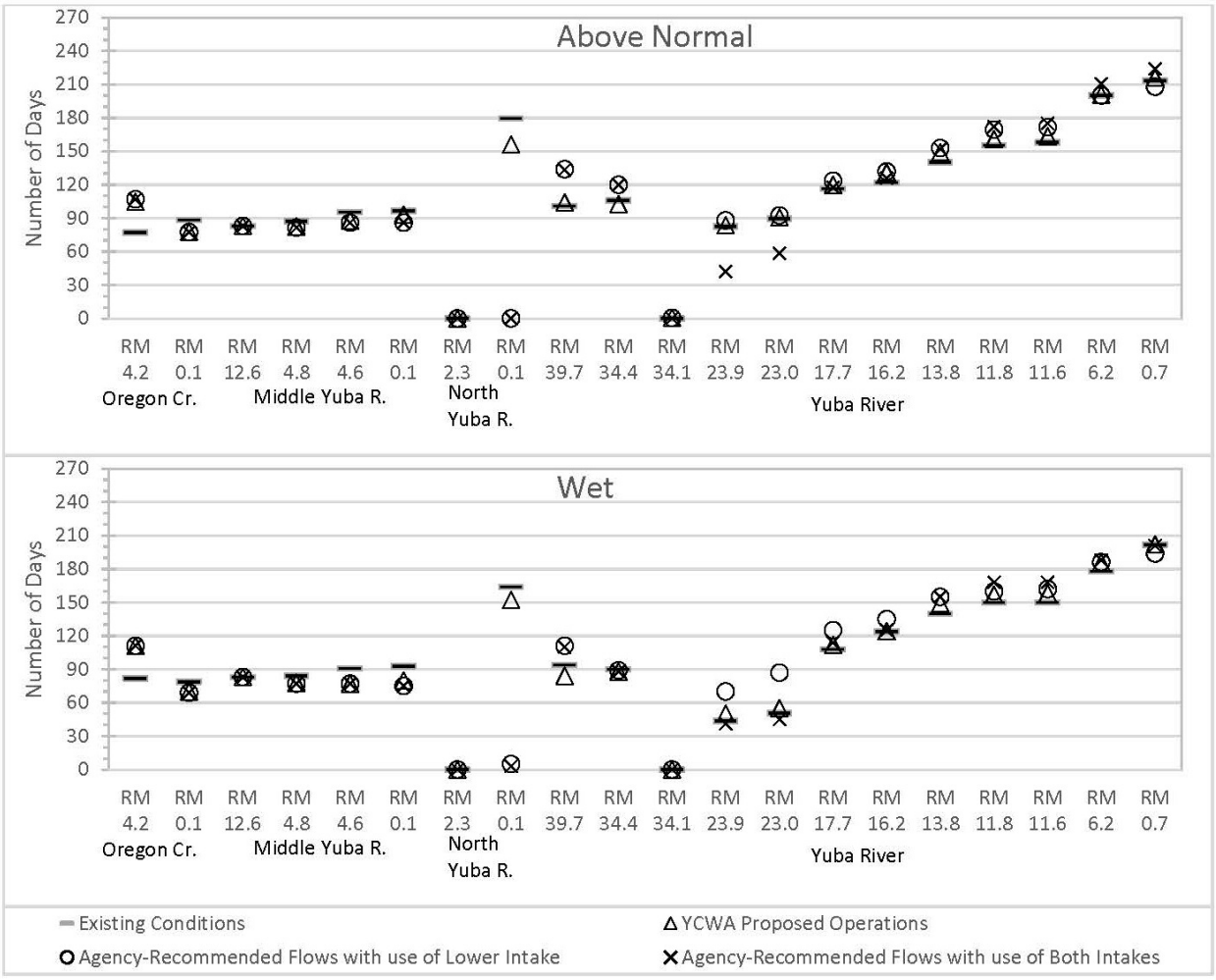


Figure 3-34. Monthly frequency of simulated daily mean temperature of 12ºC to 20ºC between New Bullards Bar Dam and New Colgate Powerhouse for four operational scenarios, July to October (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).



Note: Yuba River Index water year types based on existing conditions.

Figure 3-35. Median number of days per year that simulated daily mean temperature is between 12ºC and 20ºC in critical, dry, and below normal water years under existing, proposed, and recommended operations (1970–2010) (Source: HDR and Grinnell, 2017b,c,d).



Note: Yuba River Index water year types based on existing conditions.

Figure 3-36. Median number of days per year that simulated daily mean temperature is between 12ºC and 20ºC in critical, dry, and below normal water years under existing, proposed, and recommended operations (1970–2010) (Source: HDR and Grinnell, 2017b,c,d).

The Water Board's lower set of minimum flows for the North Yuba River below New Bullards Bar Dam are the same as YCWA's proposed minimum flows; therefore, they would result in the same water temperatures as proposed operation. In contrast, the Water Board's higher set of minimum flows for the North Yuba River range from two to about eight times the agency-recommended minimum flows. These much higher flows would moderate seasonal and daily temperature fluctuations between New Bullards Bar Dam and New Colgate Powerhouse. This would result in a reduction in the frequency of temperatures between 12°C and 20°C in the North Yuba River, but a much higher frequency of temperatures between 12°C and 20°C between the North Yuba-Middle Yuba River confluence and the New Colgate Powerhouse. It also would result in fewer

exceedances of 20°C between the North Yuba-Middle Yuba River confluence and New Colgate Powerhouse.

Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam

Operation of the project affects the seasonal instream flow pattern of the lower Yuba River between the Narrows 2 Powerhouse tailrace (RM 24.0) and its confluence with the Feather River. These altered flow conditions affect the river's capacity to support spawning, rearing, and other lifestages of resident and anadromous fish and may also affect additional physical processes including, sediment transport, floodplain connectivity, water temperature, and the maintenance of riparian vegetation. Changes in the annual hydrograph can also affect locally adapted anadromous species and their habitats by altering timing of immigration and emigration and ability to ascend natural and artificial barriers. The annual hydrograph in the lower Yuba River is most altered during the spring months when snowmelt runoff dominates (April through June) with effects varying in magnitude across water years.

In regulated river reaches that contain productive aquatic habitat, resource managers often establish instream flow regimes to maintain ecological functions and processes that are important for sustaining aquatic and riparian biota. However, balancing the different resource values associated with a given flow regime often involves a complex series of tradeoffs that affect conditions for different fish species and lifestages, consumptive water uses, recreation, and power generation.

Under proposed measure AR3, YCWA would continue to operate the project to maintain specified minimum flows in the lower Yuba River according to a flow schedule that would vary depending on the six water year types. With the exception of conference years (i.e., the driest water years, expected to occur approximately 1 percent of the time), the proposed minimum flows for each water year (schedules 1 through 6) correspond to the requirements in the Yuba Accord (table 3-43), which YCWA adopted in 2008 and continues to follow, although the measure was not included in the existing license. The proposal includes one minor exception from the Yuba Accord, containing requirements for conference years, which are designed to protect Chinook salmon redds from dewatering and to provide better water temperature conditions in the Yuba River than would occur during conference years under the current Yuba Accord requirements. These differences are shown in table 3-44. YCWA's proposed minimum instream flows would be measured at the indicated USGS gages, which are located downstream of the combined releases of the Narrows 2 Powerhouse, Narrows 2 full bypass, and PG&E's Narrows 1 Powerhouse. The minimum streamflows would be the 5-day running average of average daily streamflows, with the 15-minute flows not less than 90 percent of the specified flow requirement in table 3-43. In addition, the 15-minute flows would not be less than the applicable flow requirement specified in table 3-43 for more than 48 consecutive hours.

Table 3-43. Minimum streamflows in cubic feet per second downstream of Englebright Dam proposed by YCWA (AR3). Alternative values in ***bold italics*** represent agency recommendations where they differ from YCWA's proposed minimum flows (Source: staff).

Date	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
Yuba River—Below Narrows 2 Powerhouse/Narrows 2 Full Bypass (Compliance Point: Smartsville Gage 11418000)							
October 1–31	700	700	700	700	600	600	500
November 1–30	700	700	700	700	600	600	500
December 1–31	700	700	700	700	550	550	500
January 1–31	700	700	700	700	550	550	500
February 1–29	700	700	700	700	550	550	500
March 1–31	700	700	700	700	550	550	500
April 1–15	700	700	700	700	600	600	500
April 16–30	--	--	--	--	--	--	--
May 1–31	--	--	--	--	--	--	--
June 1–30	--	--	--	--	--	--	--
July 1–31	--	--	--	--	--	--	--
August 1–31	--	--	--	--	--	--	--
September 1–30	700	700	700	700	500	500	500
Yuba River – Below Narrows 2 Powerhouse/Narrows 2 Full Bypass (Compliance Point: Marysville Gage 11421000)							
October 1–31	500	500	500	400	400	350	350
November 1–30	500	500	500	500	500	350	350
December 1–31	500	500	500	500	500	350	350
January 1–31	500	500	500	500	500	350	350

Date	Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
February 1–29	500	500	500	500	500	350	350
March 1-22	700	700	500	500	500	350	350
March 23–31	700 ***3,500***	700	500	500	500	350	350
April 1–15	1,000 ***3,500***	700 ***2,500***	900	600	500	350	300
April 16–30	1,000 ***3,500***	800 ***2,500***	900	900	600	500	300
May 1–15	2,000	1,000 ***1,400***	900 ***1,150***	900	600 ***850***	500 ***750***	245 ***395***
May 16–31	2,000	1,000	900	600	400	400	245 ***300***
June 1–15	1,500	800	500	400	400	300 ***350***	245
June 16–30	1,500	500	500	400	400	150 ***350***	150
July 1–31	700	500	500	400	400	150 ***350***	150
August 1–31	600	500	500	400	400	150 ***350***	150
September 1–30	500	500	500	400	400	350	150

Table 3-44. Proposed changes in conference year minimum streamflows in cubic feet per second for the Yuba River Development Project by month (Source: YCWA, 2017a).

Month	Yuba Accord Conference Year Requirements	YCWA's Proposed Condition AR3 Conference Year Requirements
Yuba River—Below Narrows 2 Powerhouse/Narrows 2 Full Bypass (Compliance Point: USGS Gage 11418000, Yuba River near Smartsville)		
October 1–15	--	500
October 16–31	600	500
November 1–30	600	500
December 1–31	600	500
January 1–15	1,000	500
January 16–31	600	500
February 1–29	600	500
March 1–31	600	500
April 1–15	--	500
April 16–30	--	--
May 1–15	--	--
May 16–31	--	--
June 1–15	--	--
June 16–30	--	--
July 1–31	--	--
August 1–31	--	--
September 1–30	--	500

As described in the revised final license application, minimum flows specified in the Yuba Accord were developed to achieve the following objectives:

- maximize "optimal" flows and minimize the occurrence of sub-optimal flows, within the bounds of hydrologic variation and available water storage capacity;
- maximize the occurrence of appropriate flows for Chinook salmon and steelhead immigration, spawning, rearing, and emigration;

- provide month-to-month flow sequencing in consideration of Chinook salmon and steelhead life history periodicities;
- provide appropriate water temperatures for Chinook salmon and steelhead immigration and holding, spawning, embryo incubation, rearing, and emigration;
- promote a dynamic, resilient, and diverse fish assemblage;
- minimize potential stressors to fish species and lifestages; and
- develop flow regimes that consider all freshwater lifestages of salmonids and allocate flows accordingly.

The minimum instream flows for the lower Yuba River under the Yuba Accord (which are considered existing conditions in this EIS) are substantially higher than the minimum streamflows specified in the current project license. California DFW (10(j) recommendations 2.3, 2.4, 2.5, and 2.6), FWS (10(j) recommendations 1, 2, and 11), and BLM (10(a) recommendation 10) recommend a series of modifications to YCWA's proposed minimum instream flow schedule. Their recommended changes would require the flow regime presented in bold italics in table 3-43, which has: (1) significantly higher minimum flows for March 23 through April 30 of schedule 1 years, and for April 1 through 30 of schedule 2 years (referred to as spring floodplain inundation flows); (2) higher minimum flows for May 1 to 15 of schedule 2, 3, 5, 6, and conference years (referred to as spring pulse flows); (3) slightly higher minimum flows from May 16 through May 31 of conference years; (4) higher flows from June 1 through August 31 of schedule 6 years; and (5) significantly higher minimum flows for February 1 to February 6 of schedule 5, 6, and conference years if such higher flows did not already occur during the previous December 1 through February 1 period (referred to as conditional winter pulse flows) (table 3-45).

Similarly, during a schedule 1 water year type, NMFS (10(j) recommendation 1) recommends YCWA provide 60 days of continuous flow above 3,500 cfs as measured at Marysville gage between March 1 and June 15. During a schedule 2 water year type NMFS (10(j) recommendation 1) recommends that YCWA provide 30 days continuous flow above 2,500 cfs as measured at Marysville gage between March 1 and June 15. NMFS expects YCWA would use scheduled forecasts of rainfall, snowmelt, and streamflow to determine the optimal time to begin the snowmelt pulse flow. YCWA would use flow from the Middle and South Yuba Rivers to the maximum extent possible and coordinate the springtime pulse flow to coincide with anticipated spill events from Englebright Reservoir.

Table 3-45. Conditional winter pulse flows in cubic feet per second recommended by California DFW, FWS, and BLM for the Yuba River downstream from Englebright Dam (Source: staff).

Date	Schedule 5	Schedule 6	Conference Year
February 1–February 2	3,000	2,850	2,745
February 3	1,850	1,700	1,595
February 4	1,000	850	745
February 5	750	600	495
February 6	600	450	345

Note: Conditional winter pulse flows would be implemented in schedule 5, 6, and conference years if between December 1 and February 1, no instances occur in which flows are greater than 3,000 cfs for 2 consecutive days as measured at the Smartsville gage.

NMFS (10(j) recommendation 1) also recommends that, if YCWA has not initiated the pulse flow by April 15 of a schedule 1 or 2 year, the pulse flow would commence on April 15 and last for the next 60 days (schedule 1) or 30 days (schedule 2). In addition, if at any point during the 60-day schedule 1 snowmelt pulse release, the water year type changes to schedule 2, the pulse flow would conclude at 30 days. If the water year type changes to schedule 3 or lower, the pulse flow would conclude immediately, subject to the recession condition outlined in NMFS 10(j) recommendation 2 (see below). NMFS also recommends flows not be reduced by more than 5 percent of the previous day's average flow as measured at the Smartsville gage from the onset of the pulse flow outlined above through September 30, and whenever flow is at or below 4,130 cfs as measured at the Smartsville gage.

NMFS (10(j) recommendation 2) recommends a minimum flow of 350 cfs in June through August at the Marysville gage (11421000) for schedule 6 years to maintain cooler temperatures in the lower Yuba River to improve survival of spring-run Chinook salmon and steelhead. FWS (10(j) recommendation 2), BLM (10(a) recommendation 8), and California DFW (10(j) recommendation 2.6) recommend, and FWN supports, releasing 350 cfs in June through August with a provision for YCWA to propose changes to the default flow schedule and the ecological group to alter the schedule by consensus.

The Water Board comments that "Proposed Condition AR3 may not achieve a level of Yuba River protection and enhancement adequate to offset project impact," and in its preliminary 401 condition 1 states it would likely condition minimum flows, but does not specify these flows. Based on the Water Board's comments on the draft EIS, we analyze the two flow scenarios being considered by the Water Board (2017c) in table 3-46. The Water Board states that the first scenario incorporates specific components of the flow regime (e.g., spring flows, and spring and winter pulse flows),

and the second scenario includes Yuba Accord flows in drier water year types and provides greater flows in wetter water year types. In addition, we evaluate two flow regimes (i.e., 35 and 75 percent of unimpaired flow in January through June) to cover the range being considered in Phase II of updating the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (referred to as the Bay-Delta Plan) (Water Board, 2018c).

California DFW, FWS, and BLM maintain that YCWA's proposed minimum instream flows do not contain sufficient components of a natural hydrograph to fully support anadromous salmonid instream life-history. They note that anadromous salmonids in California evolved with river conditions that contained:

- fall and early winter freshets that mobilized sediment, improved instream water conditions, and provided a migration cue for steelhead migration to spawning areas and for spring-run Chinook salmon outmigration;
- winter and spring storm flows that mobilized and cleansed spawning gravels, aerated salmon eggs in redds, and inundated the riparian edge and riparian floodplain; and
- a flow recession of seasonal rains that was modulated by snowmelt and allowed for germination and establishment of riparian species, rearing habitat for juvenile salmonids, and outmigration cues to reduce stranding.

California DFW, FWS, and BLM believe that YCWA's proposed minimum flows would not provide these components of the natural hydrograph that would provide timely migration cues and foraging habitat for juvenile salmonids in the floodplain and other areas outside the main channel.

NMFS states that the current flow regime has decreased the magnitude and duration of streamflow during the peak snowmelt months, resulting in large decreases in off-channel rearing habitat for salmonids; and many studies show the positive relationship between salmonid growth and survival when juvenile salmonids have access to off-channel areas and floodplains. NMFS believes that floodplain habitat should be inundated annually for between 30 and 90 days to allow for primary productivity derived from inundated habitat to be realized throughout most of the lower Yuba River. In addition to providing critical rearing habitat, NMFS also believes that elevated flows in spring decrease energetic expenditure for emigrating salmonids and decreases the risk of predation, thereby improving passage survival in the lower Yuba River.

Table 3-46. Water Board suggested range of minimum streamflows (cfs) by water year type for the lower Yuba River measured at Marysville gage. 11421000 (Source: Water Board, 2017c).

Date	Schedule 1[a]	Schedule 2[b]	Schedule 3	Schedule 4	Schedule 5	Schedule 6	Conference Year
October 1–31	500, 500	500, 500	500, 500	400, 400	400, 400	350, 350	350, 350
November 1–30	500, 500	500, 500	500, 500	500, 500	500, 500	350, 350	350, 350
December 1–31	500, 500	500, 500	500, 500	500, 500	500, 500	350, 350	350, 350
January 1–31	500, 500	500, 500	500, 500	500, 500	500, 500	350, 350	350, 350
February 1–29	500, > of 75% or 500	500, > of 40% or 500	500, 500	500, 500	500[c], 500	350[d], 350	350[e], 350
March 1–22	700, > of 75% or 700	700, > of 40% or 700	500, 500	500, 500	500, 500	350, 350	350, 350
March 23–31	3,500, > of 75% or 700	700, > of 40% or 700	500, 500	500, 500	500, 500	350, 350	350, 350
April 1–15	3,500, > of 75% or 1000	2,500, > of 40% or 700	900, 700	600, 600	500, 500	350, 350	300, 300
April 16–30	3,500, > of 75% or 1000	2,500, > of 40% or 800	900, 700	900, 900	600, 600	500, 500	300, 245
May 1–15	2,000, > of 75% or 2000	1,400, > of 40% or 1000	1,150, 900	900, 900	850, 600	750, 500	395, 245
May 16–31	2,000, > of 75% or 2000	1,000, > of 40% or 1000	900, 900	600, 600	400, 400	400, 400	300, 245
June 1–15	1,500, > of 75% or 1500	800, > of 40% or 800	500, 500	400, 400	400, 400	350, 300	245, 245
June 16–30	1,500, > of 75% or 1500	500, > of 40% or 500	500, 500	400, 400	400, 400	350, 150	150, 150
July 1–31	700, 700	500, 500	500, 500	400, 400	400, 400	350, 150	150, 150
August 1–31	600, 600	500, 500	500, 500	400, 400	400, 400	350, 150	150, 150
September 1–30	500, 500	500, 500	500, 500	400, 400	400, 400	350, 350	150, 150

Notes: For each set of values, the first value incorporates specific components of the flow regime, and the second value preserves the Yuba Accord benefits for drier water years types and provides greater flows in wetter water year types.

[a] "> of 75% or" indicates the greater of 75 percent of unimpaired flow or the flow (cfs) value listed.

[b] "> of 40% or" indicates the greater of 40 percent of unimpaired flow or the flow (cfs) value listed.

[c] Includes pulse flows of 3,000 cfs on February 1 and 2, 1,850 cfs on February 3, 1,000 cfs on February 4, 750 cfs on February 5, and 600 cfs on February 6.

[d] Includes pulse flows of 2,850 cfs on February 1 and 2, 1,700 cfs on February 3, 850 cfs on February 4, 600 cfs on February 5, and 450 cfs on February 6.

[e] Includes pulse flows of 2,745 cfs on February 1 and 2, 1,595 cfs on February 3, 745 cfs on February 4, 495 cfs on February 5, and 345 cfs on February 6.

Based on comments and recommendations, YCWA revised its AR3 proposal and filed it with its reply comments on October 10, 2017. This revised proposal adds water releases of 30,000 acre-feet from New Bullards Bar Reservoir in schedule 6 years to the proposed instream flows in table 3-43 during periods when this water can be accounted for as Delivered Transfer Water under YCWA's December 4, 2007, Water Purchase Agreement with California DWR or to other transferees for diversions and uses downstream from the confluence of the lower Yuba River and the Feather River under applicable provisions of California law. YCWA proposes that by April 10 of years when schedule 6 conditions are in effect, it would provide a written proposed schedule to provide the additional 30,000 acre-feet of flow in the lower Yuba River at the Marysville gage during June 1 through August 31. YCWA would refine the proposed schedule by May 1; by May 15, the Ecological Group would notify YCWA in writing of any proposed modifications to YCWA's proposed schedule. If these parties do not reach written agreement on the schedule by May 21, YCWA would allocate the 30,000 acre-feet to achieve uniform flows at the Marysville gage during the portions of the June 1 through August 31 period that such water is transferable, as discussed above.

In YCWA's reply comments, it states that drafting water from the lower intake for the New Colgate Powerhouse would result in cooler than natural conditions at the Marysville gage in May through October. In addition, YCWA states that if the additional 30,000 acre-feet that YCWA must release in Schedule 6 years under Water Board Corrected Order WR 2008-0014, and YCWA proposed condition AR3 is distributed uniformly from June 1 through August 31, then the resulting flow would be 338 cfs, which is substantially the same as the recommended 350 cfs.

Our Analysis

From 2002 through 2005, YCWA, California DFW, NMFS, FWS, and several non-governmental organizations negotiated a set of minimum flow requirements (flow schedules) for the Yuba River downstream of Englebright Dam. According to YCWA, these parties carefully considered the water supplies that would be available in different types of water years, ranked the stressors in the lower Yuba River that apply to each species or run of salmonids, and considered all relevant biological factors as they developed these flow schedules. The resulting flow schedules were then included in the Yuba Accord and YCWA's water-right permits. From 2005 through 2007, YCWA conducted a comprehensive California Environmental Quality Act/National Environmental Policy Act process to analyze the environmental effects of the Yuba Accord, and in late 2007, YCWA certified its final Environmental Impact Report for the Yuba Accord. On May 20, 2008, the Water Board adopted its Corrected Order WR 2008-0014, which amended YCWA's water right permits to incorporate the Yuba Accord flow schedules. YCWA currently operates the project to maintain these Yuba Accord minimum flows. As a component of the Yuba Accord, YCWA also established a RMT, which is composed of representatives of YCWA, California DFW, NMFS, FWS, and non-governmental organizations. The primary purpose of the RMT is to evaluate the

effects of implementation of the Yuba Accord on anadromous fish in the lower Yuba River. The RMT collected field data to develop an instream flow model from June 2006 through June 2010. A hydraulic model was developed from October 2010 through June 2012.

In 2012, YCWA initiated an instream flow study in the Yuba River between the Narrows 1 Powerhouse tailrace and its confluence with the Feather River (figure 3-37). The objectives of this study were to: (1) estimate the fish habitat index versus flow relationships (WUA) using hydraulic and habitat models at four sites in the Yuba River downstream of Englebright Dam; and (2) use WUA versus flow relationships and the hydrologic record to develop a habitat duration analysis of fish habitat over time under the existing operational scenario (i.e., Yuba Accord flow schedules). Another objective was to provide information regarding floodplain inundation. The study targeted the following five fish species and lifestages:

1. spawning, fry, and juvenile Chinook salmon (i.e., both spring-run and fall-run);
2. spawning, fry, and juvenile Central Valley steelhead;
3. spawning North American green sturgeon;
4. adult and ammocoete lamprey (i.e., Pacific and river lamprey); and
5. adult rainbow trout.

YCWA and the relicensing participants agreed to use the project's Sedimentation and River Hydraulics Two-dimensional Model, Version 2.1 (SRH2D v2.1) to predict the distribution of depths and velocities within the study area according to flow, and a habitat suitability model to provide the biological criteria (i.e., preferred depths and velocities, as well as non-hydraulic variables) input to the SRH2D v2.1. The habitat suitability criteria datasets were developed in collaboration with relicensing participants. For habitat modeling purposes the study area was divided into four hydrologic zones (HZs): Englebright Dam, Deer Creek, Dry Creek, and Daguerre Point Dam. YCWA and the relicensing participants also agreed to evaluate simulated aquatic habitat conditions under a no-action scenario, as the project is currently operated under the Yuba Accord minimum instream flow releases, and a "without-project" model scenario (under a hypothetical reference condition that reflects conditions that would exist if the project had not been constructed).

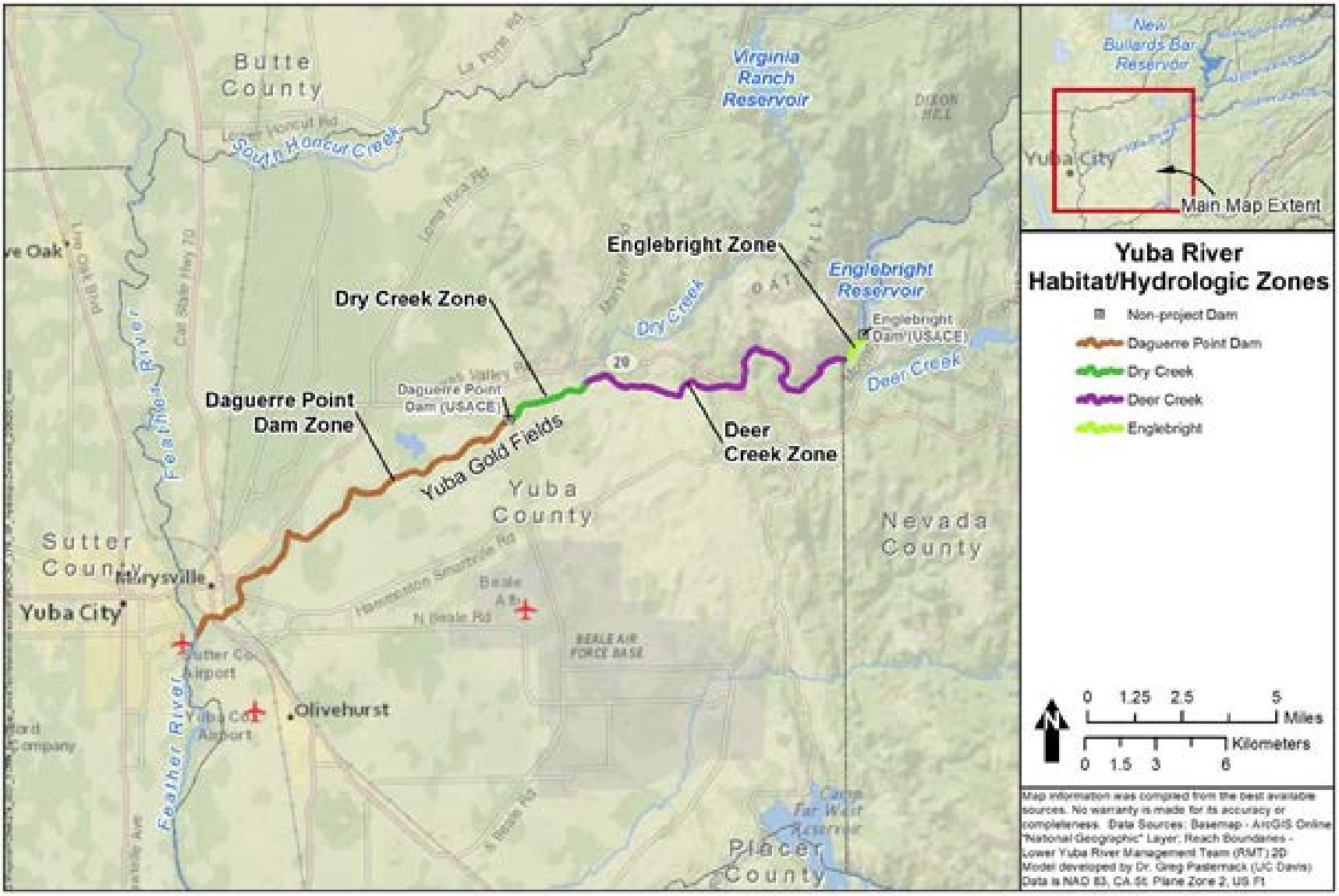


Figure 3-37. Map of habitat/hydrologic zone boundaries (Source: YCWA, 2017a).

YCWA's Proposed Minimum Instream Flows—The results of YCWA's instream flow study exhibited bimodal habitat functions for approximately half of the modeled species and lifestages. One peak of the WUA curves usually occurred within the active channel and one peak occurred outside the active channel in the floodplain. Based on the results of studies reported in Technical Memorandum 1-2, Channel Morphology Downstream of Englebright Dam (YCWA, 2013f, filed on April 29, 2014), bankfull discharge was reported to be approximately 5,000 cfs in the Yuba River downstream of Englebright Dam. According to flood frequency analysis, 5,000 cfs has a return interval of about once every 1.25 years. The next higher inundation threshold is approximately 21,100 cfs, which is the floodplain-filling flow. This discharge has a 2.5-year return interval. In several cases, WUA peaked at flows above the floodplain-filling threshold of 21,100 cfs.

Chinook Salmon and Steelhead Spawning Habitat—Under the minimum flow associated with the Yuba Accord, the long-term average spring-run Chinook salmon spawning habitat availability (WUA) in the lower Yuba River is 98.8 percent of the maximum, and provides over 80 percent of maximum spawning WUA during all water year types (table 3-47). Long-term average steelhead spawning WUA in the lower Yuba River is 92.4 percent of maximum WUA (table 3-47).

Table 3-47. Long-term and water year type average Chinook salmon and steelhead spawning and rearing weighted usable area (percent of maximum) under the no-action scenario (Source: YCWA, 2017a).

Species / Lifestage	Long-term Full Simulation Period	Water Year Type				
		Wet	Above Normal	Below Normal	Dry	Critical
Chinook spawning	98.8	99.3	99.4	99.6	99.6	96.1
Steelhead spawning	92.4	97.6	96.4	94.0	91.2	83.9
Chinook fry rearing	88.6	88.6	88.9	87.6	88.2	89.7
Chinook juvenile rearing	96.3	95.5	95.7	96.4	97.5	97.1
Steelhead fry rearing	83.0	81.8	82.1	81.5	84.0	86.0
Steelhead juvenile rearing	96.6	95.6	95.8	96.8	98.1	97.4

Chinook Salmon Fry and Juvenile Rearing Habitat—Under existing conditions, long-term average Chinook fry rearing WUA in the lower Yuba River is 88.6 percent of the maximum and over 80 percent of maximum during all water year types (see table 3-47).

Long-term average juvenile Chinook rearing WUA in the lower Yuba River averages 96.3 percent of maximum and over 80 percent (and even 95 percent) or more of maximum juvenile in-channel rearing WUA during all water year types (table 3-47).

Steelhead Fry and Juvenile Rearing Habitat—Under existing conditions, long-term average steelhead fry rearing in-channel WUA in the lower Yuba River averages 83 percent of maximum and provides an average of 80 percent or more of maximum WUA during all water year types (table 3-47).

Long-term average steelhead juvenile rearing WUA in the lower Yuba River averages of 96.6 percent of maximum and provides an average of over 80 percent (and even over 95 percent) of juvenile rearing maximum WUA during all water year types (table 3-47).

North American Green Sturgeon Spawning and Deepwater Habitat—YCWA's examination of relationships between flow at the Marysville gage and green sturgeon spawning WUA for pool morphological units in the Yuba River downstream of Daguerre Point Dam indicates that flows and spawning WUA have a steeply increasing positive linear relationship with flows up to about 5,000 cfs; a positive, yet lower rate of increase in WUA between about 5,000 and 10,000 cfs; and relatively little increase in spawning WUA at flows above 10,000 cfs. The areal extent of deepwater areas in the Yuba River downstream of Daguerre Point Dam also appears to have a positive, linear relationship with flows at the Marysville gage.

Adult Rainbow Trout and Adult and Ammocoete Lamprey Habitat—Adult rainbow trout WUA in the Lower Yuba River's active channel peaked at 700, 622, 700, and 622 cfs depending on the HZ. Adult lamprey WUA peaked inside of the active channel at Daguerre Point Dam, Deer Creek, and Dry Creek at 622, 600, and 1,700 cfs, respectively. Predicted flows within the Daguerre Point and Deer Creek HZs under YCWA's proposal would provide at least 80 percent of optimum conditions for Pacific lamprey at least 90 percent of the time. Because of the lack of preferred fine substrate in other HZs, habitat for lamprey ammocoetes only existed in the Daguerre Point HZ. The lamprey ammocoete lifestage WUA in Daguerre Point HZ peaked outside the active channel at 10,000 cfs.

The Resource Agencies' Recommended Instream Flows—Under the resource agencies' recommended flow regime, minimum flows in the lower Yuba River would be the same as those proposed by YCWA except during the spring (March 23 to May 31), when they would be substantially higher than YCWA's during schedule 1 and 2 water years (and slightly higher during schedule 3, 5, 6, and conference years) (see table 3-43). They would also be significantly higher for February 1 to 6 of schedule 5, 6, and

conference years, if higher flows had not already occurred during the previous December 1 through February 1 period.

As noted in the resource agencies' 10(j) recommendations, these increased flows are intended to more closely mimic the natural hydrograph in the lower Yuba River to promote floodplain inundation; the transport, storage, deposition, and recruitment of substrates and organic matter (such as woody materials); and the development, recruitment, and persistence of riparian vegetation. They are also designed to facilitate salmon and steelhead reproduction and outmigration, increase the amount of important off-channel rearing habitat, and enhance riparian seedling recruitment (see section 3.3.3.2, in the subsection *Riparian Vegetation*).

Under existing conditions, flows during May in the lower Yuba River have been reduced by 33 percent across all water years as a result of the project. The largest decrease in magnitude occurs in wet years, with median monthly flows dropping from 6,141 cfs (without-project flow) to 3,637 cfs (with-project), a decrease of 40 percent. During dry years, median monthly flows have decreased from 1,618 cfs (without-project) to 900 cfs (with-project), a decrease of 44 percent (YCWA, 2010). Similar decreases in magnitude have occurred in April in the lower Yuba River with median monthly flows dropping from 3,921 cfs to 2,048 cfs, a decrease of 48 percent. Flows in June have slightly increased across all water years as a result of the project, with slight decreases in flow during dry and critical years.

According to cbec, inc. eco engineering (cbec), flows in the lower Yuba River during March through June, a period significant for salmonid rearing and emigration, have decreased significantly as a result of project operation (cbec, 2013). In an unimpaired state, a 21-day duration flow that occurred in 50 percent of the years was 5,529 cfs—that flow is now 3,360 cfs as a result of the project. Similarly, with a 21-day flow that occurred 67 percent of the years was 4,873 cfs in an unimpaired state—that flow is now 1,972 cfs.

The results of YCWA's indicators of hydrologic alteration analyses also indicate that operation of the project has reduced the magnitude and duration (number of days) of high pulse flows in the lower river, as measured at both the Smartsville and Marysville gages (tables 3-48 and 3-49). Some increases in duration are seen at both Smartsville and Marysville for wetter years for the with-project scenario but always decrease in dry and critical years at both gages. For these statistics, a day is classified as a high-flow pulse if the maximum flow during the day is greater than a threshold value. The high pulse flow thresholds used in YCWA's analyses were 3,142 cfs at Smartsville and 3,357 cfs at Marysville.

Table 3-48. Frequency and duration of high and low pulse flows for without-project and with-project scenarios for October 1969 through September 2010 for the Yuba River at Smartsville by water year type (Source: YCWA, 2013g).

	All Years		Wet		Above Normal		Below Normal		Dry		Critical	
Parameter	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**
# of high pulses	6	2	6	2	8	5	7	3	7	1	4	1
Duration of high pulses (days)	6	11	11	61	8	15	3	6	2	1	3	1

Table 3-49. Frequency and duration of high and low pulses for without-project and with-project scenarios for October 1969 through September 2010 for the Yuba River at Marysville by water year type (Source: YCWA, 2013g).

	All Years		Wet		Above Normal		Below Normal		Dry		Critical	
Parameter	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**	**Without-Project**	**With-Project**
# of high pulses	7	3	7	3	9	7	7	3	6	2	3	1
Duration of high pulses (days)	5	3	10	14	6	2	4	4	3	2	2	1

Figures 3-38 and 3-39 compare average monthly flow for the 35 and 75 percent of unimpaired flow under consideration in the Phase II update of the 2006 Bay-Delta Plan (Water Board, 2018b) with simulated existing conditions and YCWA proposed operation. Overall, YCWA's proposed operation would result in average monthly flows in the Yuba River near Smartsville that are similar to existing conditions. Across the period of record, the 75 percent unimpaired flow would generally be slightly greater than current conditions and YCWA's proposed operation in the winter months (January through February) become noticeably greater than current and proposed conditions during the spring months (March through May) and then be less than current and proposed conditions in June. Higher spring flows under the 75 percent unimpaired flow would reduce warming in the lower Yuba River. In contrast, the reduction in June flows would increase warming in the lower Yuba River, particularly in the drier years.

The Water Board comments that the draft EIS does not analyze the 10(j) recommendations for schedule 6 summer minimum flows. Based on our review of YCWA's modeling data over the period of record (1970–2010), no water years were classified as schedule 6. Therefore, we selected the schedule 5 water year (calendar year 1988) that was closest to a schedule 6 water year for analysis. Figures 3-40 and 3-41 show simulated average daily flow and water temperature at Smartsville and Marysville, respectively. All three alternative flow regimes (i.e., existing, proposed, and agency recommended) resulted in similar summer (June through August) water temperatures at Smartsville and Marysville that would differ from one another by no more than 0.6°C. The agencies' recommended schedule 6 summer flows of 350 cfs would provide cooler water temperatures in the lower Yuba River than YCWA's proposed schedule 6 summer flows and would likely also provide more off-channel habitat for rearing salmonids.

Based on the analyses, it is clear that project operation has affected and would continue to affect the quality and quantity of available salmon and steelhead habitat in the lower Yuba River. It is also apparent that the resource agencies' recommended flow regimes would more closely mimic the natural (pre-project) hydrograph, and that these conditions would create more normative ecological processes that would benefit both aquatic and terrestrial resources. In addition, in the absence of substantial floodplain modifications (see *Lower Yuba River Habitat Restoration and Large Woody Material Management*), the resource agencies' recommended spring pulse and floodplain inundation flows would not markedly increase the amount of estimated juvenile salmonid rearing habitat in the lower river during the spring period and, based on the results of YCWA's daily flow and water temperature model, would likely result in less suitable water temperatures overall for numerous lifestages of ESA-listed salmonids (HDR and Grinnell, 2017e).

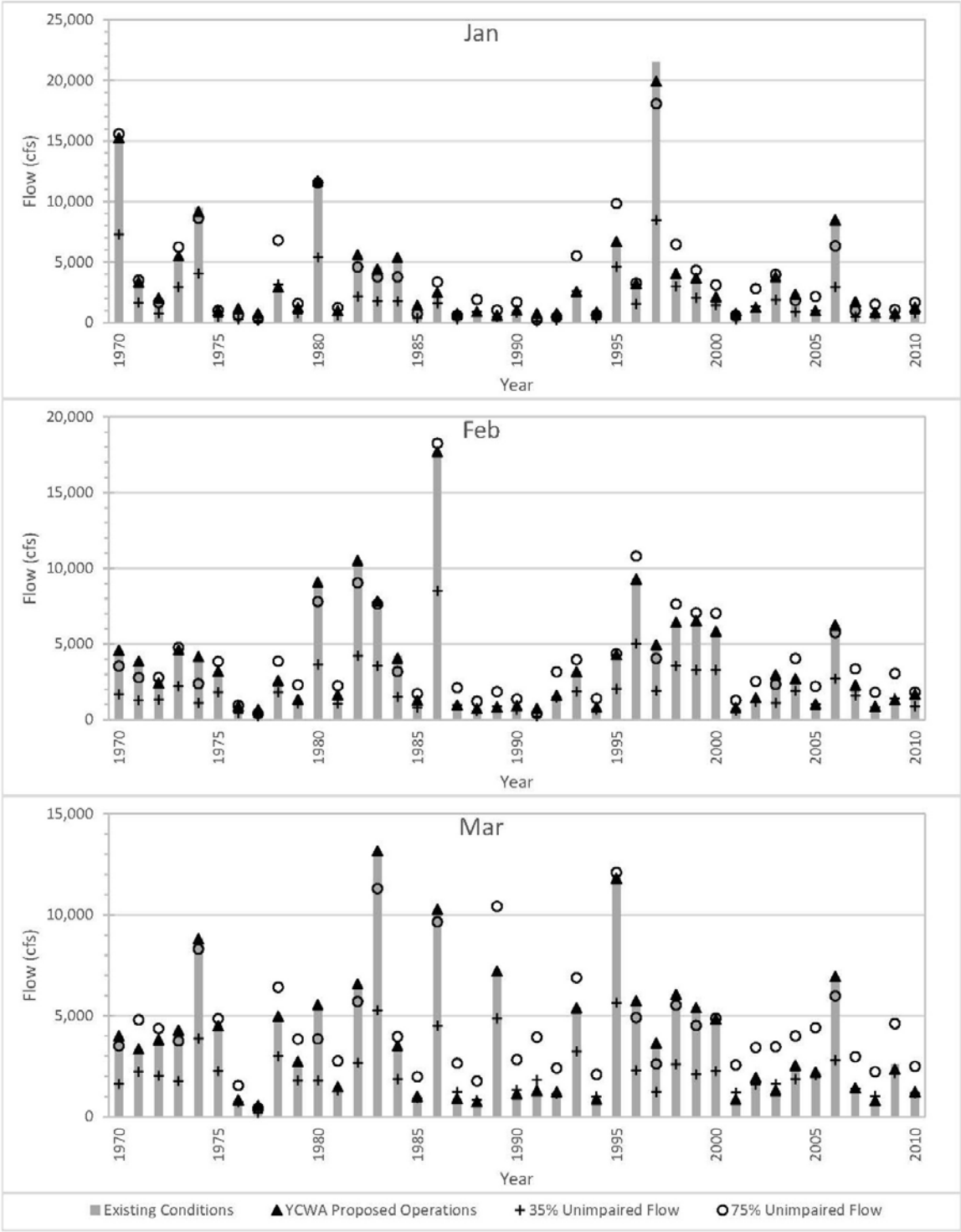


Figure 3-38. Average monthly flow of Yuba River near Smartsville (RM 23.9) for 35 and 75 percent of unimpaired flow compared to simulated flows for existing conditions and YCWA's proposed operation, January, February, and March (Source: HDR and Grinnell, 2017b,c; CDEC, 2018, as modified by staff).

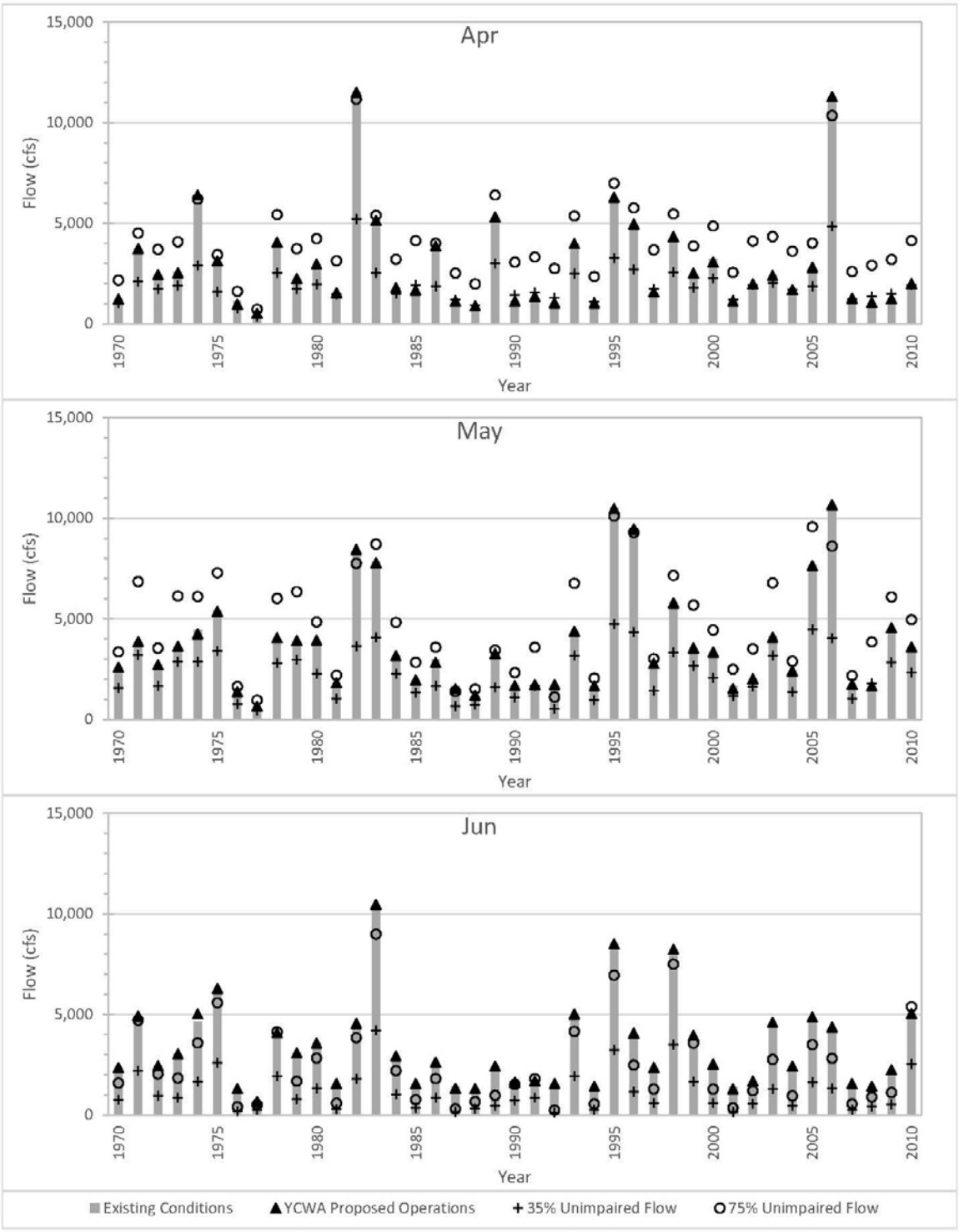
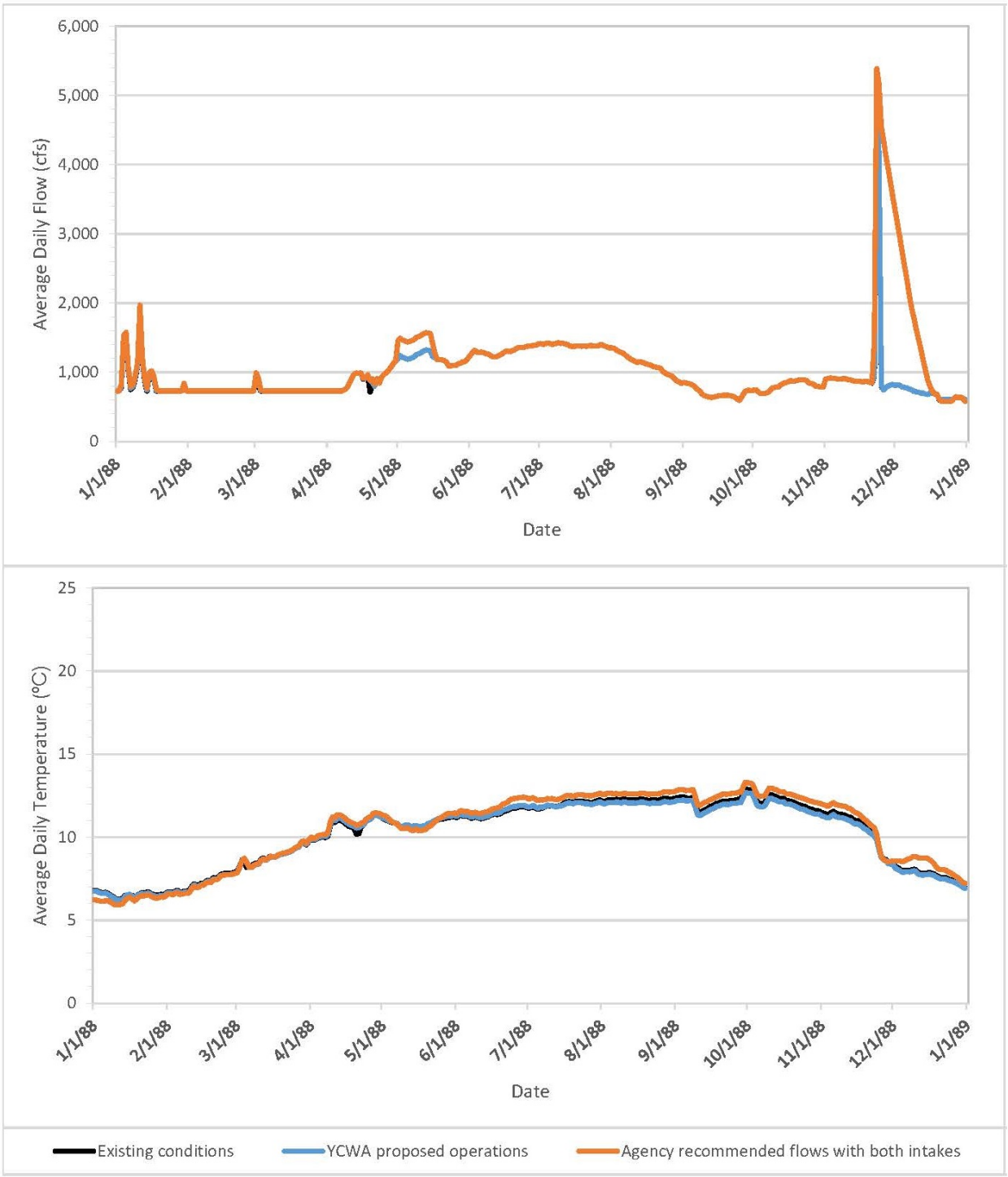
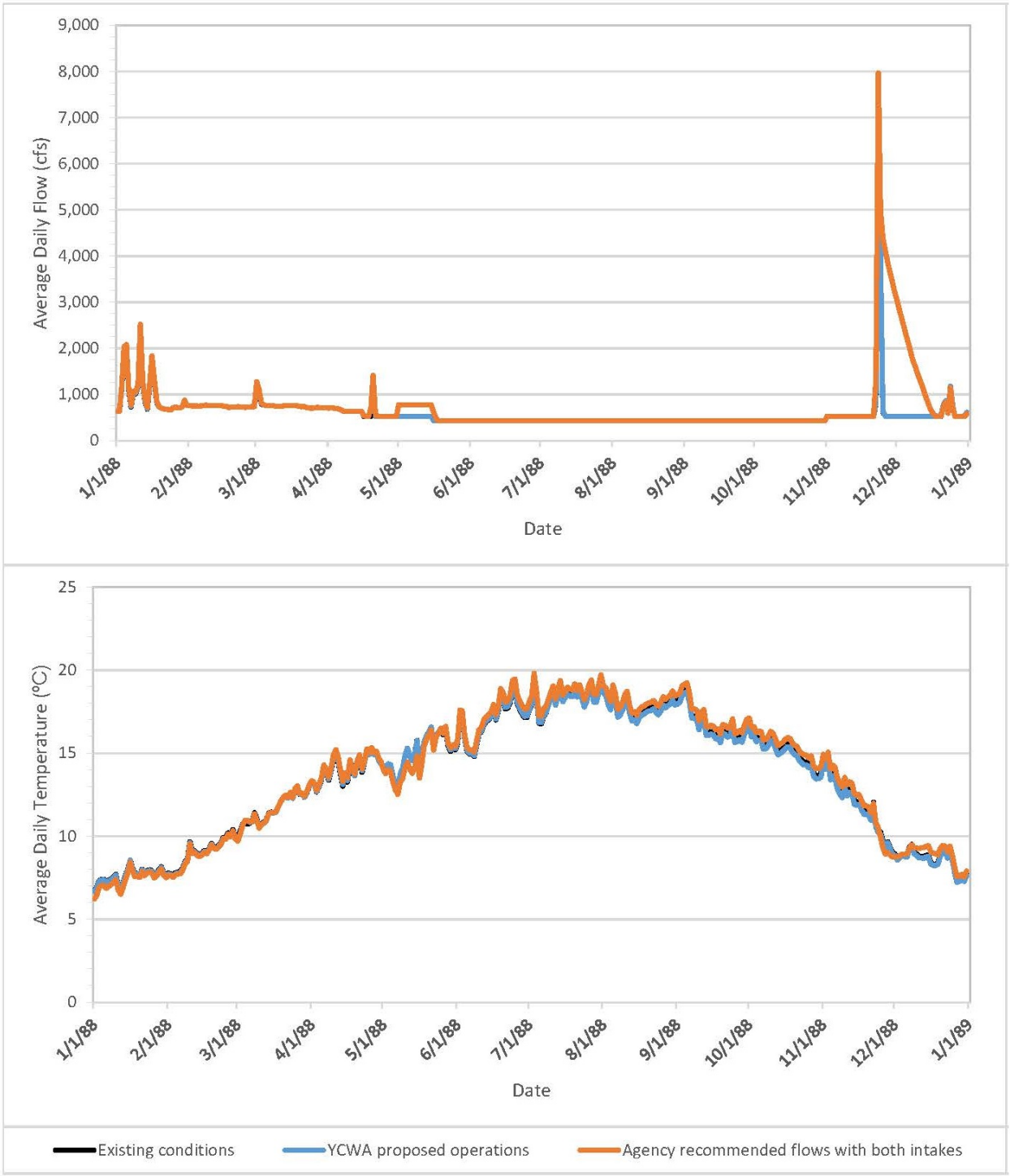


Figure 3-39. Average monthly flow of Yuba River near Smartsville (RM 23.9) for 35 and 75 percent of unimpaired flow compared to simulated flows for existing conditions and YCWA's proposed operation, April, May, and June (Source: HDR and Grinnell, 2017b,c; CDEC, 2018, as modified by staff).



Note: Only lower intake was used in 1988 because New Bullards Bar Reservoir levels were less than the 1,881.2 feet needed to operate the upper intake.

Figure 3-40. Time series Yuba River at Smartsville (RM 23.9) simulated average daily flow and water temperature under various project operations (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).



Note: Only lower intake was used in 1988 because New Bullards Bar Reservoir levels were less than the 1,881.2 feet needed to operate the upper intake.

Figure 3-41. Time series Yuba River at Marysville (RM 6.2) simulated average daily flow and water temperature under various project operations (Source: HDR and Grinnell, 2017b,c,d, as modified by staff).

However, operating within these constraints, we also recognize the benefits associated with the resource agencies' recommended gradual (natural) recession rates, especially during wetter years because this measure would provide valuable off-channel rearing habitat for Chinook salmon and further benefit juvenile salmonids through reestablishment of riparian vegetation.

Finally, we question whether the implementation of the conditional winter pulse flows would improve the adult steelhead upstream passage rate because 13 years of empirical data describing adult steelhead upstream passage at Daguerre Point Dam and associated average daily flows demonstrate that a conditional winter pulse flow is not needed to facilitate adult steelhead upstream passage (i.e., adult steelhead upstream passage through Daguerre Point Dam has occurred during a variety of flow conditions, including ascending hydrographs, descending hydrographs, and extended periods of stable flow conditions, and during "drier" conditions).[85] In addition, a pulse flow release would provide the potential for steelhead redds constructed during the higher flow conditions to become dewatered when flows are reduced after the pulse event. Additionally, information about the potential benefits of the recommended adult spring-run Chinook salmon attraction flows is limited (HDR and Grinnell, 2017f; RMT, 2013).

Ramping Rates and Controlling Project Spills Upstream of Englebright Dam

Rapid changes in streamflow associated with hydroelectric project operation have the potential to adversely affect aquatic resources by stranding fish in shallow, low gradient gravel bar areas and off-channel habitat; temporary loss of fish habitat or loss of habitat access; and dewatering of amphibians, aquatic insects, and plant life (Hunter, 1992). 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. Rapid changes in streamflows also can affect fish behavior and reduce spawning success. 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).

As discussed above, YCWA proposes (AR4) to reduce the rate of flow recession after any spill releases that occur between May 1 and July 31 and after water is no longer stored in the flood reservation space (elevation 1,956 feet to 1,918 feet) in New Bullards Bar Reservoir (table 3-50). YCWA would make these spill cessation releases by either: (1) adjustments to the New Bullards Bar Dam spillway gate openings; or (2) adjustments to the New Bullards Bar Dam low-level outlet valve openings; or (3) both.

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[85] Adult steelhead upstream passage through Daguerre Point Dam has occurred during a variety of flow conditions, including ascending hydrographs, descending hydrographs, and extended periods of stable flow conditions (HDR and Grinnell, 2017f).

Table 3-50. Summary of YCWA's proposed (measure AR4) spill reductions from approximately 2,000 cfs at New Bullards Bar Dam (Source: YCWA, 2017a).

Initial Spill Rate	Target Flow Reduction	Termination of Flow Recession Rate
When spill events greater than 2,000 cfs recede to 2,000 cfs	250 cfs per day	Until spill event ceases; flows equal the minimum flow required at that time
Spill events less than 2,000 cfs	250 cfs per day, or less	Until spill event ceases and flows within 20 percent of the required minimum flow.

As discussed in more detail previously in section 3.3.2.2, in the subsection *Effects of YCWA's Proposed Measures on Instream Flows and Water Levels*, under proposed measure AR11, if the end-of-March New Bullards Bar Reservoir storage is 775,000 acre-feet or more and the subsequent April is a wet water year (defined in YCWA's proposed measure WR2), YCWA would close the Lohman Ridge Diversion Tunnel through September 30 of that calendar year. YCWA additionally proposes that in non-tunnel closure years it would, from April 1 through July 31 in Below Normal, Dry, and Critically Dry water years and from May 1 through July 31 in Wet and Above Normal water years, implement the spill reduction schedules shown in table 3-51 at Our House Diversion Dam. Spill reduction would be performed by adjusting the opening of the low-level outlet (proposed measure AR2).

Table 3-51. Summary of YCWA's proposed (measure AR2) spill reductions from approximately 600 cfs plus required minimum flows at Our House Diversion Dam (Source: YCWA, 2017a).

Mean Daily Flow Measurement at Gage 11408880	Frequency of Adjusting Low-level Outlet Valve	Target Flow Reduction
600–300 cfs plus required minimum streamflow	48 hours	100 cfs, but no less than 90 cfs and no greater than 110 cfs
299–200 cfs plus required minimum streamflow	72 hours	100 cfs, but no less than 90 cfs and no greater than 110 cfs
199–0 cfs plus required minimum streamflow	72 hours	50 cfs, but no less than 45 cfs and no greater than 55 cfs

To reduce the rate of spill cessation at Log Cabin Diversion Dam, YCWA proposes to implement the spill reduction schedules shown in table 3-52 from April 1 through July 31 of each year (proposed measure AR12). Spill reduction would be performed by adjusting the opening of the low-level outlet.

Table 3-52. Summary of YCWA's proposed (measure AR12) spill reductions from approximately 100 cfs plus required minimum flows at Log Cabin Diversion Dam (Source: YCWA, 2017a).

Mean Daily Flow Measurement at Gage 1140900	Frequency of Adjusting Low-level Outlet Valve	Target Flow Reduction
100–0 cfs plus required minimum streamflow	96 hours	20 cfs

Forest Service (4(e) condition 33) specifies the same spill reduction rates for Our House Diversion Dam spills as YCWA's proposed measure AR2. In its letter filed August 25, 2017, FWS commented that it has concerns regarding the use of the low-level outlet, but did not explain the nature of its concerns. California DFW (10(j) recommendation 2.9) recommends the same spill reduction rates as YCWA.

Forest Service (4(e) condition 34) specifies the same spill reduction rates for Log Cabin Diversion Dam spills as YCWA's proposed measure AR12. In its letter filed August 25, 2017, FWS comments that it supports YCWA's proposed measure AR12. California DFW (10(j) recommendation 2.10) recommends the same spill reduction rates as YCWA. FWN states that it supports YCWA's proposed measure AR12.

Forest Service (10(a) recommendation 3) recommends the same spill reduction rates for New Bullards Bar Dam spills as YCWA's proposed measure AR4. FWS (10(j) recommendation 12) recommends that project spills at New Bullards Bar Dam be controlled in a similar way as proposed by YCWA (AR4), except that FWS recommends that compliance with recession rates is met through adjustments to New Bullards Bar Dam spillway gate opening without the optional use of the dam's low-level outlet as proposed. California DFW (10(j) recommendation 2.11) recommends the same spill reduction rates as YCWA. FWN states that it supports YCWA's proposed measure AR4.

Water Board (preliminary 401 condition 2) specifies that it would likely condition project operation with ramping rate specifications to limit artificial flow fluctuations in project-affected river and stream reaches, including the Yuba River between the Narrows 1 and Narrows 2 Powerhouses. Water Board (preliminary 401 condition 5) specifies that it would likely condition instream flow recession rates for spill events at New Bullards Bar Dam, Log Cabin Diversion Dam, and Our House Diversion Dam in light of the whole record, where spill events are defined as water flowing through spill gates or

overtopping dams. The Water Board would likely consider operations of the proposed New Bullards Bar Dam auxiliary flood control outlet a spill event.

Our Analysis

Middle Yuba River and Oregon Creek—YCWA's proposed measures AR2 and AR12 would minimize the frequency and magnitude of spill flow changes downstream of the diversion dams that would have the potential to adversely affect fish and other aquatic organisms in the Middle Yuba River and Oregon Creek. YCWA states it would not implement the spill recession rates proposed as part of AR2 during years when the Lohman Ridge Diversion Tunnel is closed. Controlling project spills via the proposed spill recession rates shown in table 3-51 would be difficult when the Lohman Ridge Diversion Tunnel is closed, and would prevent inflows to the Our House impoundment to be diverted through the tunnel. YCWA's proposed spill cessation schedules encompass the period during which rainbow trout spawning, incubation and emergence are most likely to occur. The spill cessation schedules would provide for a stepped reduction in spills so that downramping is gradual. Based on modeled application of the proposed spill cessation measures to flows in the 41-year period of record, the proposed measures would tend to prolong the total time during which high flows from spill occur and would reduce the magnitude of daily decreases in spill flow. Figures 3-42 and 3-43 show that YCWA's proposed measures AR2 and AR12, would mimic the shape of the natural hydrograph better than under the no-action scenario (existing conditions). Reductions in flow would be more gradual and spill periods would be prolonged. Inflows above the capacity of the Lohman Ridge and Camptonville Diversion Tunnels (860 cfs and 1,100 cfs, respectively), plus the required minimum flows downstream of each diversion dam, would be spilled over the dams.

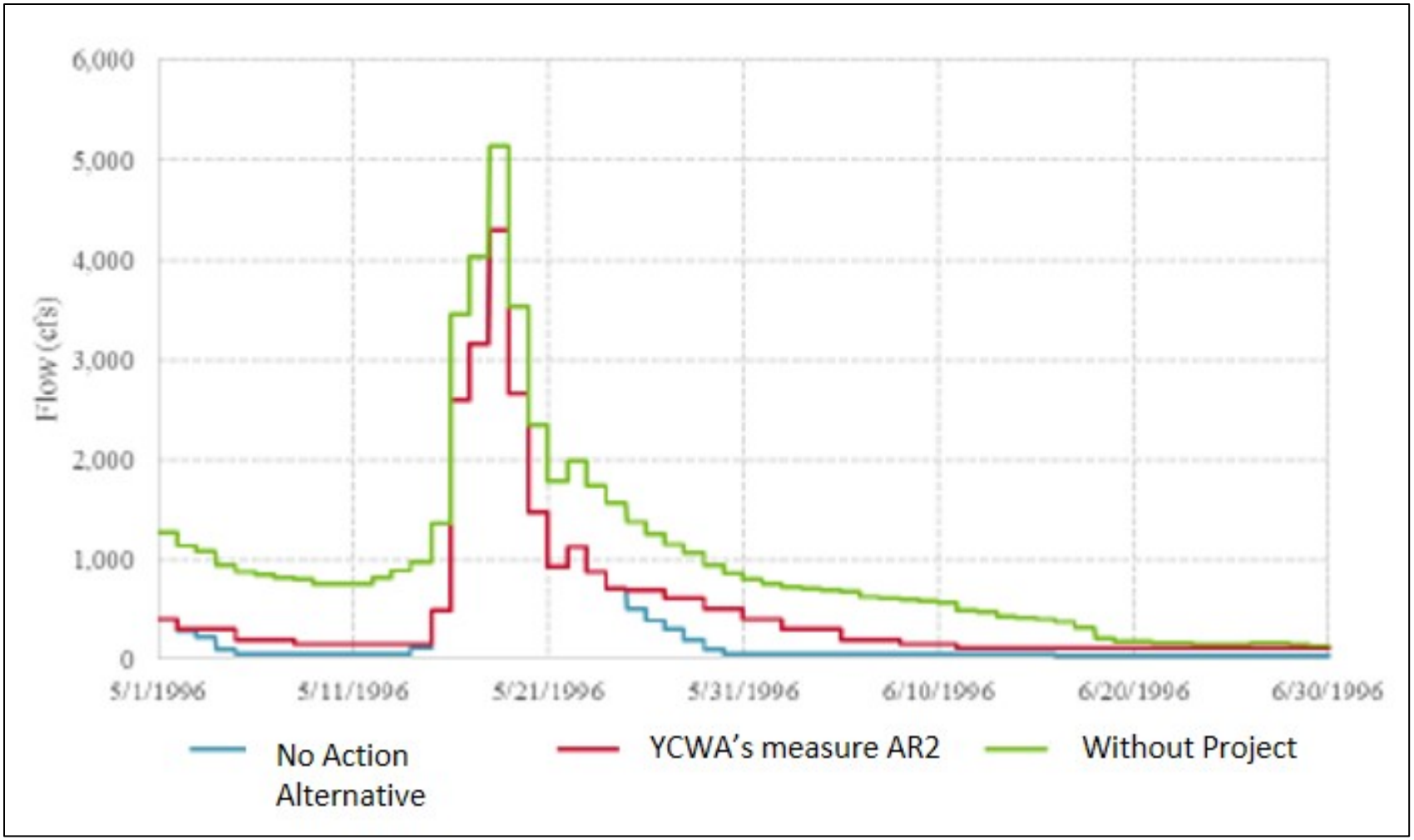

Figure 3-42. Modeled spill cessation downstream of Our House Diversion Dam (Source: YCWA, 2017a, as modified by staff).

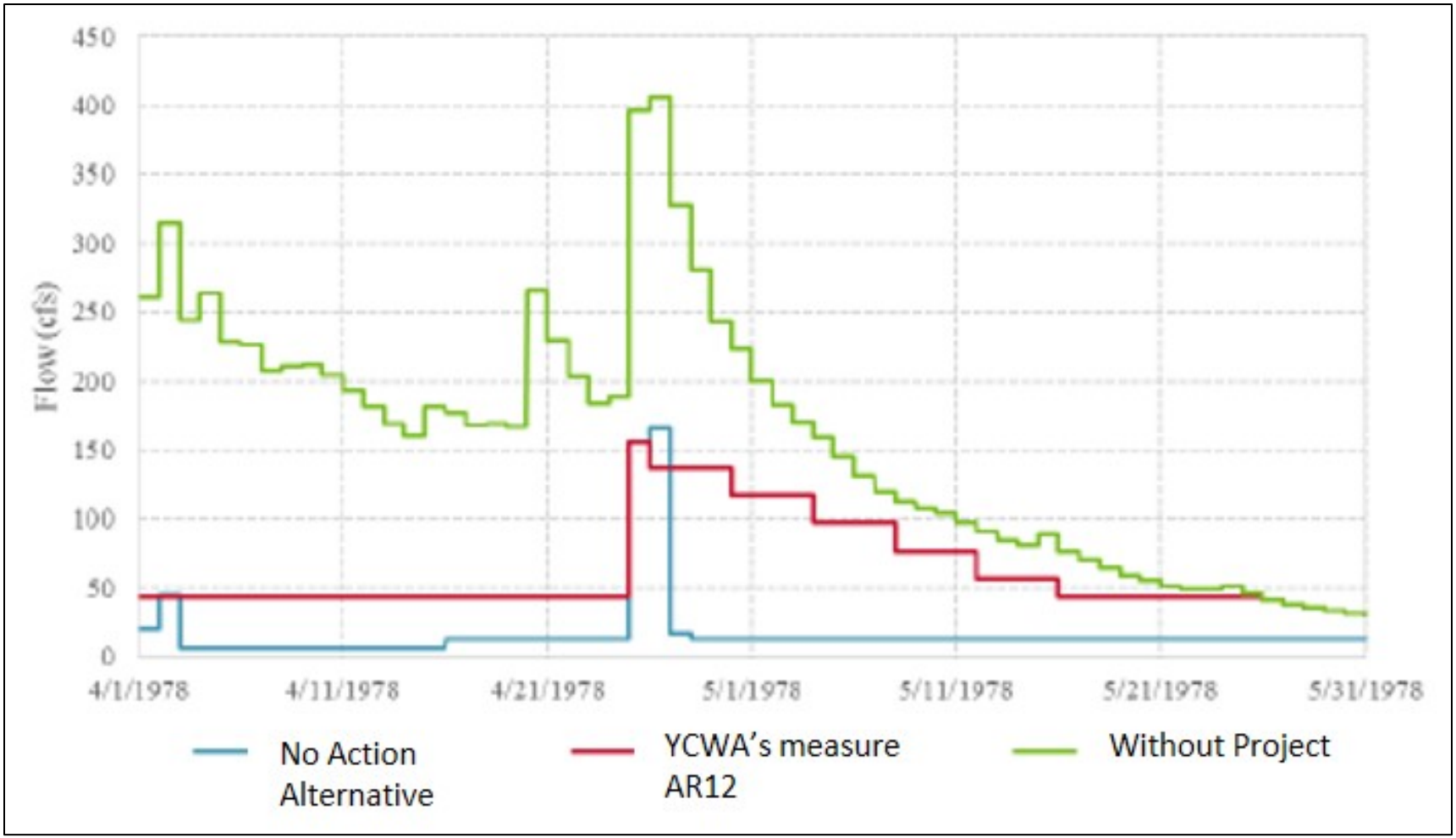

Figure 3-43. Modeled spill cessation downstream of Log Cabin Diversion Dam (Source: YCWA, 2017a, as modified by staff).

In its letter filed August 25, 2017, California DFW comments that under YCWA's proposed measure AR2, daily flow decreases would range from approximately 4 to 12 percent and stage change from the beginning to the end of the spill cessation schedule (typically a 3-week period) would range from 2 to 2.5 feet, while under YCWA's proposed measure AR12, daily flow decreases would range from 5 to 12 percent while stage change would average less than 1 foot over a 3-week period (California DFW, 2017a). California DFW (2017a) notes that the average daily rate of change is within typical unimpaired springtime recession rates (Epke, 2011; Yarnell et al., 2016). Yarnell et al. (2016) also found that flow recession rates with slow ramping rates similar to those observed in unregulated rivers (less than 10 percent per day) were likely to protect native aquatic species. 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 effects associated with ramping regimes in river reaches affected by the Klamath Hydroelectric Project. The study found that ramping rates ranging from 0.1 to 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). Under AR2, spill recession rates in the Middle Yuba River would decrease by 2.3 cfs during the first hour after a gate adjustment. A flow reduction from 40 cfs to 30 cfs would decrease the river stage in the Middle Yuba River by approximately 0.16 feet. Under AR12, spill recession rates in Oregon Creek would decrease by 0.21 cfs during the first hour after a gate adjustment. A flow reduction from 10 cfs to 5 cfs would decrease the river stage in Oregon Creek by approximately 0.26 feet. 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.

FWS's concerns regarding the use of the low-level outlet at the Our House Diversion Dam for controlling project spills remains unclear. Considering the approximately 40-foot difference in elevation between the Our House Diversion Dam spillway and the low-level outlet, the potential difference in water temperatures would be minimal. Furthermore, an analysis of water temperature data collected by YCWA in the Middle Yuba River from 2008 through 2012 shows that daily mean water temperatures in the impoundment and downstream of the dam are nearly the same, indicating that if the Our House Diversion Dam impoundment does stratify, it has a negligible effect on water temperatures downstream of the dam.

North Yuba River—YCWA proposed measure AR4 would minimize the frequency and magnitude of spill flow changes that have the potential to adversely affect stream fish populations in the bypassed reach of the North Yuba River downstream of New Bullards Bar Dam. YCWA's proposed spill cessation schedule would encompass May through July, during which rainbow trout spawning, incubation, and emergence are most likely to occur. As described above, the spill cessation schedule provides for stepped reductions in spills so that downramping is gradual while prolonging the total length of time during which each spill event occurs. Figure 3-44 shows that YCWA's

proposed measure AR4 would mimic the shape of the natural hydrograph better than under the no-action scenario (existing conditions). Figure 3-44 also shows that the spill recession rates proposed by YCWA and supported by the Forest Service would not differ from existing operation until flows are less than 2,000 cfs. Flows less than 2,000 cfs would recede more slowly under YCWA and the Forest Service's recommendation than under existing conditions (i.e., flows would be greater for a longer period of time under YCWA and the Forest Service's recommendation, thus LWM is expected to be transported from the bypassed reach more quickly than under existing conditions).

YCWA's proposed measure AR11, the Forest Service's 4(e) condition 35 (periodically close Lohman Ridge Diversion Tunnel), California DFW's 10(j) recommendation 2.13, and FWS's 10(j) recommendation 10 for an increased frequency of tunnel closures (see section 3.3.2.2, in the subsection *Fish Entrainment*, for a detailed analysis of these measures) would reduce the magnitude of spill events in the North Yuba River downstream of New Bullards Bar Dam by reducing the quantity of water diverted from the Middle Yuba River and into New Bullards Bar Reservoir.

Based on a 41-year period of record, YCWA's proposed measure would close the tunnel beginning in April through September, in 7 of 41 years (17 percent of years), and would prevent the average diversion of 131,289 acre-feet in those years. YCWA's proposed measures would close the tunnel from October through December, in 24 of 41 years (59 percent of years) and would prevent an average diversion of 11,788 acre-feet per year during those years. California DFW and FWS's recommendations would result in 4 additional spring closures and approximately 413,206 acre-feet of water that would not be diverted, and 17 additional fall closures and 199,732 acre-feet of water that would not be diverted. During those same water years from April through September, YCWA's operations model of base case conditions for New Bullards Bar Reservoir spillways indicate that 164,283 acre-feet of water would be spilled from New Bullards Bar Dam, indicating about 248,923 acre-feet of water would not remain in the reservoir and available for generation. From October through December for those same water years, YCWA's operations model of base case conditions for New Bullards Bar Reservoir spillways indicate that 116,752 acre-feet of water would be spilled from New Bullards Bar Dam, indicating about 82,980 acre-feet of water would not remain in the reservoir and available for generation.

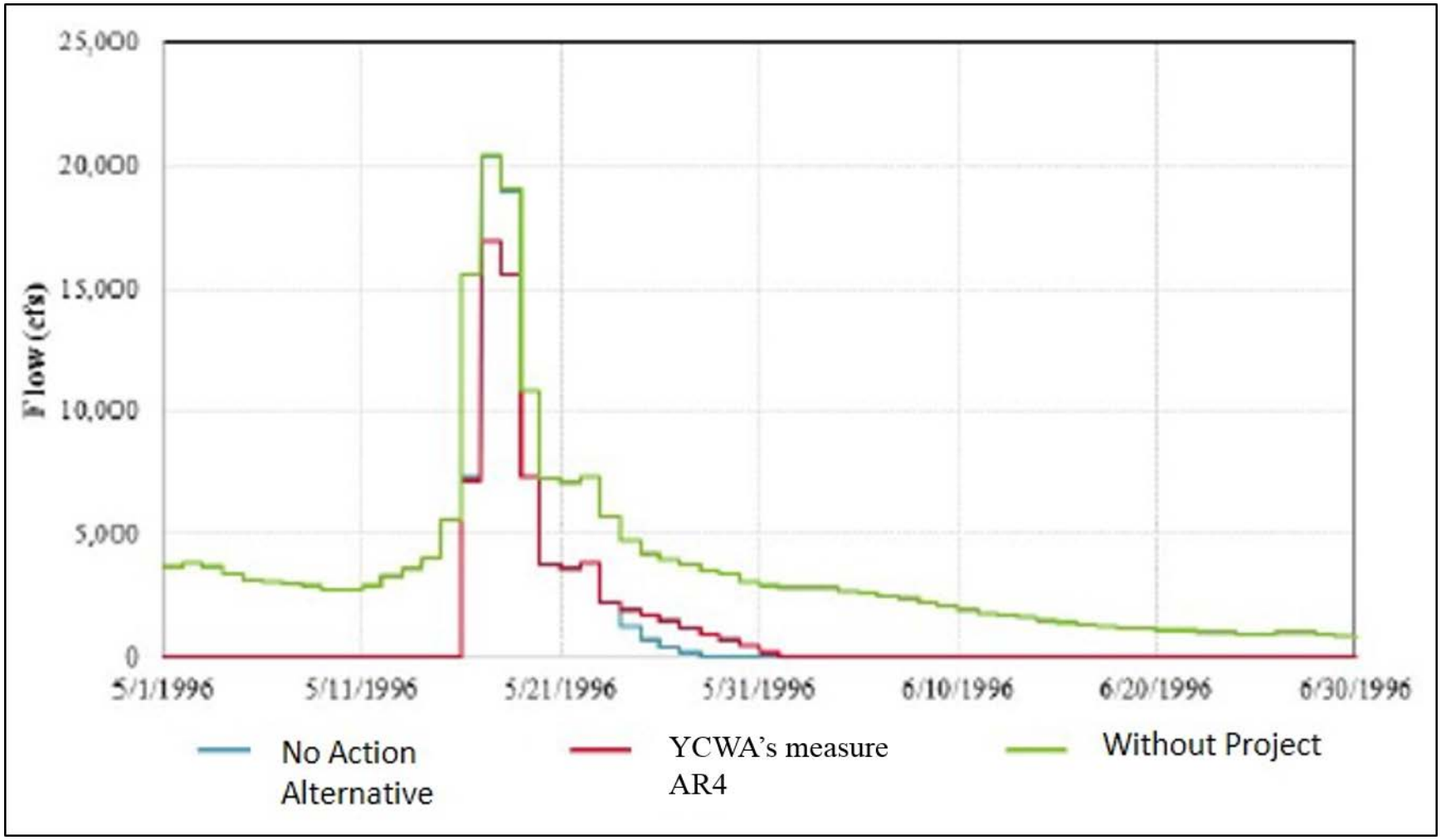

Figure 3-44. Modeled spill cessation downstream of New Bullards Bar Dam (Source: YCWA, 2017a, as modified by staff).

In its letter filed August 25, 2017, FWS comments that switching to the low-level outlet following a spill may result in a change in water temperatures downstream of New Bullards Bar Dam; and therefore, it recommends compliance with recession rates be met through adjustments to New Bullards Bar Dam spillway Tainter gate opening rather than through the dam's low-level outlet (as proposed in AR4). However, when any spill event ceases, releases into the North Yuba River would resume through the minimum flow powerhouse, drawing water from the lower elevation in New Bullards Bar Reservoir. Therefore, the purpose of FWS's recommendation would be negated when any spill event ceases. Furthermore, by making adjustments through both the spillway Tainter gate openings and the low-level outlet, YCWA would be able to provide a more gradual change in water temperature as a spill event ceases relative to using only the spillway gate openings.

Ramping Rates Downstream of Englebright Dam

As discussed above, rapid changes in river flow associated with hydroelectric project operation have the potential to adversely affect aquatic resources. These adverse effects may include the stranding of juvenile salmonids in shallow, low-gradient gravel bar areas and off-channel areas and the dewatering of salmon and steelhead redds (spawning nests) (Hunter, 1992). Rapid changes in streamflow also can affect salmon and steelhead behavior and reduce spawning success (Bauersfeld, 1978).

To address these concerns, YCWA proposes to limit the downramping rate and magnitude of project-related flow fluctuations in the Yuba River downstream of Englebright Dam (AR9) (as measured at the Smartsville gage). Under its proposed AR9, changes in flow would not increase at a rate of greater than 500 cfs per hour, nor decrease at a rate in excess of 200 cfs per hour at any point in the year. Also, at no point in the year would flows change, either up or down, by more than 15 percent of the average daily flow, nor would they be reduced by more than 30 percent of the previous day's flow. According to YCWA, this condition is expected to minimize potential adverse effects related to flow ramping and flow fluctuations on salmonids in the lower Yuba River downstream of Englebright Dam (i.e., protect juvenile salmonids from stranding and minimalize potential adverse effects on salmon and steelhead behavior and spawning success).

In addition to the ramping rates described above, between September 2 and December 31, and between January 1 and May 31, YCWA would limit its flow reductions under normal operations according to the larger of: (1) the applicable minimum streamflow requirement specified in YCWA's proposed AR3; or (2) the flow that would result from applying the maximum flow reduction amount specified in tables

3-53 and 3-54.[86] These flow reduction schedules are designed to minimize the potential for spring-run Chinook and steelhead redd dewatering and are based on the decreases in flow that would result in no more than 1 percent of expected spring-run Chinook salmon and steelhead redds being dewatered (using the known spatial and depth distributions of spring-run Chinook salmon and steelhead redds and morphological unit-specific stage-discharge relationships). From April l through May 31 when flow schedules 3 through 6 or conference years are in effect as specified in YCWA's proposed measure WR3, YCWA could reduce the flow downstream of Englebright Dam to the applicable minimum streamflow requirement specified in its proposed measure AR3.

Table 3-53. YCWA proposed maximum flow reductions to ensure that no more than 1 percent of redds are dewatered, corresponding to the maximum 5-day average release that occurred from September 1 through December 31 (Source: YCWA, 2017a).

Base Flow Range (cfs)	**Maximum Allowable Flow Reduction (cfs)**
450–549	200
550–849	250
850–1,049	300
1,050–1,349	350
1,350–1,599	400
1,600–1,849	450
1,850–2,199	500
2,200–2,549	550
2,550–2,899	600
2,900–3,199	650
3,200–3,549	700
3,550–4,130	750

[86] Normal operations are those other than flow manipulations related to emergencies, required by the Corps' flood control criteria, required to maintain a flood control buffer or for other flood control purposes, bypasses of uncontrolled flows into Englebright Reservoir, uncontrolled spilling, or uncontrolled flows of tributary streams downstream of Englebright Dam.

Table 3-54. YCWA proposed maximum flow reductions corresponding to the maximum 5-day average release that occurred from January 1 through May 31 (Source: YCWA, 2017a).

Base Flow Range (cfs)	Maximum Allowable Flow Reduction (cfs)
450–499	200
500–549	250
550–649	300
650–849	350
850–1,199	400
1,200–1,449	450
1,450–1,699	500
1,700–1,899	550
1,900– 2,149	600
2,150–2,399	650
2,400–2,699	700
2,700–2,949	750
2,950–3,199	800
3,200–3,449	850
3,450–3,899	900
3,900–4,130	950

Between April 1 and July 15, YCWA would limit flow reductions to less than the larger of: (1) the applicable minimum streamflow requirement specified in YCWA's AR3; (2) the flow that would result from applying the maximum flow reduction amount specified in table 3-55; or (3) the flow that would result from applying 120 percent of the maximum flow reduction amount specified in table 3-55 for the previous end of day flow. In addition, as a target only, YCWA would make reasonable efforts to adhere to the above riparian seedling recruitment flow reductions from July 16 through September 30 (AR9). These limitations are intended to enhance riparian seedling recruitment (see section 3.3.3.2, in the subsection *Riparian Vegetation*).

Table 3-55. YCWA proposed maximum daily flow reductions corresponding to the preceding end of day flow that occurred from April 1 through July 15 for riparian seedling recruitment (Source: YCWA, 2017a).

Previous End of Day Flow Range (cfs)	Maximum Flow Reduction (cfs)
400–999	79
1,000–1,999	150
2,000–4,200	200

As a component of its Lower Yuba River Aquatic Monitoring Plan (AR8), YCWA also proposes to monitor interactions of anadromous fish with Narrows 2 facilities and operation. Specifically, YCWA would observe anadromous fish presence during specific operational scenarios and rapidly identify any occurrence of stranding or isolation in the Narrows Reach (i.e., the approximately 1,000-feet-long section of the Yuba River that extends from the Narrows 2 facilities to the Narrows 1 Powerhouse). Interactions would be characterized from July through February of each year. YCWA would survey for stranded Chinook salmon and steelhead in this portion of the Yuba River when:

- the full bypass ceases operations (i.e., flow through the full bypass is reduced to 0 cfs);
- at a starting flow of 1,500 cfs or greater, the combined discharge from the Narrows 2 facilities decreases by more than 400 cfs within any 1-hour period; or
- at a starting flow of less than 1,500 cfs, the combined discharge from the Narrows 2 facilities decreases by more than 250 cfs within any 1-hour period.

Surveys would be conducted using binoculars from the Narrows 2 Powerhouse deck or, if flows allow safe access to the river channel, by walking, wading along, or boating around the perimeter of the full bypass pool and then continuing along the bank opposite the full bypass slowly downstream searching edgewater, backwater, perched habitats, and exposed bars for stranded Chinook salmon and steelhead. Any observations of stranded fish would be reported to NMFS, FWS, California DFW, and the Water Board within 48 hours.

FWS (10(j) recommendation 4), also recommends YCWA, within the first full calendar year of the new license term, develop a Narrows Reach fish stranding prevention plan in consultation with California DFW, NMFS, the Water Board, and FWS. The plan would be consistent with YCWA's proposed measure AR8, would be focused on the reach of the lower Yuba River from immediately below Englebright Dam to the Narrows No. 1 Powerhouse, and would include long-term measures to reduce or eliminate the stranding potential of fish during flow transitions of normal operations of the project. In its 10(j) recommendation 5, FWS also recommends that YCWA report a potential

fish-stranding event to FWS, NMFS, and California DFW if a flow reduction of greater than 500 cfs occurs for more than 5 minutes. If the unplanned flow reduction occurs on a weekday, reporting to the fisheries agencies would be on the same day, via email and telephone. If the unplanned flow reduction occurs after 5:00 p.m. on a Friday, reporting to the fisheries agencies would be by 10:00 a.m. on the following Monday, via email and telephone.

NMFS 10(j) recommendation 5; the Water Board preliminary 401 condition 17; and BLM 10(a) recommendation 9 are consistent with the FWS recommendation regarding the need for a Narrows Reach fish stranding prevention plan. However, NMFS also recommends YCWA notify NMFS, FWS, and California DFW within 24 hours if a project flow reduction triggers monitoring, and if the subsequent monitoring finds stranded fish. In addition, if a new project license includes California DFW's recommended flows between March 23 through April 30 in schedule 1 years and April 1 through April 30 in schedule 2 years for (as specified in California DFW's recommendation 2.5), California DFW further indicates its flow fluctuation criteria would not apply during operations for minimum flows during the periods these flows are in effect.

Our Analysis

Under the existing license, operation of the project results in occasional stranding of juvenile and adult salmonids and non-salmonid fishes downstream of Englebright Dam. While these effects on fish populations are relatively minor (ICF/Jones & Stokes, 2010), YCWA developed proposed measure AR9 to reduce the potential for juvenile stranding and redd dewatering during project-related flow transitions.

According to Hunter (1992), juvenile salmonids are usually more susceptible to stranding than adults; however, juvenile Chinook vulnerability reportedly drops substantially once they reach a size of 50 to 60 millimeters in length (Hunter, 1992), and juvenile steelhead vulnerability usually drops when they reach 40 millimeters in length (Beck Assoc., 1989, as cited in Hunter, 1992). Larger juveniles are more likely to inhabit pools, glides, overhanging banks, and mid-channel substrates, where they are less prone to stranding (Hunter, 1992). In the lower Yuba River, juvenile Chinook salmon were found to be most susceptible to stranding during the post-emergent fry stage (30 to 40 millimeters in length) (YCWA, 2017a).

YCWA's proposal to restrict downramping rates to less than 200 cfs per hour (approximately 1 inch per hour) at any point in the year, would be well within the rates of stage change considered necessary to protect juvenile salmonids from stranding (Hunter, 1992). A downramping rate of 1 inch per hour is also generally within the range of natural rates of stage reductions in unregulated rivers (Olson and Metzgar, 1987), while Higgins and Bradford (1996) state that maximum recommended stage reduction levels for gravel bars of regulated rivers are typically 1 to 2 inches per hour (Sommer et al., 2001). In addition, YCWA found no relationship between ramping rates and the incidence of fry stranding on low-gradient bars ("beaching") when flow reductions were

less than 200 cfs per hour at Narrows 2 Powerhouse. Consequently, the downramping ramping rates specified under AR9 would better allow juvenile salmonids to avoid stranding during project-related flow reductions. Nevertheless, some stranding of post-emergent Chinook salmon fry has been observed even at half this rate, suggesting that young fry have limited ability to detect or respond to receding water levels, regardless of the ramping rate. Similarly, surveys conducted by YCWA indicate that the small size and strong association of young fry with substrates limit their ability to detect or respond to receding water levels, regardless of ramping rate. Reporting ramping events that are greater than 500 cfs for more than 5 minutes to FWS, NMFS, and California DFW, as recommended by FWS, would also allow YCWA and the resource agencies to assess the magnitude of a potential stranding event and respond accordingly (i.e., conduct a fish rescue or assess the amount of mortality related to the event).

Flow reductions associated with project operation also have the potential to dewater salmon and steelhead redds and incubating eggs downstream of Englebright Dam (CALFED and YCWA, 2005). To address this issue, YCWA completed a detailed analysis of the known temporal, spatial, and depth distributions of spring-run Chinook salmon and steelhead redds upstream and downstream of Daguerre Point Dam and their associated habitat unit stage-discharge relationships (YCWA, 2017a). The spawning periods for spring-run Chinook salmon and steelhead used in this analysis were obtained from RMT (2013). The embryo incubation period for redds constructed on a given day during the respective spawning period was calculated using modeled mean daily water temperatures and accumulated thermal units. The maximum flow reductions specified in tables 3-53 and 3-54 are those that would result in the dewatering of no more than 1.0 percent of the expected spring-run Chinook salmon and steelhead redds in the lower Yuba River during their spawning and incubation periods, based on YCWA's 41-year modeling period (YCWA, 2014b). In addition, no egg pockets would be dewatered under the AR9 scenario during any water year type. Because fall-run Chinook salmon spawning and embryo incubation extends from October 1 through March 31, AR9, which would restrict flow reductions during the spring-run Chinook salmon and steelhead spawning and embryo incubation periods, also would restrict flow reductions during the fall-run Chinook salmon spawning and embryo incubation period in the Yuba River downstream of Englebright Dam. While evidence of biological impacts associated with rapid flow increases is scarce (Hunter, 1992), YCWA's proposal to not increase flows at a rate of more than 500 cfs per hour would likely minimize any behavioral effects on spawning and rearing salmonids, and could even prevent the stranding of fishermen and other people located on gravel bars, rocks, or in confined canyons.

Historically, YCWA's project license, did not include any restrictions regarding how YCWA operates the Narrows 2 facilities, as long as instream flow and flow fluctuation requirements are met at the Smartsville gage, which is located approximately 300 feet downstream of PG&E's Narrows 1 Powerhouse and 1,300 feet downstream of the Narrows 2 facilities. However, in an October 8, 2014 letter, the Commission required YCWA to develop a Narrows 2 Prioritized Operations and Monitoring Plan for the

Narrows 2 Development to minimize the potential for fish stranding in the partial bypass channel and at a gravel bar immediately below the full bypass. The requirement was the result of documented fish mortalities that occurred below the development during previous use of the partial flow bypass (i.e., fish were attracted to the partial bypass and then dewatered in riprap when the partial bypass was shut down). On January 2, 2015, YCWA filed its Narrows 2 Prioritized Operations and Monitoring Plan with the Commission for approval. The plan outlined a detailed protocol for use of the Narrows 1 and 2 Powerhouses, partial flow bypass, and the full flow bypass to minimize the potential for fish stranding. YCWA also agreed to modify the gravel bar (a potential fish-stranding site) located immediately downstream of the full bypass and install a hood around the partial bypass system. The hood was designed in such a way as to narrow the extent of water spraying onto the banks of the lower Yuba River, which historically caused false fish attraction and subsequent fish mortality. In addition, YCWA agreed to develop a fish stranding monitoring program that would be implemented following: use of the partial bypass, non-emergency use of the full bypass, and significant flow reductions from the combined releases of the Narrows 2 facilities. Specifically, YCWA agreed to conduct visual fish stranding surveys to look for the presence of stranded fish. If stranded fish were found, YCWA agreed to contact the resource agencies for assistance in handling salmon or steelhead; quantify and measure stranded fish, to the extent possible; rescue stranded fish if appropriate permits were granted; physically mark any deceased fish; note the location of stranding; measure proximal water temperatures; and photograph the stranding location. Under proposed measure AR8, YCWA would continue to implement these operational protocols and several of the monitoring measures outlined in its approved Narrows 2 Prioritized Operations and Monitoring Plan.

Prior to filing its Narrows 2 Prioritized Operations and Monitoring Plan, YCWA evaluated the relationship between shutdowns of the Narrows 2 partial bypass and fish stranding in Technical Memorandum 7-13, Fish Stranding Associated with Shutdowns of Narrows 2 Powerhouse Partial Bypass (YCWA, 2014c; filed on April 29, 2014). The study was conducted in proximity to the Narrows 2 Powerhouse, which is located approximately 400 feet downstream of Englebright Dam. It included surveys to document the occurrence and condition of any fish found stranded after shutdowns of the partial bypass, visual observations of fish from the Narrows 2 Powerhouse deck before and after shutdowns of the partial bypass, a summary of historical and current operations of the partial bypass, and documentation of incidental observations. Over the course of the study period, operational changes that led to shutdowns of the partial bypass occurred twice, once on September 8, 2013, and again on October 7, 2013. During the September 8, 2013, event, visual inspection events from the powerhouse deck resulted in 111 observations, of which 99 were of Chinook salmon and 12 were of fish that could not be identified. Visual inspections during the October 7, 2013, event resulted in 30 observations (20 Chinook salmon and 10 fish that could not be identified). Incidental observations of fish stranding in this reach also occurred prior to initiation of study 7.13.

YCWA's proposed measure to keep monitoring anadromous fish interactions with Narrows 2 facilities and operation would likely continue to provide valuable information on the timing and magnitude fish stranding. Ongoing monitoring under proposed measure AR8 would also afford opportunities for YCWA and the resource agencies to rescue trapped fish (including ESA-listed fish species). The monitoring methods and triggers outlined in proposed measure AR8 are generally consistent with those outlined in YCWA's approved Narrows 2 Prioritized Operations and Monitoring Plan and would likely minimize potential adverse effects on the fishery in the Yuba River. In addition, NMFS's recommended reporting requirements for potential fish-stranding events (within 24 hours) would allow the resource agencies to conduct a timelier fish rescue than what would occur under YCWA's proposed 48-hour reporting requirement, and would help the resource agencies to identify and obtain an adequate count of dead fish before substantial predation can occur. Furthermore, developing a formalized Narrows Reach fish stranding prevention plan in consultation with California DFW, NMFS, the Water Board, and FWS, consistent with YCWA's proposed measure AR8, would help guide the implementation of this measure and ensure that the resource agencies have an opportunity to provide input on the monitoring plan.

Fish Passage and Anadromous Fish Restoration

Barriers to upstream fish passage can be natural or human-caused and often delay migrations and movements, fragment populations, or prevent access to critical habitat necessary to sustain populations. Natural barriers can include waterfalls and debris obstructions (e.g., beaver dams); artificial barriers to fish passage mainly include dams and road-stream crossings. Unscreened intakes at hydroelectric projects also have the potential to entrain fish rearing or migrating in project area waterbodies. Fish that are entrained are removed from the local population within the river, stream, or reservoir and may be killed or injured or they may survive and interact with fish populations located downstream of the powerhouse.

Under existing conditions, New Bullards Bar Dam and Our House and Log Cabin Diversion Dams are complete barriers to the upstream migration of fish and impede downstream fish passage. Operation of the project's Narrows 2 Powerhouse also has the potential to adversely affect fish passage because of delay, false attraction and stranding, and redd and channel dewatering. Although not part of the Yuba River Development Project, the Corps' Englebright Dam is a complete barrier to upstream fish passage and also impedes downstream passage. The Corps' Daguerre Point Dam (located at RM 11.6, 12.7 miles downstream from Englebright Dam) includes two fish ladders. These ladders were constructed approximately 80 years ago and were reconstructed in 1965 after the northern portion was washed away in high flood flows. Some fisheries biologists believe that the ladders impair upstream passage of adult salmonids; however, no data support this belief. Some also believe the flows over the dam crest mask the attraction to the ladder inlets, but again, no data support this.

Fish are sometimes observed circling around at both the inlet and outlet of the ladders during daylight hours, but they are gone the next day, so it may be that the fish are simply waiting for a "trigger" to send them on their way upstream. It is true that the existing ladders completely block the upstream migration of green sturgeon because they cannot maneuver through ladders of this design.

FWS recommends (10(a) recommendation 2) YCWA assist in the implementation of Anadromous Fish Restoration Program actions as identified in the Final Restoration Plan (FWS, 2001) (as needed to make all reasonable efforts to double natural production of anadromous fish in Central Valley streams). Friends of the River et al. recommend that a placeholder be reserved in any new license to implement any future actions for Daguerre Point and Englebright Dams that are recommended in the Corps' Yuba River Ecosystem Restoration Program.

Our Analysis

Project facilities and operations have caused habitat fragmentation and loss, created upstream fish migration barriers, and impeded downstream passage throughout the Yuba River project area. Operation of New Bullards Bar Dam completely blocks upstream fish passage, impedes downstream passage, and inundates approximately 15 miles of historical riverine habitat in the North Yuba River. The Our House and Log Cabin Diversion Dams on the Middle Yuba River and Oregon Creek also completely block upstream fish passage and impede downstream fish passage. While Englebright Dam is not part of the Yuba River Development Project, controlled flow releases from Englebright Reservoir into the lower Yuba River are made via the project's Narrows 2 Powerhouse. The penstocks to PG&E's Narrows 1 Project and YCWA's Narrows 2 Development are the only outlets from Englebright Dam, the only means of discharging water downstream, except for rare spills over the top of the dam, and generally provide the only downstream fish passage routes. Similarly, the Narrows 2 facilities present conditions that are hazardous for fish attempting to swim upstream (e.g., fish have the potential to enter the Narrows 2 tailrace, draft tubes, and runner blades).

While a variety of fishways has been used in California, Oregon, and Washington and have successfully transported salmon past dams for many years, fish passage has not been provided on the Yuba River, except at the Corps' Daguerre Point Dam. However, actions being developed as part of Yuba Salmon Partnership Initiative's[87] anadromous reintroduction program would facilitate the recolonization of approximately 30 miles of historical anadromous fish habitat upstream of Englebright Dam.

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[87] The Yuba Salmon Partnership Initiative is a collaboration between California DFW, NMFS, YCWA, American Rivers, and the California Sportfishing Protection Alliance to return spring-run Chinook salmon and possibly steelhead to more than 30 miles of the North Yuba River.

YCWA does not propose any measures to provide upstream or downstream fish passage at the project. YCWA's proposed measures would be consistent with the following objectives of the Anadromous Fish Restoration Program as identified in the FWS's Final Restoration Plan (FWS, 2001):

- improve habitat for all lifestages of anadromous fish by providing flows of suitable quality, quantity, and timing, and improved physical habitat;
- improve survival rates by reducing or eliminating entrainment of juveniles at diversions;
- improve the opportunity for adult fish to reach their spawning habitats in a timely manner;
- collect fish population, health, and habitat data to facilitate evaluation of restoration actions;
- integrate habitat restoration efforts with harvest and hatchery management; and
- involve partners in the implementation and evaluation of restoration actions.

Additional actions identified in this plan pertaining to the Yuba River that would be addressed in YCWA's proposed measures include, among others: reducing and controlling flow fluctuations to avoid and minimize adverse effects on juvenile salmonids; maintaining adequate instream flows for temperature control; and operating reservoirs to provide adequate water temperatures for anadromous fish.

Regarding Friends of the River et al. recommendation that a placeholder be reserved in any new license to implement any future actions that are recommended in the Corps' "Yuba River Ecosystem Restoration Program," we believe that Friends of the River et al. is likely referring to the Corps' Yuba River Ecosystem Restoration Feasibility Study. This study is ongoing, and available information regarding the measures that may be recommended by the Corps is insufficient to evaluate their benefits. Regardless, Commission licenses already include a standard fish and wildlife reopener article that could be used to assess the need for any additional fish and wildlife measures during a license term.

Fish Entrainment

Some fish entrainment likely occurs at powerhouse intakes in New Bullards Bar and Englebright Reservoirs, and in the Lohman Ridge and Camptonville Diversion Tunnels. Only the New Bullards Bar minimum flow, New Colgate, and Narrows 2 penstocks, however, lead to powerhouses and associated turbines. Fish entrained through powerhouses may be subject to injury during turbine passage, and fish entrained into the Lohman Ridge and Camptonville Diversion Tunnels may affect the species composition and recruitment of fish to the reaches downstream of the diversion facilities.

YCWA proposes to periodically close the Lohman Ridge Diversion Tunnel (AR11). If the end-of-March New Bullards Bar Reservoir storage is 775,000 acre-feet or

greater and the subsequent April is a Wet Water Year (defined in YCWA's proposed measure WR2), YCWA would close the Lohman Ridge Diversion Tunnel within 2 business days of publication of California DWR's April Bulletin 120. The Lohman Ridge Diversion Tunnel would remain fully closed through September 30 of that calendar year. During this closure, YCWA would open the low-level outlet and fish release valve at Log Cabin Diversion Dam, but would potentially leave the Camptonville Diversion Tunnel fully open. Additionally, if May is a Wet, Above Normal or Below Normal water year (defined in YCWA's proposed measure WR2) and the subsequent end-of-September New Bullards Bar Reservoir storage is 600,000 acre-feet or greater, YCWA would fully close the Lohman Ridge Diversion Tunnel from October 1 through December 31 of that calendar year.

Forest Service specifies (4(e) condition 35) that YCWA shall periodically close the Lohman Ridge Diversion Tunnel under the same circumstances as described in YCWA's proposed measure AR11.

FWS states that it supports YCWA's proposed Lohman Ridge Diversion Tunnel closures in concept, but argues that the closure periods do not cover the most important migratory period of rainbow trout (i.e., the fall season when rainbow trout migrate between freshwater reaches). FWS recommends (10(j) recommendation 10) that YCWA periodically close this tunnel during the spring and summer periods as described above, and it also recommends that YCWA fully close this tunnel from October 1 through December 31 of each year, regardless of the water year type. California DFW's 10(j) recommendation 2.13 is the same as FWS's 10(j) recommendation 10. FWN supports FWS and California DFW's recommendation to close the Lohman Ridge Diversion Tunnel during the fall.

Water Board (preliminary 401 condition 10) specifies that it would likely require YCWA to develop and implement a plan to mitigate for project related effects on beneficial uses, including fish and wildlife entrainment. Water Board (preliminary 401 condition 7) specifies that it would likely require a schedule to periodically close the Lohman Ridge Diversion Tunnel and the Camptonville Diversion Tunnel based on water year types that Water Board would specify.

Our Analysis

North Yuba River—In New Bullards Bar Reservoir, the New Colgate Powerhouse uses the lower intake located 328.5 feet below the NMWSE. The minimum flow powerhouse uses the low-level outlet located at 508.5 feet below the NMWSE of the reservoir. In rare events when the reservoir's water surface elevation reaches the minimum elevation of 1,730 feet, allowed under article 34 of the existing license, the depth of the intakes can be as shallow as 103 feet (for the lower intake) to 282.5 feet (for the low-level outlet) below the surface. In January and June 2012, YCWA performed gillnetting in New Bullards Bar Reservoir to document the occurrence of fish near the intake structures. Gillnetting near the dam at depths up to 100 feet showed very low fish abundance with only one kokanee and one spotted bass collected from deepwater habitat

near New Bullards Bar Dam. Water at that depth lacks light and offers minimal food resources due to low productivity. The New Colgate and New Bullards Bar Minimum Flow Powerhouses both have Pelton turbines, which have a higher mortality rate compared to a Francis turbine, such as the one used at the Narrows 2 Powerhouse (Cada, 2001). However, considering the low number of fish occurring in deep water, the effects of operating the New Colgate and New Bullards Bar Minimum Flow Powerhouses on reservoir fishes would be minimal.

Lower Yuba River Downstream of Englebright Reservoir—In Englebright Reservoir, the intake for the Narrows 2 Powerhouse is located at a depth of approximately 77 feet below the NMWSE of the reservoir. YCWA performed gillnetting in Englebright Reservoir in June 2012. Catch in deep water nets approximately 580 feet from the Narrows 2 intake, included two rainbow trout and one brown trout. All other fish were found near the surface, which was the general trend throughout the reservoir. Similar to New Bullards Bar Reservoir, the gillnetting results indicated that few fish likely occupy deepwater habitat in Englebright Reservoir. Water at that depth lacks light and offers minimal food resources due to low productivity. Unlike the New Colgate and New Bullards Bar minimum flow powerhouses, the Narrows 2 Powerhouse has a Francis turbine, which due to its design, has a higher survival rate (Cada, 2001). Considering the low number of fish occurring in deep water, and the turbine design, the effect of operating the Narrows 2 Powerhouse on reservoir fishes appears to be minimal.

Middle Yuba River and Oregon Creek—The Lohman Ridge Diversion Tunnel is located 15 feet below the NMWSE of the Our House Diversion Dam impoundment, and the Camptonville Diversion Tunnel is located 18 feet below the NMWSE of the Log Cabin Diversion Dam impoundment. To measure entrainment into these tunnels during the flow diversions of 2012 and 2013, YCWA used passive integrated transponder tags to monitor rainbow trout and brown trout movement. In the Middle Yuba River upstream of the Lohman Ridge Diversion Tunnel, 159 rainbow trout and 2 brown trout were tagged; in Oregon Creek upstream of the Camptonville Diversion Tunnel, 379 rainbow trout were tagged. Monitoring from October 22, 2012, through November 7, 2013, detected 49 tagged fish (approximately 30 percent) entering the Lohman Ridge Diversion Tunnel, and 39 tagged fish (approximately 10 percent) entering the Camptonville Diversion Tunnel. The majority of fish detected in the Camptonville Diversion Tunnel (77 percent) originated from the Middle Yuba River. YCWA estimated daily entrainment rates of 0.56 fish/day and 0.03 fish/day for the Lohman Ridge and Camptonville Diversion Tunnels, respectively.

FWS and California DFW's 10(j) recommendations for increasing Lohman Ridge Diversion Tunnel closures would reduce the potential for rainbow trout and other fish to be entrained through the diversion tunnel more than YCWA's proposed measure AR11. In its response to comments, filed on October 10, 2017, YCWA notes that the increased fall tunnel closures recommended by FWS and California DFW would result in 17 more closures over a 41-year period of record than under YCWA's proposed measure AR11 (YCWA, 2017c). With a daily entrainment rate of 0.56 fish/day, FWS and California

DFW's recommendation would reduce entrainment into the Lohman Ridge Diversion Tunnel by approximately 845 fish over 41 years compared to YCWA's proposed measure AR11. However, unlike the intake structures associated with the New Colgate, New Bullards Bar Minimum Flow, and Narrows 2 Powerhouses, the Lohman Ridge and Camptonville Diversion Tunnels do not lead to generating facilities that could subject entrained fish to direct mortality through turbine strikes. Additionally, YCWA's entrainment study documented individual fish passing the passive integrated transponder antennas multiple times, indicating that entrained fish could swim back through the diversion tunnels and return to Oregon Creek or the Middle Yuba River. During relicensing studies of the fishery located upstream of Englebright Reservoir, YCWA documented several similar fish species in New Bullards Bar Reservoir and in both Middle Yuba River and Oregon Creek (e.g., rainbow trout, Sacramento pikeminnow, and Sacramento sucker), as well as multiple age-classes for fishes in Middle Yuba River and Oregon Creek suggesting that existing entrainment does not affect the fish communities in either New Bullards Bar Reservoir, Middle Yuba River, or Oregon Creek. FWS also comments that the frequency of tunnel closures proposed in YCWA's measure AR11 does not cover the most important migratory periods of rainbow trout. Rainbow trout, however, are not a facultative anadromous species, and as such, they are able to complete their life cycle without any migration. Moreover, the passive integrated transponder tag detections in the Lohman Ridge and Camptonville Diversion Tunnels indicate limited fall and spring movements of rainbow trout in the project area.

Considering the daily entrainment rates associated with the Lohman Ridge and Camptonville Diversion Tunnels, YCWA's proposed measure AR11 would provide a moderate level of protection against fish entrainment. The increased frequency of closing the Lohman Ridge Diversion Tunnel recommended by FWS and California DFW would provide a high level of protection against fish entrainment.

Managing Sediment and Large Woody Material in the North and Middle Yuba Rivers and Oregon Creek

LWM provides habitat structure in streams and can influence sediment storage and channel morphology through its effects on flow, water velocity, and sediment transport. LWM provides cover and holding habitat for fish, serves as substrate for the growth of algae and invertebrates (which are important components of the aquatic food web), and affects patterns of sediment deposition and scouring. Loss of LWM can result in reduced complexity of aquatic habitat and subsequently reduced carrying capacity for aquatic biota.

YCWA proposes to implement the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan (GS3). Under the plan, YCWA would allow woody material larger than 8 inches in diameter and up to 36 feet in length to pass downstream of the Our House and Log Cabin Diversion Dams, but would annually collect, store, and dispose of untreated floating woody material

(e.g., non-pressure treated or creosote impregnated wood) at New Bullards Bar Reservoir. Storage would primarily occur at two sites on the Garden Point Peninsula. When floating material exceeds the capacity of these two storage coves, land upstream of the Cottage Creek Boat Launch would be used. Rootwads would also be passed downstream of the diversion dams unless YCWA determines a particular rootwad would present a risk to dam safety.

Forest Service (4(e) condition 38) specifies and California DFW (10(j) recommendation 2.18) recommends that YCWA implement the proposed Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan. In its letter filed August 25, 2017, FWS comments that it supports the Our House and Log Cabin Diversion Dams portion of YCWA's proposed measure GS3, but not the New Bullards Bar Reservoir portion because of adverse effects on California red-legged frog critical habitat. FWS comments further that while the 300-foot buffer around critical habitat goes a long way toward protecting California red-legged frog[88] Critical Habitat Unit YUB-1, extreme wood-flow events[89] would still mean that Moran Cove could be swamped with floating LWM and woody debris.

Forest Service (10(a) recommendation 5), FWS (10(j) recommendation 9), BLM (10(a) recommendation 3), and California DFW (10(j) recommendation 2.19) all recommend that YCWA develop and implement a North Yuba River LWM and sediment enhancement and management plan. The sediment enhancement component of this plan is discussed in section 3.3.1.2, in the subsection *Sediment Transport in North Yuba River*. The resource agencies define LWM differently from YCWA and specify that LWM be at least 25 feet in length (not including the rootwad) and at least 12 inches in diameter. The agencies recommend that YCWA: (1) conduct a baseline survey in the North Yuba River downstream of the New Bullards Bar Dam spillway no more than 1 year prior to LWM placement and anchoring; (2) between August and September in the first 5 years of any new license, using truck, helicopter, or other means deemed safe and feasible by YCWA, place a minimum of 129 pieces of LWM in 1 or more piles in the lower water channel and floodplain surfaces downstream of the spillway channel, and anchor or bury a minimum of 14 pieces of LWM at 2 sites on the North Yuba River downstream of the dam; (3) take photos and document the location with GPS immediately following placement; and (4) establish two permanent transects and photo points for LWM

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[88] We discuss effects on California red-legged frog in section 3.3.4.2, in the subsection *California Red-Legged Frog.*

[89] In California, high rainfall years that follow periods of low rainfall or drought lead to mobilization of dead trees and branches that have fallen into rivers and been carried downstream. Winter storms lead to high volumes of LWM and woody debris covering the surface of large and small reservoirs (wood-flow events).

monitoring within the first 2.4 miles of the bypassed reach downstream of New Bullards Bar Dam and to the confluence of the Middle Yuba River.

Under this agency-recommended plan, YCWA would also monitor LWM up to three times in each 10-year period of any new license, as triggered by a flow event of 8,000 cfs or more; if less than two of these events occur within the 10-year period, then YCWA would also monitor during year 10. Following each monitoring event, YCWA would also replenish the LWM piles to a total of 129 pieces, minus the number of stable pieces observed during monitoring. YCWA would also replace any of the 14 originally anchored or buried pieces of LWM that are no longer in place every 10 years. In addition, YCWA would file reports with the Commission, and provide to the Forest Service, FWS, California DFW, and the Water Board, a report describing the implementation of LWM placement and the results of baseline monitoring by March 15 of the year following initial LWM placement, and the results of monitoring and any replenishment in subsequent years. Finally, YCWA would present to the ecological group (set up under proposed measure GEN1) the results and an evaluation of the LWM and gravel/cobble enhancement effort following completion of each 10-year monitoring period. The presentation would include the amount of LWM and gravel/cobble replenished, monitoring triggers and frequency, monitoring methods, and/or discontinuing the replenishment of LWM and/or gravel/cobble. Any changes to the plan should be collectively agreed to by YCWA, Forest Service, FWS, California DFW, and the Water Board prior to YCWA filing a revised plan with the Commission for approval.

The Water Board's preliminary 401 condition 11 is consistent with YCWA's proposal to pass LWM over Our House and Log Cabin Diversion Dams but also specifies that YCWA collect, store, and dispose of LWM in New Bullards Bar Reservoir and mitigate for the reduction of LWM downstream of New Bullards Bar Dam. The goal of the plan is to provide downstream transport of LWM past Our House Diversion Dam on the Middle Yuba River and Log Cabin Diversion Dam on Oregon Creek and increase the amount of LWM below New Bullards Bar Dam to improve downstream habitat quality.

Our Analysis

North Yuba River—Historically, woody material begins to accumulate on the surface of New Bullards Bar Reservoir during spring runoff in April and May when the reservoir is filling. The source of this material is primarily from the North Yuba River and smaller tributaries to the reservoir. The material accumulates at the upper end of the reservoir or in coves, but can disperse throughout the reservoir based on wind direction and speed, and the dispersal pattern may change from week to week. YCWA estimates that approximately 2,500 cubic yards of woody material is collected in an average year; however, in very wet years YCWA has collected and removed approximately 70,000 cubic yards from the reservoir. In some years YCWA does not collect or dispose of any woody material (YCWA, 2017c). During relicensing studies, YCWA measured 13

pieces of LWM along a 327 foot-long section (100 meters) of the bypassed reach downstream of New Bullards Bar Dam near the confluence of the Middle Yuba River.

The agencies' recommended LWM placement in the North Yuba River downstream of the dam could enhance habitat for fishes, including rainbow trout. However, as mentioned in section 3.3.1.2, in the subsection *Sediment Transport in the North Yuba River*, the North Yuba River downstream of the New Bullards Bar Dam has a steep gradient (2.0 percent on average, with sections as steep as 5.5 percent) that makes this reach subject to high-velocity flow events. Subsequently, with the steep gradient and regular high flows present in this reach, it is likely that high-velocity, turbulent conditions would act to prevent long-term residence of LWM within the reach. Figure 3-1 (section 3.3.1.2) shows that spill events in this reach occur regularly, and can vary greatly in magnitude. Table 3-2, in section 3.3.1.2, also shows that even at a relatively low spillage flow of 2,880 cfs, maximum simulated velocities at 20 instream flow study transects range from 5 to 21 feet per second, indicating that any anchored LWM would experience significant forces (particularly at higher spillage flows) that would act to dislodge them from their anchor points.

The agencies' recommendation does indicate that LWM should have rootwads that could allow the LWM to become wedged between boulders and includes provision for the anchoring or burial of at least 14 pieces of LWM in the reach. Proper anchoring is a critical factor to ensure LWM remains in place and is effective and could include anchoring into the soil or attaching to boulders or bedrock. YCWA found that in the North Yuba River below New Bullards Bar Dam and in similar streams where boulders and bedrock dominate the channel topography, LWM often floats and becomes exposed out of the wetted channel and on top of boulders once the water recedes, where it is relatively ineffective at capturing and storing sediment and providing value to aquatic habitat. To maximize the effectiveness of anchored LWM to enhance aquatic habitat, the material would typically have to be anchored close to the channel thalweg to remain mostly submerged during non-spill lower flow releases. These areas, however, would also be subject to the highest flow velocities, and any anchored material would have the highest probability of becoming dislodged relative to material placed along shorelines in more shallow areas. Additionally, anchoring LWM to the boulder- and bedrock-dominant streambed of this bypassed reach would require special anchoring techniques and the possible use of heavy equipment. The steep gradient and limited access to this bypassed reach would make transporting the LWM and heavy equipment to the sites difficult and costly. Because the reach has a steep gradient, regular high flows, and boulders and bedrock dominate the channel topography and limit habitat suitability, the agencies' recommendation to anchor 14 pieces of LWM in the reach would only slightly improve aquatic habitat in the reach.

The agencies' recommendation includes an additional provision to enhance aquatic habitat in this reach through gravel augmentation. This gravel augmentation recommendation is described fully in section 3.3.1.2, in the subsection *Sediment Transport in the North Yuba River*, and would include similar provisions for monitoring

and replenishing as described for LWM above. While placement of trout spawning gravel would enhance aquatic habitat, much of the gravel would regularly be transported downstream and eventually out of the North Yuba River reach, similar to the LWM discussed above. Anchored LWM would help trap some of the added gravel, however, it is likely, based on the frequency and magnitude of spill events (figure 3-1), that high velocities (table 3-2) would mobilize much of the gravel, even if anchored LWM remained in place. Gravel would have to be replenished continually in the reach. Additionally, the hydraulic variability in this bypassed reach could deposit gravels in the channel margins, which often lack suitable depths and flow velocities necessary for trout spawning at lower flows (YCWA, 2013a).

The agencies' recommendation does include a provision to monitor and replenish LWM and gravel up to 3 times in each 10-year period, and to replace any of the 14 originally anchored or buried pieces of LWM that are no longer in place every 10 years. This monitoring and replenishment would help maximize the effectiveness of the gravel and LWM at enhancing aquatic habitat, however, as mentioned previously, repeated access to this streambed and transporting the necessary heavy equipment and material would be difficult and costly.

In summary, placed gravel and cobble would temporarily form bars in the river, depending on the nature and size of the flow events that disperse the sediment immediately following placement. However, high-flow events would eventually transport most of the placed spawning-size gravel out of the North Yuba River reach. Placed cobble would also be mobilized and eventually be transported out of the reach, although at a slower rate. As a result, additional gravel/cobble would need to be placed into the reach at frequent intervals to meet the agency recommendations for sediment enhancement downstream of the reservoir.

Middle Yuba River and Oregon Creek—Woody material enters Our House and Log Cabin Diversion Dam impoundments from upstream, primarily during high spring flows in April and May, and then either passes downstream over the spillway or accumulates on the trash rack to the diversion tunnels. Large pieces of woody material on the trash rack are moved into the impoundment so they may pass over the spillway. Smaller pieces are collected using a rake and piled on the impoundment bank where they are either removed by YCWA and disposed of offsite or burnt in the fall. In its description regarding the existing passage of woody material at Our House and Log Cabin Diversion Dams, YCWA does not specify any size criteria for large pieces versus small pieces of woody material. The amount of woody material varies by year, with the most material occurring in wet years following a series of dry years.

As shown in tables 3-37 through 3-40 and mentioned above, these reaches currently provide higher quality habitat and support more rainbow trout than the bypassed reach downstream of New Bullards Bar Dam to the confluence with the Middle Yuba River. Passing LWM and sediment downstream of Our House and Log Cabin Diversion Dams, as proposed by YCWA's measure GS2 and GS3 and supported by the Forest

Service, FWS, and California DFW would maintain the existing aquatic habitat complexity and support the habitats' carrying capacity for aquatic biota in these downstream reaches.

YCWA's proposed Log Cabin and Our House Diversion Dams Sediment Management Plan contains a provision to pump up to 250 cubic yards of sediment around the dams and discharge it directly into the rivers downstream of the dams between October 1 and April 10, at the latest. This sediment pumping would occur in the event that diversion valves or outlets became blocked by sediment accumulation, and YCWA would have to clear the blockage with an air and/or water nozzle. Based on the quantities of sediment that historically spilled over the diversion dams described in section 3.3.1.1, YCWA's proposal to pump sediment around the dams following clearing of blocked diversion valves or outlets would have a minimal beneficial effect on fisheries and aquatic habitat.

Lower Yuba River Habitat Restoration and Large Woody Material Management

Under existing conditions, the storage and diversion of water associated with operation of the project and other dams and diversions in the Yuba River Watershed restricts fish passage; blocks the downstream movement of LWM and coarse sediment; alters the timing, magnitude and duration of river flows; and modifies the natural thermal regime in the lower Yuba River. Mitigating any adverse effects associated with operation of the project through the implementation of habitat restoration and enhancement projects could benefit aquatic biota as well as terrestrial vegetation and improve geomorphic processes in the lower Yuba River. However, any recommended or proposed mitigation measures must demonstrate a clear nexus to the project and consider YCWA's ongoing role in providing water supply, flood control, hydroelectric generation, and recreation.

YCWA's amended final license application does not include any proposed measures to modify or enhance physical habitat or LWM in the lower Yuba River. YCWA contends that project operation does not result in effects on geomorphic and riparian conditions, which have been severely degraded due to past and ongoing non-project activities (i.e., as a result hydraulic mining and relocation, reconfiguration and channelization of the lower Yuba River) (YCWA, 2017a). However, YCWA is proposing to pass LWM at Our House and Log Cabin Diversion Dams and to rapidly remove LWM from New Bullards Bar Reservoir and make it available for use by the agencies or other entities for habitat enhancement in the Lower Yuba River (GS3).

FWS, NMFS, California DFW, BLM, and FWN each recommend YCWA develop and implement a suite of physical habitat improvement projects for juvenile salmonids in the lower Yuba River. Specifically, FWS 10(j) recommendation 3 would have YCWA, in consultation with California DFW, FWS, NMFS, and the Water Board, develop a plan to restore or enhance functioning juvenile salmonid rearing habitat in the lower Yuba River from Englebright Dam, 20.9 miles downstream through the Hallwood Reach,

which ends at approximately RM 3.3. Potential measures include lowering of floodplain surfaces, planting of riparian vegetation, and installation of LWM. Additional FWS recommendations include:

- Floodplain habitat (340 acres total) currently accessible at 5,000 cfs would be modified to be accessible between 1,500 to 3,000 cfs. Land modification may include grading, benching of bank areas, backwater expansion, and creation of side channels or swales. All modified habitat would be planted with native riparian vegetation.
- Existing floodplain habitat (251 acres total) that is currently accessible between 3,000 and 21,000 cfs would be planted with native vegetation. For this and the floodplain habitat recommendation, half of the restoration would be completed by year 10 and the remaining acreage by year 20.
- LWM (492 pieces total) would be placed from Englebright Dam through the Hallwood Reach. Placement and density would be guided by a restoration ecologist in consultation with the California DFW, FWS, NMFS, and the Water Board. Material would be at least 24 inches in diameter and 18 feet in length with 50 percent of the pieces maintaining a crown or rootwad. In addition, 10 percent of the pieces would be secured to the bank and accessible at flows as low as 880 cfs upstream of Daguerre Point Dam or 530 cfs downstream of the dam, based on installation location. Half of the pieces would be placed by year 5 of the new license and the remainder by year 10.
- LWM would be surveyed and replaced as needed every 10 years until a new license is issued.

FWS's recommended plan would include implementation and effectiveness monitoring. Effectiveness monitoring would include assessing function of the restored floodplain, survival of planted vegetation, LWM presence, terrestrial input at restored/enhanced floodplain sites, and salmonid usage of habitat associated with restored floodplains or LWM. Effectiveness monitoring would begin within a year of completion of each restored area and continue for 10 years or until the location reaches its performance metric, whichever occurs first. LWM effectiveness monitoring would commence within 1 year of completion and continue for 3 years. Annual reporting and presentation of effectiveness monitoring to the ecological group would also be required.

FWS also identified that modifications to the plan could occur if collaboratively agreed upon by YCWA, FWS, California DFW, and the Water Board. Revisions could include but not be limited to performance metrics, the amount of LWM replenished, monitoring triggers and frequency, monitoring methods, and/or discontinuing the replenishment of LWM.

FWS (10(j) recommendation 7) additionally recommends: (1) the wood just upstream of the Cottage Creek Boat Launch on New Bullards Bar Reservoir should be removed using an excavator and loaded onto trucks or temporarily stored in YCWA's

operations yard ramp area for no more than 1 day; (2) following rapid woody removal, YCWA should make 200 key pieces of LWM (24–36 inches in diameter at the widest end, not including the rootwad, and greater than 25 feet in length) available to entities conducting salmonid restoration actions in the lower Yuba River; (3) receiving entities should only be charged the hauling cost to transport the LWM to restoration areas or stockpiling sites in the lower Yuba River; (4) all key pieces of LWM with rootwads still attached should be preferentially selected to be made available for lower Yuba River salmonid habitat restoration; (5) YCWA should consult with the FWS on timing and amounts of key LWM pieces available; (6) if fewer than 200 key pieces of LWM are available, YCWA should provide the balance of the LWM in pieces of wood that could be used to construct engineered log jams in the lower Yuba River (i.e. greater than 30 feet in length); and (7) YCWA should allow the receiving entities a minimum of 60 days to collect key pieces of LWM.

In its section10(j) recommendation 15, FWS further recommends that YCWA model the amount of above-bankfull (>5,000 cfs) floodplain inundation that would be lost in the lower Yuba River from operation of the proposed auxiliary flood control outlet as described in the final license application (rather than as described during the relicensing process and outlined in the operations model). The ecological group would then use this model to determine the number of acres of floodplain restoration needed to mitigate for the loss of floodplain inundation.

BLM 10(a) recommendation 4 and California DFW 10(j) recommendation 2.29 are the same as FWS 10(j) recommendation 3.

NMFS 10(j) recommendation 4 is similar to the FWS, BLM, and California DFW recommendations with one exception—its recommended LWM augmentation program is included in its 10(j) recommendation 3. NMFS 10(j) recommendation 3 would have YCWA collect and stockpile wood from all project reservoirs for use in enhancements projects downstream. Specifically, NMFS's recommendation provides for:

- Annual removal of wood greater than 3 feet long and 8 inches in diameter at 5 feet from the large end, from all project reservoirs and storage of the wood for future placement at locations proximal to enhancement projects.
- Placement of at least 100 pieces of wood in the lower Yuba River annually until a frequency of 100 pieces per mile of stream channel is reached on average from Timbuctoo Reach (RM 21.0) to the Hallwood Reach (RM 2.5). Once the target number is reached, monitor after flow events to determine if additional material should be added to replace displaced wood.

FWN recommends the development and implementation of a lower Yuba River habitat enhancement plan, as recommended by California DFW in 10(j) recommendation 2.29 and FWS in 10(j) recommendation 3. FWN further recommends that YCWA develop the plan within 1-year of license issuance in consultation with the resource agencies and restoration experts. The plan would focus on the restoration of functioning

juvenile salmonid rearing habitat through implementation of specific habitat enhancement measures. Implementation of the actions would begin within 3 years of license issuance and would be substantially completed within 10 years. The plan would also include implementation and effectiveness monitoring and a provision for review, discussion, and evaluation in the ecological group.

The Water Board states that "additional immediate actions to restore riparian planting and LWM placements may be appropriate." The Water Board (preliminary 401 condition 3) also specifies it would likely require YCWA to develop and implement a restoration plan, in consultation with the relevant resource agencies. The Water Board indicates that the restoration plan should include the total area to be restored, restoration method, performance metrics, maintenance, and implementation and effectiveness monitoring.

In its 10(a) recommendation 6, the Forest Service recommends that YCWA provide all necessary and required support for the recovery of special-status species in the Yuba River downstream of Englebright Dam. The Forest Service also reserves the right to modify its 10(a) measures depending on the protection measures formally recommended by state and federal fish and wildlife agencies in the relicensing of this project and/or to respond to changes in the status, distribution, and management of special-status species in the lower Yuba River that may result in effects on NFS lands and resources.

YCWA states that the enhancement measures recommended by the resource agencies would not and could not change the fundamental geomorphology that has caused the historical and current conditions in the lower Yuba River. YCWA also argues that implementing the agency-recommended measures would be prohibitively difficult because of the inaccessibility of the river corridor, and given their scale, the recommended measures would have substantial harmful effects on the river corridor.

Our Analysis

The lower Yuba River historically supported large numbers of anadromous spring- and fall-run Chinook salmon and steelhead, unknown numbers of green and white sturgeon, and Pacific lamprey. Beginning in the 1850s habitat degradation associated with hydraulic mining, the loss of historical habitat from dam construction, and other impacts tied to over-fishing and poor hatchery practices have contributed to the decline and eventual listing of Central Valley salmonid populations under the ESA (Lindley et al., 2006; NMFS, 2014b). In the Yuba River, aquatic and riparian habitat degradation from hydraulic mining was particularly severe from 1852 through 1906 from the immense influx of mining debris (estimated at 367 million cubic yards of sediment) causing aggradation within the Yuba River channel on the order of 26 to 85 feet. The construction of the Corps' Daguerre Point Dam in 1910, to prevent hydraulic mining debris from the Yuba River from flowing into the Feather and Sacramento Rivers,

blocked salmon and steelhead runs for about 10 years.[90] Completion of the Corps' Englebright Dam in 1941 to further trap sediment derived from mining operations in the upper watershed created a complete barrier to upstream anadromous fish, confining these species to the lower 24 miles of the mainstem Yuba River. Sacramento River Flood Control Project levees were also constructed along the Feather and Yuba Rivers and their tributaries to prevent flooding of valley communities.

Aquatic and riparian habitat in the lower Yuba River has been slowly recovering from the variety of historical disturbances tied to hydraulic mining, dam building by the federal government for sediment and flood control, and channelization, as described above. However, the availability of anadromous fish habitat in the reach continues to be limited by a lack of LWM, an absence of off-channel spawning and rearing habitat, restricted floodplain connectivity, and an underdeveloped riparian corridor. Coarse sediment (i.e., spawning gravel) does not appear to be a limiting factor for anadromous salmonids in the lower Yuba River as a result of gravel recruitment from the banks of the lower river and ongoing gravel injection efforts by the Corps to collect and transport gravel downstream of Englebright and Daguerre Point Dams.[91] While the majority of these existing habitat conditions are unrelated to project operation, project operation does affect the quality and quantity of available salmon and steelhead rearing habitat by altering the natural flow and water temperatures regimes. The project also blocks the downstream movement of LWM and coarse sediment, both of which are key components of complex spawning and rearing habitat.

Historical activities unrelated to project effects are responsible for the current geomorphic characteristics of the lower Yuba River. These transformative activities include hydraulic mining, sediment management, and subsequent dam building for sediment control by the California Debris Commission, and historical flood control channelization. Even prior to mining, the river had already been highly altered by sedimentation, agriculture, and engineering projects. Furthermore, riparian conditions in the lower Yuba River are essentially unchanged or perhaps slightly improved from pre-project conditions. Therefore, project operation appears to have a relatively small influence on floodplain connectivity and off-channel habitat availability in the lower Yuba River.

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[90] Two fishways, one for low water and the other for high water, were constructed at Daguerre Point Dam; however, these ladders were destroyed during the floods of 1927–1928. These fish ladders were not replaced until 1938, leaving a 10-year period when upstream fish passage at Daguerre Point Dam was blocked.

[91] The Corps has been injecting a mixture of cobble and gravel into the lower Yuba River below Englebright Dam, as part of voluntary conservation measures associated with ESA consultations regarding Daguerre Point Dam.

Given these circumstances, YCWA's modeling and analysis show that the resource agencies' recommended pulse flows would not substantially increase floodplain inundation, and that inundation would not increase habitat because of the highly disturbed nature of the floodplain below Englebright Dam. Since the recommended habitat improvement measures cannot change the fundamental reshaping of the geomorphic and riparian conditions in lower Yuba River that occurred as a result of these historical influences, any improvements would be transitory at best. Moreover, the releases would result in overall less suitable water temperatures for numerous lifestages of ESA-listed salmonids. The additional releases would also come at a significant cost in terms of reduced project operational flexibility, water supply, and power generation. In addition, the agencies' combined flow recommendations would have significant adverse impacts on recreation by lowering reservoir levels in New Bullards Bar Reservoir (see section 3.3.5, *Recreation*). As described in section 3.3.3, *Terrestrial Resources*, the disturbance of 340 acres of riparian habitat with earth-moving equipment would also cause noticeable disturbance, which could have substantial, short-term, adverse effects on numerous sensitive wildlife that inhabit the lower Yuba River corridor. The ground disturbance would also increase the potential for new infestations of non-native invasive species and increase fine sediment in the lower Yuba River.

As described above, operation of the project intercepts some of the LWM moving downstream from the upper Yuba River basin. In new Bullards Bar Reservoir, the standard procedure is to remove LWM and stockpile it for subsequent burning or disposal offsite.

Under existing conditions, large woody debris is sparse in the lower Yuba River because of upstream blockage by dams and the lack of riparian vegetation in the system (Lower Yuba River Fisheries Technical Working Group, 2005). Other studies have also found that the lack of large wood in the Yuba River is hypothesized to limit geomorphic heterogeneity, macroinvertebrate productivity, cover, and foraging habitat for fish species (cbec, 2013). The few pieces of large wood that are found in the lower Yuba River have been shown to benefit salmonids (Pasternack and Senter, 2008), and snorkeling studies have documented juvenile salmonid preferences for instream cover such as LWM (FWS, 2010; JSA, 1992). Placement of large wood has been identified as an action that will contribute to salmonid recovery in the lower Yuba River (NMFS, 2014a). Based on these findings, the development and implementation of a plan to transport LWM from New Bullards Bar Dam to the lower Yuba River would likely enhance salmonid spawning and juvenile rearing habitat.

Implementation of each of the resource agencies' recommended LWM augmentation programs would likely increase aquatic habitat diversity in the lower Yuba River and provide cover and holding habitat for juvenile salmonids. The programs would also likely aid in the retention of spawning gravel, organic debris, and marine derived nutrients (salmon carcasses); create habitat for macroinvertebrates and other aquatic organisms (which are important components of the aquatic food web); and create hydraulic refugia (Abbe et al., 2003; Bryant et al., 2005; and Bisson et al., 1987).

While the benefits of LWM in salmonid-bearing rivers are well documented in the literature, it is unclear how the resource agencies derived their recommended placement targets and size-based composition guidelines for the lower river. FWS and NMFS also recommend different placement targets and size-based composition guidelines for the lower river and different approaches for the LWM program. LWM measuring 24 inches in diameter and 18 feet in length (with 50 percent of the pieces maintaining a crown or rootwad) may not be readily available in the project area, and it would not be appropriate for YCWA to either purchase or harvest LWM meeting these criteria. We also question NMFS's recommendation to anchor at least 10 percent of the LWM pieces to the river bank; restoration of more normative habitat conditions should not involve the use of cables or other non-natural anchoring systems. In addition, it is unlikely that NMFS's recommendation to annually remove wood as small as 3 feet long and 8 inches in diameter from all project reservoirs and place it at locations proximal to the lower river enhancement projects would result in any long-term benefits to aquatic resources.

Developing and implementing a comprehensive LWM enhancement plan for the project, in consultation with the resource agencies and the Commission, would ensure that the plan is well developed, scientifically sound, and is capable of meeting its stated enhancement objectives. The plan could identify the sources of LWM in the project reservoirs, develop viable options for storing and transporting collected LWM, and identify suitable LWM size classes and locations for placement in the lower Yuba River. Using locally sourced (within the project area reservoirs) LWM as part of any enhancement plan included in a license would be the most appropriate means of mitigating project effects on this component of aquatic habitat because there is a direct nexus between LWM availability in the lower Yuba River and project operation. However, LWM sourced from outside the project area could be used to "jump-start" the program (pending the availability of LWM in New Bullards Bar Reservoir). Monitoring and mapping the location of LWM over time could also provide an indication of the stability of these enhancements and inform the need for future placement activities. Revisiting the LWM enhancement plan goals and the timing and frequency of placement events once within the first 3 years of license issuance and then in license year 10 and every 10 years thereafter (i.e., license years 20 and 30) could also facilitate adaptive revisions to the plan as conditions improve in the lower river.

In its comments on the draft EIS, the Water Board requests that staff analyze appropriate measures to address past, current, and future project effects on aquatic habitat

from shot rock.[92] Staff held a technical meeting on October 28, 2014, with YCWA and various stakeholders to obtain more information on aquatic habitat issues related to shot rock and its connection to the project. While stakeholders at the technical meeting identified the operation of the Narrows 2 full bypass as a potential source of shot rock, none of the stakeholders were aware of any documented incidents where erosion of the far river bank resulted in the deposition of shot rock to the lower Yuba River. Additionally, shot rock has originated from non-project sources, including the construction of the Englebright Dam and tunnels. During the 2014 technical meeting, YCWA stated that shot-rock has historically been the result of the miles of tunnel that were dug through the bedrock both upstream and downstream of Englebright Dam. Additionally, Pasternack (2010) notes that the 1997 flood caused angular hillside rocks and "shot rock" debris from the canyon bottom to be deposited on top of the hydraulic-mining alluvium in the canyon area downstream of Englebright Dam. Therefore, a clear nexus to project operation and the presence of shot rock does not appear to exist. The effects of shot rock on aquatic habitat can be both beneficial and detrimental, particularly to salmonids. Shot rock are large, angular boulders, rather than round boulders, and because of their geometry, piles of shot rock tend to provide very little interstitial space relative to round boulders. With less interstitial space, less space is available for fine gravels to accumulate to provide salmonid habitat. However, large-boulder shot rock can provide flow refuges where adult salmonids can hold and where fine gravel can settle.

Upper Yuba River Aquatic Monitoring

YCWA's proposal contains several measures that could affect the existing aquatic habitat and biota, such as increased minimum instream flows, LWM and sediment management, and controlled spill recession rates. Recent surveys of resident fish species

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[92] "Shot rock" is defined as large angular rock that is present due to anthropogenic activities and is within or may be entrained into the Yuba River channel by past project construction, or current project operation or maintenance activities. In their requests for modifications to YCWA's approved Study 1.2, *Channel Morphology Below Englebright Dam*, FWN and NMFS' recommended YCWA evaluate how existing shot rock and project operation affect anadromous fish and anadromous fish habitat in the Englebright Dam reach. An initial determination on these requests was deferred on November 13, 2014, because staff had insufficient information to adequately evaluate these requests. To obtain additional information on the habitat issues related to shot rock and its connection to the project, staff hosted a technical meeting on October 28, 2014. Subsequent to the technical meeting, FWN and YCWA supplemented the record with additional information on December 2, 2014, and December 8, 2014, respectively. In its study determination filed on February 2, 2015, the Commission determined that FWN's requested modification and NMFS's requested new study were not required.

found in project waters, summarized in the affected environment section, provide baseline conditions of species diversity and relative abundance. Salmonid species (rainbow trout and kokanee) found in New Bullards Bar Reservoir are largely maintained for recreational purposes by stocking efforts from California DFW, while other species (i.e. centrarchids, Sacramento sucker, and Sacramento pikeminnow) are maintained largely through natural reproduction in both impoundments and riverine habitats.

BMI assemblages are an important part of the aquatic ecosystem and provide a fundamental food source for many resident fish. The description and characterization of BMI can be used to provide an indication of the general health and condition of a stream. YCWA's BMI survey data show that the BMI populations were in low to moderate abundance across project waterways. BMI indices ratings ranged from poor in the North Yuba River downstream of New Bullards Bar Dam to good in the Middle Yuba River.

YCWA proposes to implement its Upper Yuba River Aquatic Monitoring Plan (AR7). YCWA states that the purpose of its Upper Yuba River Aquatic Monitoring Plan is to develop information regarding aquatic resources in response to changes in flow conditions from existing license requirements to flow requirements under any new license issued. The plan would include data collection for distribution, abundance, and physical condition of stream fishes (especially rainbow trout), BMI, foothill yellow-legged frog, and western pond turtle in addition to habitat characteristics (channel morphology, riparian vegetation, and LWM) in the Middle Yuba River, Oregon Creek, North Yuba River, and Yuba River from the confluence of the North and Middle Yuba Rivers to Englebright Reservoir. YCWA's plan states that it would file by March 15 of each year, under any license issued, an annual report with the Commission, Forest Service, FWS, California DFW, and Water Board detailing monitoring results from the previous year. YCWA would also file a draft report with these resources agencies by January 15 of each year for review and recommendation. Any agency-recommendations not adopted by YCWA would be discussed in YCWA's March 15 annual report. YCWA, in consultation with the agencies, would review, update, and/or revise the plan, as needed, when significant changes in existing conditions occur.

California DFW (10(j) recommendation 2.23), the Forest Service, and FWN support YCWA's plan as described above.[93] Interior also supports YCWA's proposed plan; however, in the event that the foothill yellow-legged frog[94] becomes a federally

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[93] The Forest Service 4(e) condition 43 specifies that YCWA implement its Upper Yuba River Aquatic Monitoring Plan for locations on NFS lands and its 10(a) recommendation 13 recommends the plan apply to non-NFS lands, consistent with YCWA's proposal.

[94] We discuss effects on foothill yellow-legged frog and western pond turtle in section 3.3.3.2, in the subsection *Special-status Wildlife.*

listed species in the future, Interior asks that YCWA also conduct monitoring in below normal, dry, or critically dry water years following a below normal, dry, or critically dry water year.

The Water Board (preliminary 401 condition 15) specifies that it would likely require YCWA to develop a plan to collect information regarding aquatic resources in project-affected creeks, rivers and reservoirs upstream of Englebright Dam. The Water Board further specifies that the plan should provide information on project impacts on designated beneficial uses, and monitoring should identify effects on aquatic resources resulting from protection, mitigation, and enhancement measures. The Water Board may also include specific metrics or methods to be included with the plan or include specific measures to be implemented for adaptive management, based on the data collected. The Water Board (preliminary 401 condition 3) also specifies that it would likely require YCWA to develop a restoration plan, in consultation with the relevant resource agencies, to protect or enhance aquatic habitats, water quality, water temperature, vegetation, fish, wildlife, invertebrates, and other designated beneficial uses of water. The restoration plan would include the total area to be restored, restoration method, performance metrics, maintenance, and implementation and effectiveness monitoring. The restoration, in concert with minimum instream flows and ramping rates, should protect or enhance aquatic habitats, water quality, water temperature, vegetation, fish, wildlife, invertebrates, and other designed beneficial uses of water. Additionally, the Water Board may include specific metrics or methods to be included with the plan.

Our Analysis

YCWA's proposed stream fish monitoring (AR7) would track changes in the fish community (age structure, abundance, biomass, fish size, and condition), as well as general habitat conditions over time, but the proposed plan does not include any mechanisms to isolate project-related effects from non-project related effects on these resources. Additionally, the plan does not identify how monitoring results would affect project operation. Further, the best available science indicates that YCWA's proposed measures for increasing sediment transport and increasing LWM at the Our House and Log Cabin Diversion Dams would provide net benefits to aquatic resources in Oregon Creek and the Middle Yuba River.

As part of its BMI monitoring proposed (AR7), YCWA would collect reach-wide data on BMI assemblages as well as physical habitat characteristics of each site (total length, gradient, and average width and depth in each reach; and wetted width, water velocity, substrate composition, consolidation, percent embeddedness, pebble count, and average canopy cover at each transect). The majority of these physical habitat characteristics would also be monitored along with stream fish monitoring and stream channel morphology monitoring detailed above. As discussed previously in section 3.3.2.1, in the subsection *Aquatic Macroinvertebrates*, BMI are excellent indicators of both water quality and biological integrity of ecosystems. However, the abundance of BMI can be highly variable and influenced by factors independent of project operation,

including predation and impaired water quality from runoff. It is unclear how YCWA would determine if changes in BMI abundance observed during monitoring would be related to project operation or non-project factors like predation by birds or fish species that prefer faster flow velocities (rainbow trout) and those that prefer slower flow velocities (centrarchids). Similarly, YCWA documented 48 wildfires within the vicinity of the Yuba River Development Project from 2003 through 2011 that, if followed by rainstorms, can drastically impair project water quality and affect BMI abundance. Therefore, it is unlikely that BMI monitoring would provide an accurate indication of the relationship between project operation and abundance.

As part of the proposed sediment monitoring (AR7 and GS2[95]), YCWA would monitor the sediment in the Our House and Log Cabin Diversion Dam impoundments and the pool downstream of Our House Diversion Dam via an acoustic Doppler current profiler, single beam echo sounder, and bathymetry. Sediment monitoring in these areas would help guide the Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2), which would help maintain quality aquatic habitat for fish and other aquatic organisms. YCWA's proposed measure GS2 is designed to pass sediment through Our House and Log Cabin Diversion Dams and for the sediment then to be redistributed downstream by high flows occurring at the end of the sediment pass-through event and during the following spring. Although these monitoring data would provide information on the effectiveness of sediment management, no information is available to indicate that the proposed sediment sluicing at the Log Cabin and Our House Diversion Dams would be unsuccessful. Furthermore, it is not clear how this monitoring would be used to modify project operation.

To monitor channel morphology and LWM downstream of the diversion dams and downstream of New Bullards Bar Dam, YCWA proposes to analyze cross sections (bed topography, pebble counts, site photos) and collect data on bedrock presence, bankfull flow, facies, pools (depth and residual fine sediment), trout spawning gravel (particle size distribution and fine sediment content), and LWM. For LWM monitoring, YCWA would count LWM pieces within each monitoring site and characterize up to 30 key pieces by documenting length, diameter, age class, source, rootwad presence, and associations with trout spawning gravel and woody riparian vegetation establishment. Monitoring LWM downstream of Our House and Log Cabin Diversion Dams could allow YCWA to assure excessive LWM does not block narrow reaches downstream of the dams. However, because YCWA's proposed Our House and Log Cabin Diversion Dams and New

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[95] In its revised Our House and Log Cabin Diversion Dams Sediment Management Plan (GS2), filed July 27, 2018, YCWA includes monitoring protocols for sediment at Our House and Log Cabin Diversion Dams and stream channel morphology in Oregon Creek and the Middle Yuba River that are identical to those described in the June 2017 Upper Yuba River Aquatic Monitoring Plan (AR7).

Bullards Bar Reservoir Woody Material Management Plan (GS3) would allow all pieces greater than 8 inches in diameter and up to 36 feet long, as well as smaller pieces, to pass the diversion dams, the quantity of LWM entering the diversion impoundments would not be substantially different than the quantity passed downstream. Therefore, because the Log Cabin and Our House Diversion Dams would not affect the overall quantity of LWM transporting through the Middle Yuba River and Oregon Creek, there would be no basis for requiring the detailed LWM monitoring program proposed by YCWA (AR7).

Additionally, information in available that indicates that the proposed sediment sluicing and LWM passing at Log Cabin and Our House Diversion Dams would be unsuccessful. As such, it is not clear how channel morphology and LWM monitoring data would be used to modify project operation or what additional benefit these data would provide to aquatic resources. YCWA does not propose to pass any sediment or LWM downstream of New Bullards Bar Dam in the bypassed reach between the dam and the Yuba River confluence, and the aquatic habitat in this reach does not provide quality habitat for fish. Therefore, it is unclear what value monitoring channel morphology and LWM in this reach downstream of New Bullards Bar Dam would provide.

The Water Board did not provide any additional details on its recommended monitoring program nor did it specify any restoration projects beyond the plan's description above. As such, Water Board's plan is too vague to understand its implications and cannot be evaluated further.

Lower Yuba River Aquatic Monitoring

Any new license for the project would likely include a number of measures that would alter aquatic and riparian habitat conditions in the Yuba River downstream of Englebright Dam. These altered conditions could affect the distribution and abundance of resident and anadromous salmonids and BMI in the lower Yuba River. To address this issue, YCWA proposes to implement the Lower Yuba River Aquatic Monitoring Plan (AR8). The plan incorporates numerous components, including monitoring:

- passage of fish (by species) at the Corps' Daguerre Point Dam year-round;
- annual spawning population abundance for spring-run Chinook salmon, fall-run Chinook salmon, and steelhead;
- temporal and spatial distributions and habitat use of spawning steelhead upstream and downstream of Daguerre Point Dam;
- abundance, size, and timing of emigrating salmonids;
- interactions of anadromous fish with Narrows 2 facilities and operation;
- channel substrate and LWM;
- riparian vegetation cover and community structure; and
- BMI community structure.

As a component of proposed measure AR8, YCWA proposes to monitor fish passage year-round at Daguerre Point Dam using a VAKI Riverwatcher™ system, or similar system, in each of the dam's fish ladders. For each year of monitoring, the time series of VAKI Riverwatcher™ fish passage data would be evaluated to characterize:

- temporal distributions of Chinook salmon and steelhead net daily passage upstream of Daguerre Point Dam annually;
- temporal distributions of adipose fin-clipped Chinook salmon and steelhead net daily passage upstream of Daguerre Point Dam;
- annual abundance of spring-run and fall-run Chinook salmon and steelhead upstream of Daguerre Point Dam, for both adipose fin-clipped and non-clipped fish;
- multi-year trends in the abundance and temporal distributions of both adipose fin-clipped and non-clipped spring-run and fall-run Chinook salmon and steelhead that pass upstream of Daguerre Point Dam;
- annual and multi-year temporal distributions of Chinook salmon and steelhead net daily passage upstream of Daguerre Point Dam and potential associations with corresponding time series of lower Yuba River flows and water temperatures;
- annual length-frequency distributions of spring-run and fall-run Chinook salmon and steelhead that pass upstream of Daguerre Point Dam; and
- Chinook salmon and steelhead spawning in the lower Yuba River to:
  - estimate the total annual abundance of Chinook salmon downstream of Daguerre Point Dam;
  - determine the origin of Chinook salmon (i.e., hatchery and river of origin) using recovered coded-wire tags;
  - characterize Chinook salmon population demographics using biometric surveys;
  - describe the temporal and spatial spawning distribution of steelhead upstream and downstream of Daguerre Point Dam;
  - characterize the size and shape of steelhead redds to assist in species-specific redd identification; and
  - provide an estimate or index of adult steelhead spawning abundance downstream of Daguerre Point Dam to complement the VAKI Riverwatcher™-based annual abundance estimation upstream of Daguerre Point Dam.

YCWA would conduct its Chinook salmon spawning surveys during the first 10 years after license issuance, unless the ecological group decides to discontinue the

surveys before the 10 years are complete. Thereafter, YCWA would conduct its Chinook surveys during 3 years of each 10-year block through the term of the license. YCWA would conduct its steelhead spawning surveys during the first 5 years after license issuance. Subsequent surveys would be conducted during 3 years of each 10-year block through the term of the license (targeting schedule 5, 6, and conference years).

In addition to these spawning surveys, YCWA would deploy up to three rotary screw traps in the lower Yuba River to:

- estimate and examine trends in the weekly, monthly, seasonal, and annual abundances of emigrating juvenile Chinook salmon; and
- evaluate time-period specific size structure during juvenile Chinook salmon emigration.

YCWA would deploy the rotary screw traps and conduct sampling for the first 5 years of the license. Subsequent rotary screw trap monitoring would be conducted during 3 consecutive years of each 10-year block through the term of the license.

As discussed above in *Ramping Rates Downstream of Englebright Dam*, YCWA's proposed measure AR8 would also monitor interactions of anadromous fish with Narrows 2 facilities and operation from July through February of each year.

In addition to monitoring these fish population parameters, YCWA proposes to monitor substrate and LWM in the lower Yuba River to inform how sediment and LWM may be changing under new license terms and conditions (proposed measure AR8). YCWA would monitor substrate and LWM once within the first 3 years of license issuance and then in license year 10 and every 10 years thereafter (i.e., license years 20 and 30) until a new license is issued.

Finally, YCWA's proposed BMI monitoring in the lower Yuba River would examine the community composition of BMIs in the lower Yuba River and evaluate how the community composition changes over time. Monitoring would be conducted once within the first 3 years of license issuance and then in license year 10 and every 10 years thereafter (i.e., license years 20 and 30) until a new license is issued. In addition, BMI monitoring would be triggered by consecutive schedule 5, 6, and conference years.

By March 15 of each year, YCWA would file with the Commission and provide to NMFS, FWS, California DFW, and the Water Board a Lower Yuba River Aquatic Monitoring Report. The report would include the information described in the plan for each resource that was monitored in the previous calendar year and would document non-compliance with the plan during the performance of the monitoring surveys, if any. By January 15 of each year, YCWA would provide a draft of the report to NMFS, FWS, California DFW, and the Water Board for a 30 day-review period. If YCWA does not adopt a particular written recommendation by NMFS, FWS, California DFW or the Water Board, it would include the reasons for not doing so in the report that it files with the Commission on March 15. In addition to those monitoring actions described in YCWA's proposed measure AR8, NMFS recommends (10(j) recommendation 6) that

YCWA deploy an Adaptive Resolution Imaging Sonar underwater camera in the vicinity of Narrows 2 Powerhouse tailrace to further monitor interactions of anadromous fish with Narrows 2 facilities and operation. The camera would be deployed after consultation with NMFS, FWS, and California DFW regarding location and dates of operation.

YCWA would review video taken 2 hours before, during, and 2 hours after any operational event that would trigger the proposed stranding surveys for evidence of false attraction, stranding, or mortality. YCWA would also make the videos available to the public upon request.

California DFW 10(j) recommendation 2.26 calls for YCWA to implement the Lower Yuba River Aquatic Monitoring Plan. The Water Board (preliminary 401 condition 16), specifies that YCWA develop and implement a plan to collect information regarding aquatic resources in the Yuba River downstream of Englebright Reservoir. The objective of this plan would be to collect data on the distribution, abundance, and condition of BMI, channel substrate, riparian vegetation, LWM, and adult and juvenile anadromous fish. The Water Board states that this plan would provide information on project effects on designated beneficial uses (e.g., cold and warm freshwater habitat, wildlife habitat, and spawning). Additional focus would be on monitoring for stranded salmonids during Narrows 2 Powerhouse flow fluctuations that have a potential to negatively affect anadromous salmonids (e.g., Chinook salmon and steelhead trout).

Our Analysis

Fish population 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. Fish habitat monitoring usually focuses on the long-term assessment of habitat variables that have the greatest influence on aquatic species. Developed in consultation with FWS, California DFW, and other relicensing participants, YCWA's proposed measure AR8 is a comprehensive fish habitat and fish population monitoring program for the lower Yuba River. However, several of the measures included in this plan lack a clear project nexus or have no connection to future license conditions.

For example, whereas implementation of YCWA's proposed upstream fish passage monitoring program at Daguerre Point Dam would provide year-round data on the abundance, size, passage efficiency, and migration timing of hatchery and wild anadromous fish entering the Yuba River, it is unclear how these data would specifically be used to address project effects on the resource or to inform changes in future project operation. It is well known that the annual abundance of adult salmon and steelhead entering any river system can be highly variable and is influenced by ocean and estuary conditions, annual hatchery augmentation, state and federal fishery management, and the operation of other dams and diversions in the watershed. All of these factors are outside YCWA's control.

Project operation affects flows and water temperature in the lower Yuba River, and these conditions, in turn, affect the quality and quantity of available spawning and rearing habitat. However, based on our analysis, YCWA's proposed minimum flows (as modified by staff) should adequately protect salmon and steelhead downstream of Englebright Dam. It is unclear how YCWA's proposed weekly Chinook salmon and steelhead spawning surveys would be used to guide future changes in project operation.

YCWA's proposed rotary screw trap sampling in the lower Yuba River would provide information on the weekly, monthly, seasonal, and annual abundances and time-period specific size structure of emigrating juvenile Chinook salmon and help examine potential relationships between these metrics and the flows and water temperatures in the lower Yuba River. However, these metrics are also influenced by environmental factors that are unrelated to project operations, such as predation, annual variability in spawning success, drought, floods, trap collection efficiency, and non-project-related habitat degradation.

In addition to these monitoring programs, YCWA's proposed channel substrate and LWM monitoring programs included in proposed measure AR8 would help inform how sediment and LWM may be changing in response to LWM augmentation and whether these changes are suitable for spawning and rearing anadromous salmonids. The results of the LWM monitoring program could allow YCWA and the resource agencies to adaptively adjust the LWM augmentation program over time.

As discussed above in *Ramping Rates Downstream of Englebright Dam*, rapid decreases in flow associated with shutdowns of the Narrows 2 Powerhouse have the potential to strand aquatic resources in the 1,000-foot-long reach of the Yuba River between the Narrows 2 partial bypass and PG&E's Narrows 1 Powerhouse. Although NMFS's recommended Adaptive Resolution Imaging Sonar-based monitoring program in the Narrows 2 tailrace has the potential to provide additional data on stranding and/or false attraction, study 7.11 and other studies completed during project relicensing also provide information to determine project effects on adult and juvenile salmonids. In addition, as a component of proposed measure AR8, YCWA would continue to monitor fish stranding at the Narrows 2 facilities following specified flow reductions and dewatering events and would notify NMFS, California DFW, and the Commission of any fish mortality or stranding incidents. Under proposed measure AR8, YCWA may also rescue stranded fish or alert agency representatives for an opportunity to conduct a fish rescue. Finally, any adult salmon mortalities documented during the AR8 surveys could be examined in consultation with the resource agencies to determine if they resulted from interactions with the powerhouse structure (i.e., turbine strike) or were the result of dewatering.

BMI have several characteristics that make them potentially useful indicators of water quality and overall aquatic ecosystem health. They are relatively non-mobile, and 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. While any license issued for the project would likely alter aquatic habitat conditions in the lower Yuba River, it is anticipated that YCWA's proposed mitigation measures, including minimum instream flows, ramping rates, BMPs during construction, and woody debris passage at the dam would adequately protect aquatic habitat and BMI in the project-affected reach. Although sampling of BMI, as proposed in measure AR8, 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. Consequently, the goals and benefits of this recommended monitoring are unclear.

The Water Board did not provide any additional details or specific monitoring programs beyond the plan's description above. As such, the Water Board's plan is too vague and cannot be evaluated further.

Aquatic Invasive Species Management

Aquatic invasive species, such as New Zealand mudsnails, quagga mussels, zebra mussels, and Asian clams can compete for habitat resources with native species and have the potential to affect aquatic communities. While YCWA did not document these species during macroinvertebrate or other relicensing studies, California DFW discovered New Zealand mudsnails in the Yuba River upstream and downstream of the Highway 20 Bridge, which is approximately 6 miles downstream of Englebright Dam near the town of Smartsville (California DFW, 2016a), and California DFW and the Forest Service have documented Asian clams in New Bullards Bar Reservoir.

New Zealand mudsnails are known to reproduce quickly with large numbers of offspring; a single female is capable of producing 2.7 billion offspring within 4 years (California DFW, 2017b). If New Zealand mudsnails became established in the Yuba River Watershed, they would pose similar threats as other aquatic invasive species in other areas, including clogging facility pipes and out-competing other aquatic macroinvertebrates for food, thereby disrupting ecosystem balances across the food web.

As a result, YCWA proposes to implement its Aquatic Invasive Species Management Plan (AR5) (filed on December 1, 2016) that includes a process to develop BMPs intended to minimize the potential for the introduction and spread of aquatic invasive species into and throughout waterways within the project area and provide education and outreach to ensure public awareness of aquatic invasive species effects and management efforts. In addition, the plan includes monitoring programs to ensure early detection of aquatic invasive species and a provision to ensure that all management activities comply with federal and State of California laws, regulations, policies, and management plans, and with Forest Service directives and orders regarding aquatic invasive species.

For Asian clams, YCWA would conduct visual and tactile surface surveys consistent with current California DFW quagga and zebra mussel artificial substrate monitoring and plankton tow sampling protocols in the North Yuba River, Willow Creek (upstream to the Camptonville Tunnel outlet), Little Oregon Creek, Indian Creek, Mill Creek, Lost Creek, and Slate Creek. Surveys would be conducted in the first full calendar year after any license for the project is issued and every other year thereafter through license year 10. YCWA would conduct one surface survey in New Bullards Bar Reservoir during October. YCWA's plan states that if no Asian clams are located during surface surveys or have otherwise been reported or observed within New Bullards Bar Reservoir within 300 feet or tributary streams by license year 10, this frequency may be reduced to once every 5 years for the remainder of the license term. For quagga and zebra mussels, YCWA would conduct artificial substrate monitoring twice annually, in July and October, in New Bullards Bar Reservoir and in the Our House and Log Cabin Diversion Dam impoundments. YCWA would conduct annual quagga and zebra mussel veliger[96] monitoring via plankton towing in September in New Bullards Bar Reservoir.

If any invasive mollusks, other than dreissenid mussels (quagga and zebra mussels) were detected, and if there were well-documented practical measures for control and/or eradication of the species in similar situations, YCWA would consult with California DFW, FWS, the Water Board, and the Forest Service to develop a plan to control and/or eradicate invasive mollusks. If zebra or quagga mussels were detected in New Bullards Bar Reservoir or in either diversion dam impoundment, YCWA would immediately notify California DFW and, in cooperation with the agency, develop measures to avoid infestation and implement a plan to control or eradicate dreissenid mussels pursuant to California Fish and Game Code section 2301.[97]

In 4(e) condition 39, the Forest Service specifies that YCWA should implement its Aquatic Invasive Species Management Plan for locations on NFS lands. Additionally, in 10(a) recommendation 8, the Forest Service recommends the plan apply to non-NFS lands. California DFW recommends that YCWA implement its plan as described above (10(j) recommendation 2.20). FWN states that it supports YCWA's proposed plan.

Consistent with YCWA's proposal, the Water Board (preliminary 401 condition 18) specifies that it would likely require YCWA to develop and implement a plan to manage aquatic invasive species, which would identify and describe invasive species currently established within the project area, as well as invasive species with a high potential to become established within the project area. Furthermore, the plan may

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[96] Veliger are the larval form of mollusks.

[97] Section 2301 of the California Fish and Game Code prohibits the possession, importation, shipment, or transportation of mussels of the genus *Dreissena* in California except as authorized by California DFW.

include similar measures as those proposed by YCWA regarding educational outreach, monitoring, and compliance with state and federal regulations, as well as additional specific metrics and measures to be taken if new invasive species are discovered in the project area.

FWS states that it supports the majority of YCWA's proposed plan, but suggests that bullfrog monitoring and suppression may not be adequate for protecting sensitive or listed frogs. We discuss bullfrog management and protection of sensitive or listed frog species in section 3.3.3.2, in the subsection *Foothill Yellow-legged Frog*, and section 3.3.4.2, in the subsection *California Red-legged Frog*.

Our Analysis

Because invasive Asian clams and New Zealand mudsnails have been documented in New Bullards Bar Reservoir and in the Yuba River, respectively, providing education and outreach as part of the proposed Aquatic Invasive Species Management Plan would help to ensure that the public is aware of aquatic invasive species and know how to prevent their spread. Developing BMPs to manage and control the spread of invasive species as part of the plan would ensure that management and control measures are responsive to future specific and identified threats to the aquatic ecosystem.

In November 2014, the Forest Service observed Asian clams at the mouth of Cottage Creek and the Dark Day Boat Launch, and, in 2015, YCWA received a report of Asian clams in New Bullards Bar Reservoir at Emerald Cove from California DFW. Because YCWA's plan does not specify that monitoring for Asian clams in New Bullards Bar Reservoir would include the mouth of Cottage Creek, the Dark Day Boat Launch, or Emerald Cove, modifying YCWA's plan to include a provision to monitor these locations as well as those mentioned previously would help YCWA control the spread of Asian clams in New Bullards Bar Reservoir.

YCWA includes a vulnerability assessment in its plan. The assessment finds the vulnerability of project impoundments to introduction of quagga and zebra mussels to be low due to multiple factors, primarily calcium concentration, total hardness, phosphorus, and alkalinity within project waters that are outside the range necessary for successful infestation of these invasive mussels. Boating does not occur in either Our House or Log Cabin Diversion Dam impoundments; therefore, the risk of aquatic invasive species being introduced through recreational use is considered low. Because New Bullards Bar Reservoir does support boating activity, it is more at risk of invasive species being introduced through recreational use. However, the generally unfavorable water quality conditions mentioned previously coupled with the preventative measures currently in place and proposed in YCWA's plan for New Bullards Bar Reservoir would minimize the potential for invasive mollusk species to be introduced into the reservoir. These preventive measures include signage, education, monitoring, and boat inspections.

YCWA's plan includes a provision to consult with the Forest Service and California DFW regarding the need to revise the plan in the future. Because FWS and

the Water Board also have an interest in ensuring aquatic invasive species are not introduced to project waters, including them in this consultation would ensure that current applicable state and federal policies and regulations are considered.

3.3.2.3 Cumulative Effects

Water Quantity

Hydroelectric project operation and diversions for consumptive uses have historically affected streamflows and water levels in the Yuba River Basin. The Yuba River Basin includes approximately 46 dams and reservoirs with a combined storage capacity of about 1,350,000 acre-feet. Thirty-eight of these dams are located upstream of the project on the North, Middle, and South Yuba Rivers. Estimated average monthly unregulated flows indicate that on an annual average basis the North Yuba, Middle Yuba, and South Yuba Rivers above Englebright Reservoir would contribute 1,087,000 acre-feet, 401,000 acre-feet, and 726,000 acre-feet, respectively, to unregulated flows in the lower Yuba River.

Non-project inter-basin water transfers from the North Yuba, Middle Yuba, and South Yuba Rivers to Bear River and the American River Watershed reduce the volume of water that enters New Bullards Bar Reservoir and is subsequently available for release to the portions of the Yuba River below New Bullards Bar Dam. The largest inter-basin water diversions occur from the South Yuba River, followed by the North Yuba River, and then the Middle Yuba River. From 1990 through 2016, Nevada Irrigation District, PG&E, and the South Feather Water and Power Agency diverted an average annual volume of 469,117 acre-feet of water from the Yuba River Basin. Water exports from 1990 through 2016 ranged from an average annual volume of 294,694 acre-feet in critically dry water years to 599,429 acre-feet in wet water years. The average annual amount of total water exports was 22 percent of the average annual unimpaired runoff of the Yuba River Basin at Smartsville. Storage provided by project and non-project storage reservoirs buffers the flow regime in the Yuba River by storing runoff during high flow periods and releasing the stored water over longer periods.

Englebright Reservoir receives flow from the North, Middle, and South Yuba Rivers and regulates flows to the lower Yuba River downstream of Englebright Dam. YCWA's proposed changes in minimum flows and the continued intrabasin water transfers from the North Yuba River, Yuba River, Middle Yuba River, and Oregon Creek associated with project operation would influence the timing but not the existing volume of the water that enters Englebright Reservoir and is subsequently available for release to the lower Yuba River downstream of Englebright Dam. PG&E and the Corps also affect the timing of flow releases from Englebright Dam through their operations at the Narrows 1 Powerhouse and Englebright Dam.

One of YCWA's primary purposes is to provide a reliable water supply to its members. Yuba River water is supplied through direct diversion of natural flow and by storage releases from New Bullards Bar Reservoir. During the irrigation season, which

typically extends from March through October, diversions from the Yuba River into irrigation canals typically average about 437,000 acre-feet per year. Although environmental flow measures and power operations are likely to remain similar over the duration of the project license in most years, non-project consumptive water demand (agriculture, municipal, and industrial) is projected to increase during this same period. Increases in water demand and the exercise of water rights to meet that demand could contribute to lower minimum flows being implemented when the proposed drought management plan is triggered, particularly during warm, dry water years.

Water Quality

Water resource projects and land management practices, including logging and land clearing have historically affected water temperature. Water resource projects upstream of the project have resulted in the project receiving reduced inflows that are warmer than would occur naturally (FERC, 2009, 2014). Because New Bullards Bar Reservoir seasonally stratifies and provides substantial cold-water storage, releases from the reservoir's cool hypolimnion compensate for the warming that occurs upstream of the project. Releases of cool water from the hypolimnion of New Bullards Bar Reservoir result in cooler than natural conditions in the North Yuba River downstream of New Bullards Bar Dam and in the Yuba River from the New Colgate Powerhouse discharges. The downstream extent of this cooling effect is augmented by storage of cool water released from New Bullards Bar Reservoir into Englebright Reservoir. Although summer inflows from the Middle and South Yuba Rivers exceed 20°C, the volume of flow from these tributaries is small compared to the volume contributed by New Bullards Bar Reservoir via the North Yuba River. Water temperatures downstream of Englebright Dam at Smartsville (RM 23.9) are consistently 9 to 13°C (table 3-8, figure 3-9). However, increased demand for irrigation water could lead to new or increased diversions and thereby reduce flows and contribute to warming in the lower Yuba River.

Water temperature data collected by YCWA indicates that the relatively cool water contributed from the Yuba River has a substantial cooling influence on the Feather River, with water temperatures measured in the Feather River downstream of the Yuba River's confluence being approximately 5°C lower than those measured in the Feather River upstream of its confluence during the summer months. The results of YCWA's water temperature modeling indicate that maximum water temperatures in the lower Yuba River under proposed operations would generally be 0.1 to 0.5°C lower than current conditions at Smartsville, and that this minor temperature reduction would persist throughout the lower Yuba River. As a result, the beneficial cooling effect of Yuba River flows on water temperatures in the Feather River is likely to persist under YCWA's proposed operation.

Mining, land clearing, and water resource projects have cumulatively affected metal concentrations and bioaccumulation of metals. Hydraulic mining sluiced sediment and mercury, which was used to enhance gold recovery, onto the basin's floodplains and watercourses from the mid-1850s to 1884 (USGS, 2005), and dredging of hydraulic mine

tailings from the upper Yuba River Basin and unmined gravels occurred between 1904 and 2003 (Hunerlach et al., 2004). Since completion of Daguerre Point Dam in 1910, Englebright Dam in 1940, and New Bullards Bar Dam in 1970, sediments have accumulated behind the dams. These sediments contain elevated concentrations of heavy metals from natural sources within the basin and mercury from mining operations (Hunerlach et al., 2004; Alpers et al., 2006). Relicensing studies documented elevated levels of copper in New Bullards Bar Reservoir; aluminum, copper, nickel, and silver in Englebright Reservoir; and bioaccumulation of mercury at levels that exceed advisory levels for human health in New Bullards Bar Reservoir (see section 3.3.2.1, in the subsection *Results from Other Water Quality Studies*). The ongoing presence of New Bullards Bar Dam and other water resource projects in the basin would continue to trap heavy metals and mercury. YCWA's proposed operations are expected to have negligible effects on heavy metal and mercury concentrations in water and aquatic organisms.

Coliform concentrations in basin waters have been historically affected by wildlife populations, the magnitude and location of recreation use, septic drainfields, and the availability of human waste facilities. YCWA's monitoring during holiday high-use recreation periods documented fecal coliform and *E. coli* levels that met the Basin Plan objective and EPA's guidance level, respectively. YCWA's proposed installation and enhancement of restroom and septic leach facilities is expected to protect against human waste contamination during increased recreational use, and its proposed recreation water quality monitoring would enable determination of the effectiveness of measures implemented to control contamination, and the need for any additional measures.

Aquatic Resources

The original construction of the Yuba River Development Project could have cumulatively affected aquatic resources by limiting or completely blocking migration patterns, trapping sediment and LWM, and altering flow and water temperature regimes as a result of reservoir operations and water withdrawals. Daguerre Point Dam is the most downstream dam on the Yuba River; it was built in 1906 and then rebuilt in 1964. This 25-foot- high by 575-foot- wide dam was built to stabilize the relocated Yuba River channel and is owned and operated by the Corps and contains two fish ladders. The roughly 260-foot- high Englebright Dam is the next dam upstream of Daguerre Point Dam; it is also owned and operated by the Corps. The dam was built in 1941 with the primary purpose of trapping and retaining sediment derived from extensive historical hydraulic mining operations in the Yuba River Watershed; it contains no fish passage facilities. Upstream of the Englebright Dam and on the North Yuba River, YCWA's New Bullards Bar Dam was built between 1966 and 1969, is about 645 feet high, and contains no fish passage facilities. YCWA's 70-foot-high Our House Diversion Dam is on the Middle Yuba River; it was built in 1968 and does not contain fish passage facilities. YCWA's roughly 43- feet- high Log Cabin Diversion Dam, on Oregon Creek, was also built in 1968 and similarly does not contain fish passage facilities. While

Daguerre Point Dam does have two fish ladders, the dam has been found to impair the upstream passage of adult salmonids and completely block upstream migration of green sturgeon. Additionally, Englebright Dam represents a complete barrier to upstream fish passage. Therefore, while the original construction of the Yuba River Development Project about 25 years after construction of Englebright Dam and 60 years after construction of Daguerre Point Dam did limit fish movement throughout the upper Yuba River Basin, any fish movement would have been, and currently is, falcutative (i.e., not necessary to complete the species' life cycle) migrations because obligate (i.e., necessary to complete the species' life cycle) migrations within the upper Yuba River Basin were no longer possible following construction of Englebright Dam.

LWM and trout spawning-sized gravel are uncommon in the stream reaches upstream of Englebright Reservoir (see section 3.3.2.1, in the subsection *Aquatic Habitat*), in part because the dams block recruitment of LWM and deposition of sediment in stream reaches downstream, thereby cumulatively reducing the quality of aquatic habitat in stream reaches upstream of Englebright Reservoir. While some sediment and LWM does currently pass the dams during spill events, YCWA's proposed sediment and LWM management plans would more effectively manage sediment and LWM passage, which in turn is expected to increase the quality of aquatic habitat in stream reaches upstream of Englebright Reservoir.

Reservoir and stream fishes upstream of and within Englebright Reservoir could be entrained through multiple intakes and tunnels during proposed project operation. Turbine-related injuries and mortality associated with operation of the Yuba River Development Project could contribute to cumulative effects on fishery resources. While some fish entrainment would occur, entrainment rates at all project intakes and tunnels are expected to be minimal. The highest rates of entrainment, discussed in detail in section 3.3.2.2, in the subsection *Fish Entrainment*, are through the Lohman Ridge and Camptonville Diversion Tunnels, neither of which is connected to a turbine or any power-generating structure. Therefore, any fish entrained through these tunnels would be less vulnerable to mortality. Reservoir fishes would be vulnerable to turbine mortality associated with entrainment through the powerhouses. However, YCWA observed very few fish (fewer than four fish) at depths near the powerhouse intakes in New Bullards Bar and Englebright Reservoirs. Water at these depths lacks light and offers minimal food resources due to low productivity. Therefore, fish entrainment related to operating the Yuba River Development Project would minimally contribute to cumulative effects on fishery resources.

Anadromous Fish and Essential Fish Habitat

A number of cumulative factors have contributed to the degradation of anadromous fish habitat in the Yuba River Basin including: (1) extensive aggregate mining both in the floodplain and river channel; (2) blocked or impaired access to historical spawning and rearing habitat at other hydroelectric projects and water diversions in the basin; (3) sediment and LWM retention by Englebright and Daguerre

Point Dams; (4) altered flow and water temperature regimes linked to reservoir operations and water withdrawals; (5) the introduction of non-native species that prey on or compete with salmon and steelhead; (6) extensive timber harvesting, grazing, agriculture, and levee construction in the lower Yuba River floodplain; (7) fish hatchery production and elevated straying levels due to transferring eggs between hatcheries and trucking smolts to distant sites for release; and (8) commercial and recreational harvest in the Sacramento River Basin and San Francisco Bay that has affected the abundance and genetic fitness of native salmon and steelhead stocks.

Spring-run Chinook salmon were once the most abundant run of salmon in the Central Valley (Yoshiyama et al., 1998) and were found in both the Sacramento and San Joaquin drainages. The Central Valley drainage as a whole is estimated to have supported annual runs of spring-run Chinook salmon as large as 600,000 fish between the late 1880s and 1940s. Historical Central Valley steelhead run sizes are difficult to estimate because of the lack of data, but McEwan (2001) suggests that steelhead run sizes may have approached one to two million adults annually. McEwan and Jackson (1996) suggest that by the early 1960s, the steelhead run size had declined to about 40,000. As discussed in sections 3.3.2.1, in the subsection *Fishery Resources,* and 3.3.2.2, in the subsection *Fish Passage and Anadromous Fish Restoration*, the Corps' Englebright Dam is a complete barrier to upstream fish passage, and the Daguerre Point Dam has been found to impair the upstream passage of adult salmonids and completely block upstream migration of green sturgeon despite having two fish ladders.

Englebright and Daguerre Point Dams also affect geology and soils, water resources, aquatic resources, riparian habitat, and anadromous fish. The purpose of Englebright Dam is to trap sediment that was released into the watershed by historical hydraulic mining. The purpose of Daguerre Point Dam is also to trap sediment and to stabilize the relocated Yuba River channel from approximately 10,000 acres of mine tailings still remaining in the lower Yuba River Watershed. The Corps has undertaken two voluntary conservation measures associated with ESA consultations regarding Daguerre Point Dam to enhance geomorphic processes. The first measure was implementation of a Gravel Augmentation Implementation Plan that included injecting a mixture of gravel and cobble into the Yuba River about 115 feet downstream of the Narrows 1 Powerhouse. Seven separate gravel injection efforts occurred from 2007 through 2016, with approximately 32,700 tons of gravel/cobble injected. The Corps also conducted redd surveys to investigate whether Chinook salmon and steelhead were using areas for spawning where gravel injection had occurred. The second measure was implementation of a Large Woody Material Management Program that included placing LWM in the lower Yuba River to enhance rearing conditions for spring-run Chinook and steelhead. The Corps initiated a pilot study in fall 2013 (Corps, 2014), and a long-term Large Woody Material Management Program is anticipated within 1 year following the Corps' completion of the pilot study.

While YCWA does not include any proposed measures to modify or enhance physical habitat or LWM in the lower Yuba River, the development and implementation

of a plan to transport LWM from New Bullards Bar Dam to the lower Yuba River would likely enhance salmonid spawning and juvenile rearing habitat and would be consistent with current Corps' measures. Implementation of a spring pulse flow program downstream of Englebright Dam would also likely contribute to the increased survival of outmigrating juvenile salmon and steelhead.

Proposed flow conditions and intrabasin water transfers from the North Yuba River, Yuba River, Middle Yuba River, and Oregon Creek would influence the timing but not the existing volume of the water that enters Englebright Reservoir and is subsequently available for release to the lower Yuba River downstream of Englebright Dam. However, as noted in section 3.3.2.3, *Cumulative Effects, Water Quantity*, non-project consumptive water demand (agriculture, municipal, and industrial) is projected to increase over the duration of any new license issued for the project. These increases and the exercise of water rights to meet that demand could contribute to lower minimum flows being implemented when the proposed drought management plan is triggered, particularly during warm, dry water years.

Coldwater temperatures downstream of Englebright Dam are maintained because of the availability of cold inflows into the reservoir. While water releases from the bottom of New Bullards Bar Reservoir supply most of this cold inflow water, water supplies from the Middle and South Yuba Rivers also contribute. PG&E and Nevada Irrigation District are currently in the processes of relicensing the hydroelectric facilities as part of the Yuba-Bear, Upper Drum-Spaulding, Lower Drum, and Deer Creek Projects (FERC Nos. 2266, 2310, 14531, and 14530) that regulate flows into the Middle Yuba River upstream of Our House Diversion Dam and in the South Yuba River. PG&E and Nevada Irrigation District's proposed operations include higher flows at several of the facilities and new minimum flows at other facilities that previously did not have minimum instream flows. For facilities associated with the Upper Drum-Spaulding Project, which regulate flows into the South Yuba River, the proposed minimum flows would result in higher flows in 16 Upper Drum-Spaulding project-affected stream reaches and minimum streamflows in 12 additional project-affected stream reaches that had no minimum streamflow requirement under the existing license. For facilities associated with the Yuba-Bear Hydroelectric Project, which regulate flows into the Middle Yuba River, the proposed minimum flows would result in similar or higher flows in six project-affected stream reaches and minimum streamflows in nine additional project-affected stream reaches that previously had no minimum streamflow requirement. These higher instream flows would allow more water to be available for YCWA to provide proposed minimum instream flows downstream of Englebright Reservoir.

Future water supply in the lower Yuba River could be affected by Browns Valley Irrigation District's plan for a tailwater recapture project. This project would relieve irrigation water supply constraints by pumping water from Dry Creek when Dry Creek flows are primarily composed of tailwater from irrigated lands draining to Little Dry Creek (Browns Valley Irrigation District, 2017). The tailwater recapture project would convey recycled flows from a pumping plant on Dry Creek to rice fields presently

irrigated exclusively by diversions from the lower Yuba River. Application of tailwater recaptured from Dry Creek to the agricultural lands within Browns Valley Irrigation District's service area would reduce the district's demand for water diverted directly from the lower Yuba River, thus balancing the reduction in inflows to the river that would result from pumping this water from Dry Creek with an equivalent reduction in diversion from the Yuba River. Use of the recaptured return water for the rice fields would reduce Browns Valley Irrigation District's diversions of cool surface water from the lower Yuba River, and this substitution would retain cool water in the lower Yuba River, which would benefit fisheries resources and aquatic habitat into and downstream of the Feather River.

Plans for the Central Valley Project and California State Water Project could cumulatively affect water supply and habitat quality for anadromous species in the Sacramento-San Joaquin Delta. The Central Valley Project is managed by the U.S. Bureau of Reclamation and comprises 20 reservoirs and more than 500 miles of canals. This project provides water to irrigate more than 3 million acres of agricultural land and has a total reservoir storage of 11,363,000 acre-feet. Authorized purposes of the Central Valley Project include flood control, fish and wildlife, municipal and agricultural water supply, power generation, and recreation. The California State Water Project is the nation's largest state-built water and power development and conveyance system and includes pumping and power plants, reservoirs, lakes, storage tanks, canals, tunnels, and pipelines that capture, store, and convey water to 29 water agencies. Since 1986, the Central Valley Project and California State Water Project have been operated in a coordinated manner, and since that time, multiple ESA listings and critical habitat designations have required ESA consultations with FWS and NMFS for the coordinated long-term operation of both projects. The U.S. Bureau of Reclamation proposes to continue to operate the Central Valley Project in coordination with the California State Water Project by implementing the associated 2008 FWS Biological Opinion and the 2009 NMFS Biological Opinion, including the Reasonable and Prudent Alternatives. These Reasonable and Prudent Alternatives include several gravel augmentation programs in the Sacramento Valley, floodplain habitat restoration in the Yolo Bypass off the Sacramento River, funding and implementation of the Central Valley Project Improvement Act's Anadromous Fish Screen Program, flow management in the Lower American River, and replacement of the Spring Creek temperature control curtain. These measures, coupled with YCWA's proposed minimum instream flow releases, ramping rate requirements, and monitoring plans would help support anadromous species in the Sacramento-San Joaquin Delta.

The Oroville facilities, which are located on the lower Feather River in Butte County, California, include the Oroville Dam and Reservoir as well as the Edward Hyatt Power Plant; the Thermalito Facilities; the Feather River Fish Hatchery; and associated recreational, fish and wildlife preservation and enhancement facilities. In 2006 and 2007, California DWR, NMFS, and other parties to the relicensing of the Oroville Project signed a comprehensive settlement agreement and habitat expansion agreement that

directed the licensees to develop a habitat expansion plan elsewhere in the Sacramento River Basin in lieu of a NMFS section 18 fishway prescription for the four Feather River Projects (Oroville, Poe, Rock-Creek Cresta, and Upper North Fork Feather). The Habitat Expansion Plan was finalized in 2010 with the specific goal of expanding habitat within the Sacramento River Basin sufficient to accommodate an increase of approximately 2,000 to 3,000 spawning Central Valley spring-run Chinook salmon (which is also expected to accommodate some amount of habitat for spawning California Central Valley steelhead). Potential actions include, but are not limited to, dam removal, dam reoperation, flow and water temperature improvements, fish passage, and physical habitat improvements. The final Habitat Expansion Plan includes habitat improvement measures in the Yuba River Watershed. In the long term, implementation of the Habitat Expansion Plan would likely increase the spatial distribution and abundance of anadromous fish populations and reduce risks to these population related to catastrophic events.

In addition to the actions included in the Habitat Expansion Plan, the California WaterFix is a proposal to improve the State Water Project and Central Valley Project freshwater storage and delivery systems that involves the following primary elements: (1) construction and operation of new water conveyance facilities in the Delta, including three intakes, two tunnels, appurtenant structures, a permanent head at Old River Gate and expansion of the Clifton Court Forebay, (2) coordinated operation and maintenance of existing and new State Water Project and Central Valley Project Delta facilities, (3) resource conservation measures, and (4) a monitoring and adaptive management program. These improvements would help protect California's water supply from the effects of earthquakes, flooding, and rising sea levels; reduce waste of fresh water; and improve habitat for fish and wildlife.

Several other comprehensive plans and programs are in effect that are intended to aid the recovery of anadromous fishes in the Yuba Basin and the Sacramento River Basin. NMFS's (2014b) recovery plan, as discussed in section 3.3.4.2, in the subsection *Aquatic Species*, aims to restore steelhead and Chinook salmon ecosystems and safeguard these species' future to the point of delisting from the endangered species list. YCWA's proposed minimum flows would provide improved aquatic habitat downstream of the Narrows 2 Powerhouse and would be consistent with the goals of NMFS's recovery plan. The Yuba Accord is one of the most comprehensive plans for the recovery of anadromous salmonids in the Yuba River Basin. As noted in section 3.3.2.2, in the subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*, YCWA's proposed minimum flows are consistent with the flow requirements in the Yuba Accord with the exception of conference years. Under YCWA's proposed AR3, the total volume of water that would be required to flow past the USGS Marysville gage during conference years would increase from the 174,208 acre-feet required to meet the Yuba Accord conference year requirements, to a new total of 197,445 acre-feet. Additionally, the proposed new requirements at the USGS Smartsville gage would be in effect for an additional 45 days during September and the first part of October and for an additional 15 days during the first part of April. Finally, there would be fewer

month-to-month changes in these requirements under YCWA's proposed AR3 compared to the flow requirements of the Yuba Accord.

Beginning in 2014, the Yuba Salmon Partnership Initiative began negotiating a settlement agreement to expand the Yuba River Watershed's contribution to the recovery of anadromous salmonids in the Central Valley, which may include reintroduction actions. One conceptual reintroduction action under consideration by members of the Yuba Salmon Partnership Initiative is to use collection facilities and tanker trucks to transport salmonids between the lower Yuba River and the North Yuba River upstream of New Bullards Bar Reservoir depending on the fish's lifestage. Because fish would be transported around Englebright and New Bullards Bar Dams via tanker trucks, YCWA's proposed project operation would not prevent this reintroduction action from being implemented. However, negotiations regarding all reintroduction actions remain ongoing, and the cost and feasibility of any reintroduction actions (e.g., fish ladders or fish-collection facilities) continue to be evaluated. The goal of the Yuba Salmon Partnership Initiative is to collaboratively develop, fund, and implement a cost-effective program that continues to expand the Yuba River Watershed's contribution to recovery of anadromous salmonids in the Central Valley. These goals would be accomplished through implementation of anadromous salmonid habitat actions in the lower Yuba River and are consistent with the recovery actions included in the NMFS recovery plan (e.g., including improving spawning habitat in the Yuba River downstream Englebright Dam) and with YCWA's proposed minimum instream flows for the Yuba River downstream of Englebright Dam.

The Water Board is updating its Bay-Delta Plan to address declines of native species and their ecosystems. In July 2018, it issued a framework for the Sacramento/Delta update to the plan, outlining an objective of maintaining inflows for the Sacramento/Delta tributaries of 55 percent of unimpaired flows, within an allowed adaptive range between 45 and 65 percent of unimpaired flows, and coldwater habitat objectives for salmonids (Water Board, 2018d). We evaluate this flow regime in section 3.3.2.2, in the subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*. The framework provides for the development of voluntary agreements to implement the proposed changes to the Bay-Delta Plan.

On December 12, 2018, California DWR, California DFW, and the Yuba Water Agency (YCWA) presented a framework that the agencies have approved in concept for the voluntary agreement to support amendments to the Bay-Delta Plan for protection of fish and wildlife beneficial uses (California DWR, California, and Yuba Water Agency, 2018). Under the agreement, YCWA would modify operations at New Bullards Bar Dam and Reservoir and reallocate up to 50,000 acre-feet, to provide: (1) a base contribution of 9,000 acre-feet per year in above normal, below normal and dry-years; and (2) a supplemental contribution of up to an additional 41,000 acre-feet per year in above normal, below normal, and dry years, based on releases from storage with YCWA's modified operation plan, to assist other agencies in meeting the Sacramento River Basin's Delta flow contribution target. YCWA would also enhance a minimum of 100 acres of

floodplain and in-channel habitat along the lower Yuba River and contribute $10 million for habitat enhancement measures.

The Water Board is expected to take final action by December 31, 2019. If implemented, the proposal has the potential to enhance aquatic and riparian habitat in the lower Yuba River downstream of the project.

Implementation of YCWA's proposed minimum instream flow releases, ramping rate requirements, Water Quality Monitoring Plan, Upper Yuba River Aquatic Monitoring Plan, and Lower Yuba River Aquatic Monitoring Plan, as modified by staff, are expected to help maintain the existing aquatic habitat diversity and mimic the natural hydrograph of the lower Yuba River more accurately over the duration of any license issued for the project. Therefore, operation of the Yuba River Development Project would help mitigate these cumulative effects on fishery resources in the lower Yuba River. Other cumulative non-project factors would need to be addressed by other entities for the available spawning and rearing habitat to reach its full potential, given the competing demands for available water.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

General Vegetation

In 2012, YCWA conducted surveys to characterize the botanical communities in the project area. The study describes general vegetation composition at the Narrows 2 Powerhouse, New Colgate Powerhouse, the shorelines of the New Bullards Bar Reservoir and Dam, Our House Diversion Dam, and Log Cabin Diversion Dam. These communities are composed primarily of upland vegetation alliances, with minimal areas of wetland, riparian, or littoral habitats.

Vegetation surrounding the Narrows 2 Powerhouse includes riparian areas, with areas of blue oak/annual grasslands and gray pine/interior live oak. At the New Colgate Powerhouse, vegetation includes gray pine/interior live oak, with a small area of riparian along the main stem of the Yuba River. At the Our House Diversion Dam, dominant vegetation includes ponderosa pine/incense cedar, Douglas fir, and a small riparian area along the Middle Yuba River. Log Cabin Diversion Dam plant communities include canyon live oak and riparian on both sides of Oregon Creek.

A variety of plant communities occurs around the perimeter of the New Bullards Bar Reservoir. Black oak-dominated communities are scattered throughout the slopes of the reservoir, with the exception of the eastern shore. Here, black oak/deer brush-dominated community occur on a southwest facing slope, and deer brush communities dominate the west facing slopes. Douglas fir and Douglas fir/tan oak-dominated communities occur throughout the slopes of the reservoir. Small patches of tan oak are most concentrated in areas near the Moran Road Boating Site and ramp, and a Douglas

fir-mixed hardwood community occurs on west facing slope of the north arm of the reservoir. Tan oak-deer brush communities are most abundant along the north slope of the reservoir, east of the Garden Point Boat-in Campground. Ponderosa pine/Douglas fir stands are abundant around the reservoir, and multiple canyon live oak communities occur on both the south and east facing slopes of the west shore of the reservoir and on the north facing slope of the North Yuba River canyon. Mixed hardwood communities occur on a south facing slope in the north arm of the reservoir.

Wetlands and Riparian Areas

YCWA reviewed FWS's National Wetlands Inventory maps to identify known riparian and wetlands and habitats in the project boundary. YCWA then performed reconnaissance and field studies to obtain more accurate vegetation information in these areas. These surveys conclude that no wetlands are present in the project boundary. In 2011 and 2012, YCWA conducted assessments at 7 riparian and 12 LWM study sites outside the project boundary but in the project vicinity, including upstream of Englebright Reservoir and 7 study sites downstream of Englebright Reservoir to characterize riparian vegetation and LWM.

All riparian assessment sites supported woody species in various lifestages, including mature trees, recruits (i.e., saplings) and seedlings. The abundance of each species often depended on the dominant substrates of the site. White alder was common in all assessment sites, and red willow occurred on transects in six of the eight sites. Other common woody species included sandbar willow, Oregon ash, black locust, Fremont's cottonwood, Goodding's willow, arroyo willow, shining willow, button willow, American dogwood, and madrone. Woody species cover ranged from as little as 1 percent in the North Yuba River, just upstream of the confluence with the Middle Yuba River, to 87 percent in the Middle Yuba River downstream of Our House Diversion Dam. Lower woody species cover was often associated with bedrock or boulder-dominated assessment sites with south-facing slopes, and higher cover was often associated with sites dominated by cobbles, gravel, and sand.

YCWA also conducted an analysis of historical (1937 or 1939) and recent (2009) aerial photographs to identify changes in riparian areas over that period. The results show no change at 3 of the 12 study sites (Middle Yuba downstream of Oregon Creek, North Yuba River, and Yuba River upstream of New Colgate Powerhouse). At the Middle Yuba River, downstream of Our House Diversion Dam, and the Yuba River, downstream of New Colgate Powerhouse riparian assessment sites, riparian vegetation increased over the study period. The Oregon Creek Celestial Valley site showed a visible change in floodplain vegetation, but no obvious change to riparian vegetation. The Middle Yuba River upstream of Oregon Creek assessment site showed localized increases and decreases in floodplain vegetation over time, with an overall net increase.

YCWA conducted studies on cottonwood trees to characterize the spatial and temporal dynamics of woody vegetation recruitment in riparian areas and analyze effects

of project operation on these processes. These studies included (1) identifying locations of trees relative to various discharge levels; (2) analyzing tree cores to determine a range of ages; and (3) developing a model to determine the number of days suitable for cottonwood establishment[98] under with project and without project hydrology.

The results indicate cottonwoods exist in all lifestages. Cottonwoods are more abundant in downstream areas of the project area relative to upstream, with a break in abundance from Daguerre Point Dam to Dry Creek Reach, and from Parks Bar Reach to Timbuctoo Bend. In addition, cottonwoods have relatively even distribution laterally across the valley floor. Of the estimated 18,540 cottonwood individuals/stands, 12 percent are within the bankfull channel (area wetted at 5,000 cfs); 39 percent are within the current floodway (area wetted between 5,000 and 21,100 cfs); 25 percent are within the current valley floor (area wetted between 21,100 cfs and 84,400 cfs); and 24 percent are above the 84,400 cfs band. Results of the cottonwood establishment model indicate with project hydrology would provide more average, minimum, and maximum consecutive days that meet the recruitment parameters than without-project hydrology.

Non-native Invasive Plants

Based on a literature review, YCWA: (1) identified possible non-native invasive plants in the project area; (2) identified locations where non-native invasive plants were previously observed in the project vicinity; and (3) gathered life history information for all potential non-native invasive plants species. In addition, YCWA reviewed: (1) the California Department of Food and Agriculture's (California DFA's) list of rated species; (2) the U.S. Department of Agriculture, Natural Resources Conservation Service, list; (3) the California Invasive Plant Council database; and (4) PNF and TNF non-native invasive plants and other invasive species of concern. Based on these sources, 35 non-native invasive plants and other invasive species of concern to the Forest Service have a reasonable potential to occur within the project boundary.

In 2012, YCWA performed surveys for non-native invasive plants and found 14 non-native invasive plants species, totaling 519 occurrences (630 acres). Excluding Himalayan blackberry, which is discussed below, 111 occurrences (76.04 acres) were on public land and 180 occurrences (193.32 acres) were on private lands. Table 3-56 lists the species identified and their classification and acreage by land ownership type.

[98] Suitable establishment days occur during the seed dispersal period (April 1–July 15) and with less than 2.5 centimeters/day drop in water level, which is the rate that cottonwood seedlings grow roots. With faster drops in water level, the roots cannot keep up with decreasing soil moisture levels and dry out.

Table 3-56. Non-native invasive plants observed in the project boundary (Source: YCWA, 2017a).

			Number and Acres of Occurrences on Public Land[a] Occurrences (acres)				Number of Occurrences on Private Land (acres)	
Common Name	**Scientific Name**	**Status[b]**	**TNF**	**PNF**	**State of California**	**Corps**	**YCWA**	**Other Private**
Barbed goat grass	*Aegilops triuncialis*	B	--	1 (0.01)	3 (1.06)	1 (0.21)	6 (1.50)	4 (2.47)
Tree of heaven	*Ailanthus altissima*	C, PNF	--	--	--	--	5 (0.96)	--
Cheat grass	*Bromus tectorum*	NR, PNF, TNF	--	1 (0.29	--	--	--	--
Italian thistle	*Carduus pycnocephalus* ssp. *pycnocephalus*	C, PNF	--	1 (0.07)	4 (0.46)	--	11 (3.53)	4 (0.07)
Maltese star-thistle	*Centaurea melitensis*	C, PNF, TNF	--	--	--	1 (0.04)	--	--
Yellow star-thistle	*Centaurea solstitialis*	C, PNF, TNF	10 (1.77)	3 (3.48)	9 (4.62)	2 (5.77)	25 (46.38)	14 (7.16)
Skeletonweed	*Chondrilla juncea*	A, PNF, TNF	1 (0.03)	1 (0.73)	5 (0.24)	1 (0.01)	5 (10.20)	3 (2.92)
Bull thistle	*Cirsium vulgare*	C	--	--	--	--	1 (0.04)	--
Bermuda grass	*Cynodon dactylon*	C	9 (20.94)	11 (5.13)	6 (2.24)	1 (0.01)	22 (9.58)	8 (0.37)

			Number and Acres of Occurrences on Public Land[a] Occurrences (acres)				Number of Occurrences on Private Land (acres)	
Common Name	**Scientific Name**	**Status[b]**	**TNF**	**PNF**	**State of California**	**Corps**	**YCWA**	**Other Private**
Scotch broom	*Cytisus scoparius*	C, PNF, TNF	15 (22.59)	10 (2.62)	--	--	35 (84.54)	13 (7.66)
Medusahead grass	*Elymus caput-medusae*	C, PNF, TNF	--	2 (0.61)	2 (0.48)	1 (0.95)	4 (2.76)	5 (3.25)
French broom	*Genista monspessulana*	C, PNF, TNF	3 (0.36)	--	--	--	4 (8.99)	4 (0.25)
Klamath weed	*Hypericum perforatum*	C, TNF	3 (0.21)	--	4 (1.11)	--	3 (0.21)	4 (0.49)
Himalayan blackberry	*Rubus armeniacus*	NR	79 (76.17)	46 (88.77)	1 (0.02)	--	102 (191.45)	--
Subtotal occurrences and area			41 (45.90)	30 (12.94)	33 (10.21)	7 (6.99)	121 (168.68)	59 (24.64)
Total Occurrences and Area			519 (630)					

[a] Some occurrences span multiple landowners and are counted more than once to account for land ownership totals, so that the number of occurrences counted in the amended license application is greater than the actual occurrences recorded.

[b] Status: A – California DFA status requiring eradication, containment, rejection, or other holding action at the state-county level. Quarantine interceptions to be rejected or treated at any point in the state; Status B – California DFA status requiring eradication, containment, control, or other holding action at the discretion of the commissioner. State endorsed holding action and eradication only when found in a nursery; Status C – California DFA status requiring action to retard spread outside nurseries at the discretion of the commissioner; reject only when found in a crop seed for planting or at the discretion of the commissioner; NR – Plant species in not ranked by California DFA; PNF – Plumas National Forest Noxious Plant Species List; TNF – Tahoe National Forest Weed List.

Himalayan blackberry, Scotch broom, and yellow star-thistle are the most common non-native invasive plants species recorded in the study, ubiquitous throughout the existing project boundary. Bermuda grass is also common, occurring in a thin band around New Bullards Bar Reservoir just below the NMWSE and along roads in the project area. On private lands, 102 occurrences of Himalayan blackberry were located, totaling 191.45 acres. On public lands, 122 occurrences of Himalayan blackberry were located, totaling 167.39 acres.

Special-status Plants

In 2012, YCWA reviewed public records from California DFW, the California Native Plant Society, and the Forest Service to identify rare, sensitive, or state-listed threatened and endangered (special-status) plants with potential to occur in the project boundary. This review identified 69 special-status plants and 3 mushroom species potentially occurring in the project vicinity.

Subsequently, in 2012, YCWA performed surveys for special-status plants. Surveys followed the botanical survey protocol section of California DFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. The study area included the existing project boundary and a buffer of 100 feet, extending upslope from the NMWSE of the project reservoir and impoundments and 100 feet around project recreation facilities, some of which were partially included in the existing project boundary. The applicant's study identified 5 special-status plants with 51 occurrences and 1 special-status mushroom with 3 occurrences (table 3-57). Of the 51 occurrences, approximately half were found on YCWA-owned land along roads, in and around recreation facilities, in remote areas associated with New Bullards Bar Reservoir, and in areas around New Bullards Bar Dam. The remaining half were located on NFS lands managed by the PNF and TNF along roads, in and around recreation facilities, and in remote areas associated with New Bullards Bar Reservoir. Six occurrences were found on private property (YCWA, 2012d). Federally listed plants protected under the ESA are discussed in section 3.3.4, *Threatened and Endangered Species*.

Table 3-57. Special-status plants occurring in the project vicinity (Source: YCWA, 2017a).

Common Name	Scientific Name	Status	Number of Occurrences by Land Ownership	Occurrence Locations/Habitat
Brandegee's clarkia	*Clarkia biloba* ssp. *brandegeeae*	FSS-P FSS-T CNPS 1B.2	TNF – 2 YCWA – 3 Private – 1	Generally occurs in the Sierra Nevada foothill woodlands at elevations ranging from 1,260 to 4,495 feet. Found in the cutbank along Our House Diversion Dam Road in habitat dominated by an overstory of black oak and tan oak; near the Bullards Bar Trail, with an overstory dominated by Douglas fir and oaks; and in an area with the overstory dominated by canyon live oak and California laurel on the rocky cliffs that abut New Bullards Bar Dam access road.
Clustered lady's-slipper	*Cypripedium fasciculatum*	FSS-P FSS-T CNPS 4.2	TNF – 1	Prefers mesic to moist, shady conifer forest in elevations ranging from 330 to 6,565 feet. Found adjacent to the Bullards Bar Trail.
Butte County fritillary	*Fritillaria eastwoodiae*	FSS-P FSS-T CNPS 3.2	TNF – 1 YCWA – 4	Generally occurs in dry benches and slopes at elevations less than 5,000 feet. Found on a cliff face adjacent to the New Bullards Bar Dam access road and on a cliff-like cut bank adjacent to Forest Service Road 0008-010.

Common Name	Scientific Name	Status	Number of Occurrences by Land Ownership	Occurrence Locations/Habitat
Cantelow's lewisia	*Lewisia cantelovii*	FSS-P FSS-T CNPS 1B.2	TNF – 6 YCWA – 7	Generally occurs in granite cliff faces and rocky outcrops, often associated with seeps in chaparral woodlands or conifer forests at elevations ranging from 1,260 to 4,495 feet. Found growing on steep rocky cliffs in habitat dominated by canyon live oak and some Douglas fir in the northern arm of New Bullards Bar Reservoir.
Humboldt lily	*Lilium humboldtii* ssp. *humboldtii*	FSS-P FSS-T CNPS 4.2	TNF – 10 PNF – 5 YCWA – 7 Private – 4	Generally occurs in chaparral woodlands and pine forests at elevations ranging from 650 to 3,610 feet. Found growing either adjacent to roads or near pedestrian trails, in and around campgrounds in Douglas fir and Ponderosa pine dominated habitat.
Olive phaeocollybia	*Phaeocollybia olivacea*	FSS-P FSS-T	TNF – 3 YCWA – 1 Private – 1	Generally occurs in mixed conifer forests in scattered to densely sprawling large rings. Found on the southeast shore of New Bullards Bar Reservoir, and in Hornswoggle Group and Schoolhouse Campgrounds. Vegetation in these habitats is dominated by an overstory of Ponderosa pine and Douglas fir.

Notes: FSS-P – Forest Service Sensitive Species for Plumas National Forest; FSS-T – Forest Service Sensitive Species for Tahoe National Forest; CNPS – California Native Plant Society listed species; 1B – Species considered rare or endangered in California and elsewhere; 3 – More information needed about this species; 4 – Limited distribution; watch list; ".2" after CNPS rating indicates a species that is fairly endangered in California

General Wildlife

YCWA evaluated wildlife in the project boundary and within a 0.25-mile buffer around the project boundary. This study area contains 15 habitat types that are classified by the California Wildlife Habitat Relationship System as annual grasslands, barren, blue oak-foothill pine, blue oak woodland, Douglas-fir, lacustrine, mixed chaparral, montane chaparral, montane hardwood-conifer, montane hardwood, ponderosa pine, riverine, Sierran mixed conifer, urban, and wet meadow. According to the California Wildlife Habitat Relationship System, these habitats could support 345 wildlife species, of which, 25 are reptile (lizards and snakes), 243 are bird, and 77 are mammal species.

Reptiles in the study area include multiple garter snake species, western rattlesnake, western fence lizard, western sagebrush lizard, and Sierra alligator lizard. These species occur in a variety of habitats, ranging from riverine to woodlands, forests, and grasslands. Most are active during summer and inactive during winter.

Common bird species expected to occur in the study area include red-tailed hawk, Cooper's hawk, dark-eyed junco, spotted towhee, white-headed woodpecker, northern flicker, great horned owl, and western screech owl. These birds are found in a variety of habitats, ranging from streamside riparian habitats and wet meadows to Sierra mixed conifer forests and hardwood-dominated woodlands common at the lower elevations of the project. Seasonally, some birds are only present during the breeding season (March through July), while others may be year-round residents.

Common mammals in the study area include Columbian black-tailed deer (discussed below), black bear, and western grey squirrel. These species are most often associated with the forested and woodland habitats. Some of the common mammals, like black bear, are active during spring and summer months and hibernate during colder winter months.

Columbia Black-tailed Deer

Columbian black-tailed deer are a subspecies of mule deer and are designated as a Forest Service management indicator species.[99] In the project area, Columbian black-tailed deer are generally migratory and spend the summer months at higher elevations and winter months in the snow-free region of the Sierra Nevada foothills. Deer in the vicinity of the project are associated with migratory Columbian black-tailed deer from the Mooretown Deer Herd, the Downieville Deer Herd, and non-migratory resident deer, found along the Sierra Nevada foothills. The Mooretown Deer Herd is bounded on the north by the Middle Fork Feather River, extending southward to about the Middle Yuba River and New Bullards Bar Reservoir. Within its northern and

[99] Management indicator species are species whose population changes may indicate the effects of land management activities.

southern boundaries, the Mooretown Deer Herd occupies seasonal ranges that include: (1) winter range in the snow-free lands of the Sierra Nevada foothills, situated between 500 and 3,800 feet in elevation; (2) intermediate range, situated between 3,800 and 4,600 feet in elevation; and (3) summer range, situated between 4,600 and 7,000 feet in elevation. The Downieville Deer Herd abuts the Mooretown Deer Herd in the vicinity of New Bullards Bar Reservoir and extends eastward along the Middle Yuba River to the crest of the Sierra Nevada. New Bullards Bar Reservoir is within winter range for the Mooretown Deer Herd and within critical winter range for the Downieville Deer Herd. The remainder of the project, downstream of New Bullards Bar Reservoir, is within the winter range of the Mooretown Deer Herd.

Population estimates show that from 1958 through 1982, the Mooretown Deer Herd population declined, averaging more than 9,000 individuals between 1958 and 1972, dropping to about 7,000 individuals from 1973 through 1982. The Downieville Deer Herd also saw a population decline from more than 9,000 individuals in 1960 to fewer than 5,000 individuals in 1982. These declines were consistent with observations throughout California over the same period, which California DFW attributed to a long-term change in management of wildlands, particularly, the move to more regulated and intensive forest management and fire suppression. Recent population estimates for both the Mooretown and Downieville herds show a downward trend in population from an estimated high of more than 130,000 deer in 1991, to a low less than 60,000 in 1995.

Special-status Wildlife

In 2012, YCWA analyzed wildlife habitats to determine the presence and distribution of special-status wildlife species (including Forest Service sensitive or management indicator species; California DFW species of special concern; California-listed threatened, endangered, or fully protected species; and FWS birds of conservation concern[100]). The study area included the project boundary and a 0.25-mile buffer around the project. The analysis included a query of federal and state databases; past YCWA surveys; and consultation with California DFW, FWS, and Forest Service staff. YCWA also performed two studies that focused on special-status terrestrial wildlife, including surveys for bald eagle and bats.

YCWA's analysis of the California Wildlife Habitat Relationship System identified 59 special-status wildlife species that have habitat or the potential to occur in the study area, including 15 mammals, 1 amphibian, 2 reptiles, and 42 birds. Table 3-58 lists these species, along with their status and known occurrences within 0.25 mile of the project. Key species are discussed in more detail below. Species listed under the ESA are discussed in section 3.3.4, *Threatened and Endangered Species*.

[100] Birds of conservation concern are species that represent FWS's highest conservation priorities (FWS, 2008).

Table 3-58. Special-status wildlife species with potential habitat within 0.25 mile of the project boundary (Source: YCWA, 2017a, as modified by staff).

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Mammals				
Ringtail	*Bassariscus astutus*	CFP	See text.	See text.
Sierra Nevada red fox	*Vulpes necator*	CT	Occurs in various habitats (e.g., forest openings, meadows, and barren rocky areas) in alpine and subalpine zones; preferred habitat in California includes red fir and lodgepole pine forests and alpine fell-fields (NatureServe, 2017).	--
Pacific marten	*Martes caurina*	FSS-P, FSS-T, MIS	Occurs in late succession forest near streams and meadows.	--
Pacific fisher	*Pekania pennanti*	FSS-P, FSS-T, SSC, FC	See text.	See text.
Northern flying squirrel	*Glaucomys sabrinus*	MIS	Occurs in coniferous and mixed forest, but will utilize deciduous woods and riparian woods.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Columbian black-tailed deer	*Odocoileus hemionus columbianus*	MIS	Require water and forage—particularly grasses, forbs, and shrubs—that is palatable and nutritious year-round. For this reason, they usually require several plant communities throughout the year. Migrate between summer and winter foraging areas (Forest Service, 2017).	Winter and critical winter range for Mooretown and Downieville herds present at all project facilities above Narrows 2 Powerhouse and Penstock.
Sierra Nevada snowshoe hare	*Lepus americanus tahoensis*	SSC	Occurs in riparian communities with thickets of deciduous trees and shrubs such as willows and alders. They also frequent dense thickets of young conifers and chaparral.	--
American badger	*Taxidea taxus*	SSC	Prefers open areas and may also frequent brushlands with little groundcover. When inactive, occupies underground burrow.	--
Sierra Nevada mountain beaver	*Aplodontia rufa californica*	SSC	Occurs in dense riparian-deciduous and open, brushy stages of most forest types.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Western red bat	*Lasiurus blossevillii*	SSC	Ranges from sea level up through mixed conifer forests; roosts in foliage, forages in open areas.	This species is known to occur at Our House Diversion Dam, Log Cabin Diversion Dam, Camptonville Tunnel, Dark Day Campground and Boat Launch, below New Bullards Bar Dam, New Colgate Powerhouse, and Narrows 2 Powerhouse, two occurrences at Slate Creek inflow to New Bullards Bar Reservoir.
Spotted bat	*Euderma maculatum*	SSC	Ranges from sea level up to 9,800 feet in arid deserts, grasslands and mixed conifer forests.	This species is known to occur at Camptonville Tunnel, below New Bullards Bar Dam, New Colgate Powerhouse, and Narrows 2 Powerhouse.
Townsend's big-eared bat	*Corynorhinus townsendii*	FSS-P, FSS-T, SSC	Ranges from sea level up to 10,300 feet; roosts in buildings, mines, tunnels, and caves; feeds along habitat edges.	This species is known to occur at Camptonville Tunnel,[b] below New Bullards Bar Dam,[b] New Colgate Powerhouse, and Narrows 2 Powerhouse.[b]
Pallid bat	*Antrozous pallidus*	FSS-P, FSS-T, SSC	Ranges from sea level up to 8,000 feet; roosts in caves, crevices and buildings, and forages in a variety of open habitats.	This species is known to occur at Camptonville Tunnel,[b] below New Bullards Bar Dam,[b] New Colgate Powerhouse.[b]

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Fringed myotis	*Myotis thysanodes*	FSS-P, FSS-T	Occur primarily at middle elevations in desert, riparian, grassland, and woodland habitats. Roosts in caves, mines, cliff faces, rock crevices, old buildings, bridges, snags, and other sheltered sites. Foraging often occurs close to vegetative canopy (NatureServe, 2017).	This species is known to occur at Our House Diversion Dam.
Western mastiff bat	*Eumops perotis*	SSC	Ranges from sea level up to 8,700 feet; roosts in rock crevices, outcroppings and buildings.	--
Amphibians				
Foothill yellow-legged frog	*Rana boylii*	FSS, SC	See text.	See text.
Reptiles				
Coast horned lizard	*Phrynosoma blainvillii*	FSS, SSC	Occurs in a variety of habitats, including scrubland, grassland, coniferous woods, and broadleaf woodlands.	--
Western pond turtle	*Actinemys marmorata*	FSS, SSC	See text.	See text.

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Birds				
Bank swallow	*Riparia riparia*	CT	Occurs in open and partly open areas, frequently near flowing water. Nests are in steep sand, dirt, or gravel banks; in burrows dug near the top of the bank; along the edge of inland water; or in gravel pits and road embankments (NatureServe, 2017).	--
Bald eagle	*Haliaeetus leucocephalus*	FSS-P, FSS-T, CE, CFP, BCC, BGEPA	See text.	See text.

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Golden eagle	*Aquila chrysaetos*	CFP, BCC, BGEPA	Generally inhabit open and semi-open country such as prairies, sagebrush, savannah or sparse woodland, and barren areas, especially in hilly or mountainous regions, in areas with sufficient mammalian prey base and near suitable nesting sites. Nests are most often on rock ledges of cliffs but sometimes in large trees including oak and eucalyptus (NatureServe, 2017).	Three occurrences observed at New Bullards Bar Reservoir.
Osprey	*Pandion haliaetus*	FGC	Occur primarily along rivers, lakes, reservoirs, and seacoasts. They often cross land between bodies of water. They typically build large stick nests on living or dead trees and man-made structures. Forage almost exclusively on fish (NatureServe, 2017).	Nine nests observed at New Bullards Bar Reservoir; eight nests had at least one nestling.
American peregrine falcon	*Falco peregrinus anatum*	CFP, BCC, FGC	See text.	See text.

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Great gray owl	*Strix nebulosa*	FSS-P, FSS-T, CE, FGC	See text.	See text.
Greater sandhill crane	*Grus canadensis tabida*	FSS-P, FSS-T, CT, CFP	Breeding habitat includes open grasslands, marshes, marshy edges of lakes and ponds, and river banks. During the nonbreeding season, roosts at night in shallow water along river channels, on alluvial islands of braided rivers, or in natural basin wetlands (NatureServe, 2017).	--
Swainson's hawk	*Buteo swainsoni*	CT, BCC	In California, occurs in open blue oak savannahs, gray pine-oak woodlands, and riparian areas. Foraging typically occurs in native grassland communities (Tesky, 1994).	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
White-tailed kite	*Elanus leucurus*	CFP	Occurs in savanna, open woodland, marshes, partially cleared lands and cultivated fields, mostly in lowland areas. Nests in trees, often near a marsh, usually 18–45 feet above the ground in branches near the top of a tree (NatureServe, 2017).	--
Willow flycatcher	*Empidonax traillii*	FSS-P, FSS-T, CE, BCC	Breeding habitat is strongly tied to brushy areas of willow and similar shrubs. Found in thickets, open second growth with brush, swamps, wetlands, streamsides, and open woodland. Common in mountain meadows and along streams; also in brushy upland pastures (especially hawthorn) and orchards. The presence of water (running water, pools, or saturated soils) and willow, alder, or other deciduous riparian shrubs are essential habitat elements (NatureServe, 2017).	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
American white pelican	*Pelecanus erythrorhynchos*	SSC	Occurs in rivers, lakes, reservoirs, estuaries, bays, marshes; sometimes inshore marine habitats.	--
California black rail	*Laterallus jamaicensis ssp. coturniculus*	CFP	Black rail habitat generally includes salt marshes, freshwater marshes, and wet meadows. The majority (>90 percent) are found in the tidal salt marshes of the northern San Francisco Bay region, primarily in San Pablo and Suisun Bays. Smaller populations occur in San Francisco Bay, the Outer Coast of Marin County, and freshwater marshes in the foothills of the Sierra Nevada (Spautz et al., 2005).	--
Redhead	*Aythya americana*	SSC	Occurs in open water on lakes, ponds, and reservoirs.	--
Northern goshawk	*Accipiter gentilis*	FSS-P, FSS-T, SSC, FGC	See text.	See text.

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Blue grouse	*Dendragapus obscurus*	MIS	Occurs in mixed forests dominated by black oak, lodgepole pine, red fir, mountain hemlock, and white pine-dominated forest from 1,200 feet to 7,500 feet elevation.	--
Oregon vesper sparrow	*Pooecetes gramineus affinis*	SSC, BCC	Occurs in plains, prairie, dry shrublands, savanna, weedy pastures, fields, sagebrush, arid scrub, and woodland clearings.	--
Grasshopper sparrow	*Ammodramus savannarum*	SSC	Prefer grasslands of intermediate height and are often associated with clumped vegetation interspersed with patches of bare ground. Other habitat requirements include moderately deep litter and sparse coverage of woody vegetation.	--
Fox sparrow	*Passerella iliaca*	MIS	Occurs in dense thickets in coniferous or mixed woodlands, chaparral, along rivers and creeks. Requires dense brushy cover during the nesting season.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Olive-sided flycatcher	*Contopus cooperi*	SSC, BCC	Occurs in forest and woodland, in burned-over areas with standing dead trees, in taiga, subalpine coniferous forest, and mixed coniferous-deciduous forest. Also swampy edges of lakes, marshy streams, and backwaters of rivers.	--
Yellow-headed blackbird	*Xanthocephalus*	SSC	Occurs in fresh-water marshes of cattail, tule, or bulrushes. Nests in wet grasses, reeds, and cattails. Also in open cultivated lands, pastures, and fields.	--
Tricolored blackbird	*Agelaius tricolor*	SSC, BCC	Occurs in fresh-water marshes of cattails, tule, bulrushes, and sedges. Nests in vegetation of marshes or thickets, sometimes nests on the ground. Historically strongly tied to emergent marshes; in recent decades much nesting has shifted to non-native vegetation.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Cassin's finch	*Carpodacus cassinii*	BCC	Common montane resident, breeds in higher mountain ranges. Prefers open coniferous forests in breeding season, most numerous near wet meadows and grassy openings. Irregular in California foothills and lowlands.	--
Yellow warbler	*Dendroica petechia*	MIS, SSC	Occurs in open scrub, second-growth woodland, thickets, farmlands and gardens, especially near water; riparian woodlands, especially of willows, in the west.	--
Hairy woodpecker	*Picoides villosus*	MIS	Occurs in mature woods with large old trees suitable for cavity nesting; also common in medium-aged forests; prefers woods with a dense canopy.	--
Black-backed woodpecker	*Picoides arcticus*	MIS	Associated with boreal and montane coniferous forests, especially in areas with standing dead trees such as burns, bogs, and windfalls; less frequently in mixed forest.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Lewis woodpecker	*Melanerpes lewis*	BCC	Uncommon, local winter resident occurring in open oak savannahs, broken deciduous, and coniferous forests.	--
Williamson's sapsucker	*Sphyrapicus thyroideus*	BCC	Summer resident in coniferous forests, nesting habitat includes lodgepole pine, but will nest in aspens adjacent to stands of red fir, Jeffrey pine, and eastside pine habitats.	--
Mountain quail	*Oreortyx pictus*	MIS	Occurs in mixed forests dominated by black oak, lodgepole pine, red fir, mountain hemlock, and white pine-dominated forest from 1,200 feet to 7,500 feet elevation and mountain chaparral.	--
California spotted owl	*Strix occidentalis*	FSS-P, FSS-T, MIS, SSC, BCC, FGC	See text.	See text.
Common loon	*Gavia immer*	SSC	Occurs in lakes containing both shallow and deep water areas.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Flammulated owl	*Otus flammeolus*	BCC	A common summer resident locally in a variety of coniferous habitats, including ponderosa pine to red fir forests between 6,000 feet and 10,000 feet.	--
Long-eared owl	*Asio otus*	SSC	Occurs in deciduous and evergreen forests, orchards, wooded parks, farm woodlots, river woods, desert oases. Wooded areas with dense vegetation needed for roosting and nesting, open areas for hunting.	--
Short-eared owl	*Asio flammeus*	SSC	Occurs in broad expanses of open land with low vegetation for nesting and foraging are required.	--
Calliope hummingbird	*Stellula calliope*	BCC	Breeds in wooded habitats from ponderosa pine and montane hardwood-conifer up to lodgepole pine, but favors montane riparian, aspen and other open forests near streams. Forages in open meadows and stands of shrubs.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Purple martin	*Progne subis*	SSC	Occurs in a wide variety of open and partly open situations, frequently near water or around towns.	--
Loggerhead shrike	*Lanius ludovicianus*	SSC, BCC	Occurs in open country with scattered trees and shrubs, savanna, desert scrub, and, occasionally, open woodland; often perches on poles, wires, or fence posts.	--
Yellow-breasted chat	*Icteria virens*	SSC	Occurs in second growth, shrubby old pastures, thickets, bushy areas, scrub, woodland undergrowth, and fence rows, including low wet places near streams, pond edges, or swamps; thickets with few tall trees.	--
Barrow's goldeneye	*Bucephala islandica*	SSC	Winters on lakes, rivers, estuaries, and bays. Usually nests near lake or pond surrounded by dense vegetation.	--
Harlequin duck	*Histrionicus histrionicus*	SSC	Historic breeding grounds include west slope of the Sierra Nevada along shores of swift, shallow rivers.	--

Common Name	Scientific Name	Status[a]	Suitable Habitat Description	Occurrence Information
Northern harrier	*Circus cyaneus*	SSC	Occurs in marshes, meadows, grasslands, and cultivated fields.	--
Black swift	*Cypseloides niger*	SSC, BCC	Nests in moist crevices or caves or on cliffs near waterfalls in deep canyons. Forages widely over many habitats.	--
Vaux's swift	*Chaetura vauxi*	SSC	Found in mature forests but also forages and migrates over open country.	--
Black tern	*Chlidonias niger*	SSC	Occurs in marshes, along sloughs, rivers, lakeshores, and impoundments, or in wet meadows.	--
Burrowing owl	*Athene cunicularia*	SSC, BCC	Occurs in open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports.	--

[a] CE – state-listed as endangered; CT – state-listed as threatened; CFP – California fully protected; FSS-P – Forest Service sensitive species, Plumas National Forest; FSS-T – Forest Service sensitive species, Tahoe National Forest; MIS – management indicator species; SC – California candidate species; SSC – California species of concern; BCC – bird of conservation concern; FC – federal candidate species; BGEPA – Bald and Golden Eagle Protection Act; FGC – California Fish and Game Code sections 3503, 3503.5, and 3513

[b] Acoustic detection is suggestive of species occurrence, but due to clutter, presence of other species, or call fragmentation, identification is not absolute.

The western pond turtle and foothill yellow-legged frog, two aquatic special-status species (considered "terrestrial" in this analysis) that are under review for ESA-listing, are found in the project area. Western pond turtle is a Forest Service sensitive species and state species of special concern, and foothill yellow-legged frog is a candidate for listing under the California ESA. The western pond turtle occurs in permanent ponds, lakes, channels, backwaters, and pools of streams; aquatic habitats with warm, shallow water with cover for hatchlings; terrestrial sites for nesting; and sites with suitable basking substrates such as rocks, logs, banks, root masses, and emergent vegetation for both juveniles and adults. During surveys conducted in 2013, suitable habitat was documented for the turtle. Western pond turtles were observed in the South Yuba River upstream of Englebright Reservoir; New Bullards Bar Reservoir at Moran Cove, Garden Point, Tractor Cove (i.e., east of Garden Point), and the mouth of Indian Creek; Oregon Creek in the Log Cabin Diversion Dam impoundment; and in the Middle Yuba River downstream of Our House Diversion Dam (YCWA, 2012e).

The foothill yellow-legged frog occurs on small to large streams and rivers with pools and low-gradient riffles (small streams are probably nonbreeding habitat). Breeding sites are usually in shallow, slow-flowing areas near the shore with coarse substrates (cobbles and boulders). Foothill yellow-legged frogs are infrequent in habitats where introduced fish and American bullfrogs are present.

Potentially suitable habitat for foothill yellow-legged frogs occur in: (1) Middle Yuba River downstream of Our House Diversion Dam; (2) North Yuba River downstream of New Bullards Bar Dam; (3) Yuba River downstream of the confluence of the Middle and North Yuba Rivers to the New Colgate Powerhouse; and (4) Oregon Creek downstream of Log Cabin Diversion Dam. Historic museum records for the area indicate that foothill yellow-legged frogs occurred throughout the North and Middle Yuba Rivers prior to construction of the project (Hayes et al., 2016). While information on the distribution of foothill yellow-legged frogs in the project area is limited, YCWA presented approximately 70 records of the species' occurrence within 5 miles of the project area (YCWA, 2012f). Within stream reaches potentially affected by the project, historical records show foothill yellow-legged frogs on the Middle Yuba River at about RM 12.4 (i.e., just downstream of Our House Diversion Dam) and at several locations along Oregon Creek, near the confluence of Oregon Creek and the Middle Yuba River. Multiple records also show foothill yellow-legged frogs from tributaries to project-affected reaches of the Middle Yuba River and Oregon Creek, including Grizzly, Moonshine, and Mosquito Creeks. None of the historical records provide evidence of foothill yellow-legged frog breeding locations. There are no records of foothill yellow-legged frogs in the North Yuba River below New Bullards Bar Dam or in the Yuba River below the confluence of the North and Middle Yuba Rivers. The Yuba River, downstream of New Colgate Powerhouse, is below 600 feet in elevation and, thus, below the known or expected distribution of foothill yellow-legged frogs (i.e., 600–5,000 feet in elevation). New Bullards Bar Reservoir is not suitable habitat for foothill

yellow-legged frog, but this species occurs on some of the tributaries to the reservoir, including Little Oregon, Bridger, and Willow Creeks (YCWA, 2012f).

During visual encounter surveys conducted during 2011, 2012, and 2013, foothill yellow-legged frogs were observed, with evidence of breeding, in the Middle Yuba River below Our House Diversion Dam; the North Yuba River above New Bullards Bar Reservoir; and Oregon Creek above and below Log Cabin Diversion Dam. Foothill yellow-legged frogs were also incidentally observed in the Middle Yuba River above Our House Diversion Dam during surveys for western pond turtle (YCWA, 2012f, 2013h).

Special-status bird species known to occur within 0.25 mile of the project and potentially affected by the project include: bald eagles (state-listed endangered species, state fully protected species, and Forest Service sensitive species); American peregrine falcons (state fully protected species); great gray owls (state endangered species and Forest Service sensitive species); northern goshawks (California species of special concern and Forest Service sensitive species); and California spotted owls (state species of special concern and Forest Service sensitive species).

Bald eagle breeding habitat most commonly includes areas close to rivers, lakes, reservoirs, or other bodies of water that reflect the general availability of primary food sources including fish and waterfowl. Wintering areas are commonly associated with open water. Bald eagles roost in conifers or other sheltered sites in winter, and communal roost sites used by two or more eagles are common (NatureServe, 2017). YCWA recorded 28 bald eagle occurrences, including 3 night roosts and 11 hunting perches, during 3 wintering surveys (2011–2012) at New Bullards Bar Reservoir and downstream of New Colgate Powerhouse. All night roost trees and hunting perches were within 300 feet of the NMWSE of New Bullards Bar Reservoir. New Bullards Bar Reservoir has at least two active bald eagle nests. One nest has been active since 1989, while the second nest was first reported in 2011 (YCWA, 2012g).

When not breeding, peregrine falcons occur in areas where prey concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports. They often nest on ledges or holes on the face of rocky cliffs or crags. Riverbanks, tundra mounds, open bogs, large stick nests of other species, tree hollows, and human-made structures clearings also provide habitat for the falcon (NatureServe, 2017). Suitable nesting habitat for American peregrine falcon exists within the steep and narrow North Yuba River, Middle Yuba River, and mainstem Yuba River Canyons. In 2013, evidence of a nesting pair of American peregrine falcon was documented across the canyon from the Narrows 2 Powerhouse below Englebright Dam, and a potential pair has been reported nesting in the Yuba River canyon below New Bullards Bar Reservoir. The Forest Service provided additional information that substantiates a likely peregrine falcon eyrie in the vicinity of Bullards Bar Dam, indicated by a pair of falcons flying around the dam and perching within a hole near the top of its south side between April and June.

Great gray owls occur in dense coniferous and hardwood forest, especially pine, spruce, paper birch, poplar; they also occur in second growth forest, especially near water, foraging in wet meadows. They nest in tops of large broken-off trees, in old nests of other large birds, or in debris platforms from dwarf mistletoe, frequently near bogs or clearings (NatureServe, 2017). A pair of great gray owls have an established nesting territory within 1 mile of the Log Cabin Diversion Dam impoundment and associated access road.

The northern goshawk occurs in lodgepole pine, red fir, mountain hemlock, white pine, and mixed conifer dominated forest. Two occurrences of northern goshawk have been reported in the project area, and one nesting area was located near the Slate Creek inflow to New Bullards Bar Reservoir. This nest area is within a northern goshawk protected activity center, designated by the Forest Service to encompass the best available forested habitat for the species around all known and newly discovered breeding territories.

The California spotted owl occurs in mixed forests dominated by black oak, lodgepole pine, red fir, white fir, ponderosa pine, sugar pine, incense cedar, and/or Douglas fir. Fifty-four California spotted owl occurrences and eight California spotted owl protected activity centers are documented within or adjacent to the project area, including eight home range core areas and one spotted owl habitat area, as defined by the Forest Service. Occurrences and protected activity centers are adjacent to: Our House Diversion Dam and impoundment, Lohman Ridge Diversion Tunnel, Log Cabin Diversion Dam and impoundment, Camptonville Diversion Tunnel, New Bullards Bar Reservoir, New Colgate Powerhouse and Switchyard, Schoolhouse Campground, Hornswoggle Group Campground, Dark Day Boat Launch, Dark Day Campground and Day Use Area, and Schoolhouse Trail. Fifty-four recorded occurrences were within 0.25 mile of New Bullards Bar Reservoir and New Colgate Power Tunnel; four were within a protected activity center, four were within a home range core area, and one was within a spotted owl habitat area within 0.25 mile of New Bullards Bar Reservoir. A protected activity center and home range core area is located along the New Colgate Power Tunnel and another protected activity center and home range core area is located at Our House Diversion Dam.

Known occurrences of special-status mammals that have been reported in the study area include Pacific fisher, ringtail, and several bat species, although there is no recent evidence of Pacific fisher.

The Pacific fisher occurs in late succession forest near streams and meadows. One occurrence of Pacific fisher was reported in the project area in 1987, but no occurrences have since been reported within or adjacent to the project. Historical occurrences were recorded in areas adjacent to: New Bullards Bar Reservoir, New Bullards Bar Dam, New Bullards Bar Minimum Flow Powerhouse, New Bullards Bar Penstock, New Bullards Bar transformer, New Colgate Power Tunnel, New Colgate Powerhouse and Switchyard, Cottage Creek Boat Launch, Cottage Creek Campground (decommissioned), Cottage

Creek Day Use Area, Dam Overlook Observation Site, and Bullards Bar Trail. Also, since 1995, no Pacific fisher have been reported in the Sierra Nevada outside two remnant populations in California—the southern Sierra Nevada and northern Coast Range populations. This lack of detections suggest that the species has been extirpated or reduced to scattered individuals in the central and northern Sierra Nevada. Because of its presumed extirpation from the study area, project operation and maintenance would have no effect on Pacific fisher, and this species is not further discussed.

The ringtail, a California fully protected species, typically occurs in rocky areas with cliffs or crevices for daytime shelter or in desert scrub, chaparral, and pine-oak and conifer woodlands within 0.5 mile of water. Dens are usually in rock shelters, but also occur in tree hollows, under tree roots, in burrow dug by other animal, in remote buildings, and underbrush piles (NatureServe, 2017). The ringtail, was observed during pre-licensing studies at New Colgate Powerhouse and Switchyard and Narrows 2 Powerhouse and Switchyard. Ringtail were also seen at Our House Diversion Dam during 2012 bat surveys.

Special-status bats documented in the study area during 2012 reconnaissance, focused, and acoustic surveys include western red bat, spotted bat, Townsend's big-eared bat, pallid bat, and fringed myotis (table 3-58; YCWA, 2012h).

3.3.3.2 Environmental Effects

Vegetation Management

Under a new license, operation and maintenance of the project and construction of any new facilities could disturb vegetation resources as a result of excavation, grading, topsoil stripping, or other similar activities. Such disturbances are expected to occur in association with improvements to recreation resources, facility maintenance, and treatment of invasive weeds. Vegetation and soil disturbance could alter the composition of existing plant communities or increase the potential for invasive weed colonization. These changes could also affect wildlife habitat quality.

Construction activities associated with the New Bullards Bar Dam auxiliary flood control outlet would permanently disturb 2.4 acres (1.7 acres of Douglas-fir and 0.7 acre of barren habitats). Temporary disturbance would also include 10 sites that could serve as staging, laydown, or disposal areas. The total disturbed area would encompass approximately 84 acres, of which 30 acres are currently barren; 26.9 acres are montane hardwood-conifer; 24 acres are Douglas-fir; 1.6 acres are urban; 0.6 acre are montane hardwood; and 0.4 acre are Sierran mixed conifer. These areas would be reclaimed as specified under YCWA's Integrated Vegetation Management Plan (TR1).

To minimize potential effects of project operation and maintenance on vegetation, YCWA proposes to implement its Integrated Vegetation Management Plan (TR1). The plan provides guidance for the management of non-native invasive plants, routine vegetation management around project facilities, revegetation, protection for sensitive

areas, pesticide and herbicide use, employee training, and reporting. For many components, the plan distinguishes between measures for NFS and non-NFS lands.

The commenting agencies, tribes, non-governmental organizations, and other stakeholders generally agree that the Integrated Vegetation Management Plan would protect vegetation resources. Forest Service 4(e) condition 40 specifies that YCWA implement the plan as filed for locations on NFS lands, and Forest Service 10(a) recommendation 9 recommends that the plan also apply to non-NFS lands. Forest Service 4(e) condition 22 specifies that pesticides may not be used on NFS land without the prior written approval of the Forest Service. California DFW 10(j) recommendation 3.1 is the same as YCWA's proposal. FWS recommends modifying the plan to include further protective measures for California red-legged frog and foothill yellow-legged frog habitat. FWS, in 10(j) recommendation 6, also recommends ESA consultation for this plan. YCWA has acknowledged this issue by suggesting that it would perform site evaluations prior to hazard tree removal. Furthermore, YCWA also proposes that if it needs to conduct any project work that could adversely affect ESA-listed species, such as California red-legged frogs, it would consult with FWS, as further discussed in section 3.3.4, *Threatened and Endangered Species.* We discuss various components of the Integrated Vegetation Management Plan below.

Non-native Invasive Plants

Non-native invasive plants have the potential to displace native species and alter native plant community composition and function, threatening project lands by reducing wildlife habitat, and affecting human uses by generating higher fuel loads and increased wildfire risk. Non-native invasive plants affect nutrient cycling, and some consume high quantities of water that could otherwise be used by native plants and wildlife or for agriculture and drinking water supply. Additionally, some invasive plants are toxic to both wildlife and humans.

YCWA's proposed Integrated Vegetation Management Plan includes three main components to manage invasive plants: (1) preventing the introduction, establishment, and further spread of invasive plants, including early detection and rapid treatment of target species (California DFA A-, B-, or Q-listed noxious weeds); (2) monitoring known and surveying for new populations; and (3) implementing control measures to contain (and/or eradicate) known existing and new infestations. The proposed measures would apply to target species, which include species listed by the California DFA as A, B, or Q noxious weeds. On NFS lands, target non-native invasive plants would also include species identified for control by the TNF and PNF, which currently are: Italian thistle, Medusahead grass, French broom, yellow starthistle, and Scotch broom. The plan would be revised as needed to accommodate any changes to California DFA's weed list or the Forest Service's noxious weed list and associated management directions.

To prevent the introduction and spread of non-native invasive species, YCWA would implement BMPs included in the current California Invasive Plant Council (2012)

BMP manual, which includes measures related to equipment, vehicle, and clothing cleaning; soil disturbance; vegetation management; and revegetation. To identify locations of non-native invasive plants in the project area, the Integrated Vegetation Management Plan calls for conducting complete surveys for target species on both NFS and non-NFS land within the project area, scheduled for the first year of a new license term and every 5 or 10 years, depending on the frequency of project-related activities in the area (i.e., low- versus high-use).

YCWA proposes a different approach for treating and monitoring infestations of non-native invasive plants on NFS lands and non-NFS lands. On NFS lands, YCWA would, in consultation with the Forest Service, develop a treatment strategy for known infestations of targeted non-native invasive plants for 5 years following a completed survey. On non-NFS lands, YCWA does not propose procedures for treating non-native invasive plants in the Integrated Vegetation Management Plan but instead proposes to develop an internal management strategy consistent with state and county statutes. It would share the strategy with the Forest Service. YCWA would monitor treated areas on NFS lands annually for 5 years, or until an occurrence is considered eradicated, and discuss the progress and potential modifications of the strategy at annual meetings. On non-NFS land, YCWA would monitor treated infestations during the 5-year survey of the project area.

To provide for early detection of new populations of non-native invasive plants, the Integrated Vegetation Management Plan includes protocols for annual environmental awareness training of project staff during the term of the license. YCWA would provide annual employee training that would include information about non-native invasive plants, emphasizing YCWA's policies, management practices, and prevention guidelines. Project employees would be trained to identify targeted non-native invasive plants known to occur in the project boundary and would be informed about the locations of known occurrences. If any new targeted non-native invasive plant species in the project area are added to the California DFA or Forest Service lists, YCWA would include information about the plant(s) in its annual employee training.

Our Analysis

Many of the non-native invasive plants in the project area are ubiquitous throughout the region. While the proposed Integrated Vegetation Management Plan would help minimize the direct effects of project activities, invasive plant species are likely to continue to expand throughout the region on both public and private lands.

Under a new license, continued project operation and maintenance activities and recreational use have the potential to contribute to the spread of non-native invasive plants. The Integrated Vegetation Management Plan includes strategies for employee education, prevention of weed transport, treatment of identified populations, monitoring/surveying, and reporting. In general, these measures would benefit vegetation resources by limiting the introduction of new invasive plants into the project

area and controlling the spread of existing populations of the higher priority target species. YCWA's proposed surveys would identify any new areas where target species become established and provide for early treatment to prevent further spread. Annually training employees (GEN 3) to recognize target species would also promote detection outside the proposed survey schedule. As specified by Forest Service 4(e) condition 28, if YCWA provides project employees at the annual training with guides for identifying non-native invasive plants and maps of sensitive areas, and describes reporting procedures for new populations of non-native invasive plants, the potential for incidental observations of non-native invasive plants by YCWA employees would be enhanced. With implementation of these measures, the project would reduce project-related effects of non-native invasive plants.

YCWA indicates that seven species of non-native invasive plants in the project area meet its proposed status requiring treatment: barbed goatgrass (0.01 acre on NFS lands and 5.24 acres on non-NFS lands); Italian thistle (0.07 acre on NFS lands and 4.06 acres on non-NFS lands); yellow starthistle (1.77 acres on NFS lands and 67.4 acres on non-NFS lands); skeletonweed (0.76 acre on NFS lands and 13.37 acres on non-NFS land); Scotch broom (25.49 acres on NFS lands and 89.28 acres on non-NFS lands); Medusahead grass (0.86 acre on NFS lands and 7.44 on non-NFS lands); and French broom (0.36 acre on NFS lands and 9.24 acres on non-NFS lands). However, on non-NFS lands, YCWA would only treat the above acreage of skeletonweed because Italian thistle, yellow starthistle, Scotch broom, Medusahead grass, and French broom are not target species on non-NFS lands.

YCWA does not provide a rationale in the Integrated Vegetation Management Plan for differentiating its treatment and monitoring of non-native invasive plants based on land ownership. For example, YCWA's development of an internal management strategy consistent with state and county directions on non-NFS lands would likely be similar to what is proposed in the Integrated Vegetation Management Plan for treating target non-native invasive plants on NFS lands. Also, YCWA would monitor treated areas on NFS lands annually but would limit monitoring of treated infestations on non-NFS lands to once every 5 years during surveys. Non-native invasive plant species are prolific seed producers. If treatment occurs infrequently, or is not effective, and monitoring does not occur for 5 years, the probability is high that the population would grow in size and spread to other areas. Annual monitoring of treated non-native invasive plants, as proposed for populations on NFS lands would prohibit seed generation and is much more likely to have a lasting effect on reducing population size and eliminating potential for spreading. Modifying the Integrated Vegetation Management Plan to include treatment and monitoring plans for target non-native invasive plants on all lands within the project boundary would further reduce the effects of the project on non-native invasive plants.

Revegetation Activities

Revegetation of disturbed areas is important to maintain wildlife habitat and prevent the spread of non-native invasive plant species. On non-NFS lands, YCWA would follow existing regulations, and revegetation activities would occur as required by any necessary permits. YCWA does not provide any details about how it would implement revegetation activities in these areas or whether monitoring would occur. On NFS lands, YCWA would consider the need for revegetation in areas including all sites where treatment of non-native invasive plants covers more than 0.5 acre, at construction sites subject to ground disturbance, at disturbed areas subject to project operation and maintenance, and at areas that have become unvegetated because of recreational use. YCWA would evaluate the need for revegetation at such sites and specific criteria would be detailed in a revegetation plan. If any of those criteria were met, YCWA would develop a site-specific revegetation plan to maximize the likelihood for native vegetation to reestablish. Revegetation would then occur as soon as possible, during the appropriate season. Any ground disturbances would be reseeded within 60 days of the disturbing activities. Monitoring of revegetated sites would include measuring vegetation cover, species richness, plant survivorship and native and invasive species counts. For revegetated sites on NFS land, the site would be monitored annually, for up to 5 years, or until criteria from revegetation plans are met. If, after 5 years, success criteria are not met, remedial measures would be implemented with an additional 2 years of monitoring. If, at the end of an additional 2 years of monitoring, success criteria are still not met, the site would be declared problematic, and strategies to deal with the site would be developed in consultation with the Forest Service. YCWA does not specify how it would perform revegetation or conduct monitoring on-NFS lands.

Our Analysis

Proposed enhancements at existing project recreation areas and construction of several new project facilities, treatment of non-native invasive plants, and maintenance of project facilities would disturb soil or alter plant community composition or structure. The implementation of YCWA's proposed Integrated Vegetation Management Plan, including use of BMPs to minimize disturbance and direct use of pesticides would effectively reduce project-related effects on terrestrial vegetation. It would also serve to identify where project operation and maintenance activities could affect existing vegetation and provides guidance for revegetation measures in these areas. For example, revegetation needs would be assessed prior to any new construction or ground-disturbing activity. Existing vegetation would be protected where possible. Revegetation and subsequent monitoring would help to ensure that native vegetation communities are restored following project-related disturbance and would minimize the potential for erosion of exposed soils.

Although the plan details proposed measures for activities on NFS lands, which is consistent with YCWA's proposal, little information is provided for similar activities on non-NFS lands, which include a substantial amount of the project area. We recognize

that some of the detail relates to consultation with the Forest Service, which would not be necessary on non-NFS lands. Yet, the measures proposed for NFS lands include a variety of non-consultation related requirements that would be appropriately applied to all land in the project boundary. These include: (1) a description of how the need for revegetation would be determined; (2) development of a revegetation plan; (3) criteria for measuring success; (4) a monitoring schedule; and (5) a description of remedial measures if success criteria are not achieved. Implementation of these measures on NFS lands, as proposed, would reduce potential for erosion, reduce risk of non-native invasive species colonization, maintain the existing character of the vegetation community, and maintain wildlife habitat. Modifying the Integrated Vegetation Management Plan to apply sections 4.1 through 4.5 of the plan to all lands in the project boundary instead of just NFS lands would benefit vegetation and wildlife resources throughout the project.

Special-status Plants

Project maintenance activities and recreation would have the potential to affect special-status plant species. Modifications to the low-level outlets of the Log Cabin Diversion Dam would involve construction activities that could affect the Humboldt lily (a special-status plant species) near the dam. Construction of the proposed auxiliary flood control outlet at New Bullards Bar Dam would involve ground disturbance and habitat alteration that could affect special-status plants documented within or adjacent to the potential construction area, including Humboldt lily, Butte County fritillary, and Brandegee's clarkia.

The construction of project recreation facilities or the rehabilitation and enhancements of existing recreation facilities would include the use of heavy equipment that causes ground disturbance and habitat alteration, which could affect known populations of special-status plants. YCWA has committed to perform surveys for botanical resources, including special-status plants, prior to construction of the proposed recreation facilities at Kelly Ridge. If sensitive plants are identified, YCWA would implement protection buffers as described in the Integrated Vegetation Management Plan.

YCWA's license application includes four proposed measures that generally address the actions it would take to avoid or minimize any potential adverse effects on special-status plants. The first measure establishes an annual meeting with the agencies and tribes (GEN1) to ensure that the Commission, resource management agencies, and tribes have an opportunity to discuss the previous calendar year's license activities and understand YCWA's plans regarding license implementation in the current calendar year. The Forest Service supports this measure with its 4(e) condition 2.

YCWA also proposes to review special-status lists and assess newly listed species on NFS lands annually (GEN2). YCWA would review an updated list of special-status species that could be affected by project operation one full calendar year after license issuance and annually thereafter. The Forest Service, in 4(e) condition 30, supports the

measure, specifying that when a species is added to one or more of the lists, the Forest Service would determine if it is likely to occur on NFS lands; if so, YCWA would develop and implement a study in consultation with the Forest Service to reasonably assess the effects of the project on the species. YCWA would provide the study report to the appropriate agencies for review, file the study with the Commission, and implement any Commission-directed conservation measures. Additionally, Forest Service 4(e) condition 30 specifies that if new occurrences of special-status are detected prior to or during project construction, operation, or maintenance, YCWA would immediately notify the Forest Service. Then, if the Forest Service determines that the project-related activities are adversely affecting any special-status species, YCWA should develop and implement appropriate protection measures in consultation with the Forest Service. California DFW 10(j) recommendation 1.2 and FWN recommend that this measure be applied to the entire project area, not just NFS lands.

The third measure (GEN3), proposes that YCWA train its staff annually to familiarize them with general identification and location of known populations of special-status species and other environmentally sensitive areas within or adjacent to the project boundary. YCWA would direct staff to avoid disturbance to these areas and discourage the spread of non-native invasive plants. YCWA anticipates that providing training to staff when they are hired would assure new staff are quickly trained, and periodic training would serve as a refresher for staff to note any changes since the last training. Training would also include procedures for reporting to YCWA's management if employees observe any project activity directly affecting these special-status plants. This measure is supported by the Forest Service (4(e) condition 28), California DFW, FWS, and the Water Board (preliminary 401 condition 27).

YCWA has also proposes to implement an Integrated Vegetation Management Plan (TR1) that includes multiple measures to protect populations of special-status plants from disturbance when conducting routine vegetation management activities within the project area. Provisions in the plan include: (1) surveying for special-status plant species in the project area in the first full calendar year following issuance of the new license and then every 10 years; (2) consulting with the Forest Service and California DFW to determine appropriate mitigation measures when YCWA is conducting vegetation management activities in areas with special-status plants; (3) flagging special-status plants prior to vegetation management; (4) using manual labor as opposed to chemical treatment, where possible; (5) implementing species-specific limited operating periods and work buffers around special-status plants; and (6) following other appropriate BMPs to protect special-status plants. During each 10-year special-status plant survey, all previously documented special-status plant occurrences on project lands would be revisited for monitoring purposes. This would include the mapping of special-status plant occurrence boundaries. All monitoring data would meet California DFW and Forest Service standards.

Our Analysis

Continued operation of the project under a new license would include some activities that could adversely affect special-status plant species if conducted nearby without the implementation of proper BMPs. These activities include vegetation management activities such as application of herbicides to non-native invasive plants, routine vegetation management, recreation activities (i.e., trampling), or any other activities with potential to disturb soil or vegetation.

Controlling undesirable vegetation could also adversely affect special-status plants. YCWA's adherence to the Integrated Vegetation Management Plan would disclose the locations and status of special-status plants within the project area. The measures outlined in the plan are sufficient to minimize or eliminate any potential adverse effects on sensitive species that could result from vegetation management activities in the project area. We also support the requirement for periodic (every 10 years) comprehensive special-status plant surveys, including monitoring known populations, as well as requirements for reporting and consultation with the Forest Service.

Adverse effects from project operation and maintenance on special-status plants would be minor because they would affect a small number of occurrences. YCWA's proposed measures GEN1, GEN2, GEN3, and TR1, as described above, would keep any potential effects to low levels. These four measures are required by Forest Service 4(e) conditions 2, 30, 28, and 40, respectively. YCWA's Integrated Vegetation Management Plan would provide additional measures to avoid and minimize effects on special-status plants. Consultation with resource agencies regarding any project activities that could potentially affect special-status plants would help ensure consistency with state and federal laws and compliance with laws protecting sensitive plants and wildlife that occur within the project area. Monitoring of known special-status plant locations would ensure the population's continued health and viability. Also, YCWA would track the boundaries of special-status plant populations potentially affected by non-native invasive plants on NFS lands by monitoring those occurrences more frequently, annually for 3 years after detection. If project-related activities were affecting special-status species are, the monitoring data could be used to craft and measure the success of adaptive management measures. Surveys would also ensure that YCWA is aware of sensitive areas and takes the appropriate precautions described in the Integrated Vegetation Management Plan to protect these areas. Periodic surveys of the entire project area, as included in the plan, would also document new occurrences of special-status species, some of which have dynamic population cycles and long-distance dispersal mechanisms. Lastly, surveys for special-status plants prior to routine project operation and maintenance activities would ensure that activities do not affect special-status plant species. With implementation of these measures, YCWA would minimize potential effects on special-status plants. However, because YCWA would consult with FWS during the development of any modifications and prior to the Commission approving the modified plan, specifically

including ESA consultation in the plan would not provide additional protection for federally listed species.

Riparian Vegetation

Continued operation of the project would result in controlled flows and sediment trapping. Reducing spring pulse flows and impeding sediment transport can disrupt generation of riparian forest because dominant species like cottonwood and willow require freshly deposited and wetted mineral soils for germination. YCWA proposes several measures that would affect riparian resources. It would control spills at Our House Diversion Dam (AR2) and Log Cabin Diversion Dam (AR12) with the intention of more closely mimicking the natural hydrograph in the Middle Yuba River and Oregon Creek, respectively. YCWA proposes to restrict flow reductions below Englebright Dam between April 1 and July 15, to less than the larger of: (1) the applicable minimum streamflow requirement specified in YCWA's AR3; (2) the flow that would result from applying the maximum flow reduction amount specified in table 3-55; or (3) the flow that would result from applying 120 percent of the maximum flow reduction amount specified in table 3-55 for the previous end of day flow (AR9). As a component of proposed measure GS2 and GS3, YCWA would open low-level outlet valves in the Our House and Log Cabin Diversion Dams to increase sediment transport downstream of the dams and would pass LWM over the dam.

YCWA would monitor riparian vegetation in the Upper Yuba River (AR7) and in the Yuba River downstream of Englebright Dam (AR8). The objectives of these measures would be to characterize future changes in riparian vegetation composition and structure and changes to cottonwood seedling recruitment and tree establishment in the Yuba River. YCWA would file monitoring results annually with California DFW and the Forest Service. YCWA, in consultation with the agencies, would review and revise the plan, and file revisions to the plan with the Commission for approval as needed, when significant changes in existing conditions occur.

California DFW, the Forest Service, BLM, and FWS are in general agreement with YCWA's proposed measures at the Our House and Log Cabin Diversion Dams and proposed monitoring activities (AR2, AR12, AR7, AR8, GS2, and GS3). The resource agencies are concerned that YCWA's proposed measure to control ramping rates below Englebright Dam (AR9) does not apply past July 15. The agencies contend that allowing faster water level reductions beyond this date would put cottonwood and willow seedlings at risk of desiccation associated with rapid recession during the summer period. To further support riparian seedling survival, FWS, in 10(j) recommendation 17, recommends that YCWA extend the period of limited flow recession rates to September 30. The Water Board also comments that YCWA should evaluate AR9 and extend the period of limited recession rates through August 31. The Water Board states that this time frame would capture the entire cottonwood seed and native willow dispersal period in the lower Yuba River.

California DFW notes that the lower Yuba River is notably lacking in both riparian floodplain and riparian overstory, which are common side effects of regulated rivers, because conditions that lead to riparian regeneration are lacking, resulting in a diminished or constrained area for tree establishment. In general, NMFS and California DFW recommend higher pulse flows during wetter water years with the objective of providing at least some floodplain inundation to enhance riparian floodplain vegetation development and increase food availability for rearing native salmonids. Specifically, FWS 10(j) recommendation 3, NMFS 10(j) recommendation 4, and California DFW 10(j) recommendation 2.9 recommend that YCWA, within the first 2 calendar years of the new license term, develop a lower Yuba River habitat restoration and enhancement plan in consultation with FWS, NMFS, California DFW, the Water Board, and a qualified restoration ecologist. The plan would include riparian restoration and enhancement measures (e.g., removing sediments to lower floodplain surfaces and increase floodplain inundation at flows between 1,500 and 3,000 cfs and planting riparian vegetation). The resource agencies' recommend extensive removal of floodplain sediments to lower 340 acres of floodplain currently inundated at 5,000 cfs to be accessible to flows between 1,500 and 3,000 cfs. Under the agencies' recommendations, YCWA would vegetate, with native riparian plants, these acres and an additional 251 acres of floodplain currently inundated at flows between 3,000 and 21,000 cfs. FWN supports these recommendations.

YCWA disagrees with the agencies' recommended lower Yuba River habitat restoration and enhancement plan. YCWA agrees that current channel morphology in the Yuba River confines riparian vegetation; however, it contends that these effects predate the project and are principally the result of hydraulic mining during the Gold Rush-era dam building by the federal government for sediment control and flood control channelization. Therefore, YCWA argues that no project nexus exists for floodplain modifications.

Our Analysis

Riparian areas support high biodiversity, providing important habitat to numerous species. Cottonwood and willow, the dominant woody species in the riparian communities of the project area, depend on spring pulse flows with slow recession rates for seedling establishment. As these flows recede, they deposit sediment and create sandbars at elevations above the normal low-flow elevation. These sandbars provide the necessary conditions for germination of cottonwood and willow seeds, including bare mineral soil, limited canopy cover, and wetted soils. Project operation could affect cottonwood and willow establishment by trapping sediment, limiting spring pulse flows, or dropping post-pulse flow levels too fast and drying suitable germination sites before seedlings are established. The proposed spring flows downstream of Englebright Dam would achieve some floodplain inundation that could enhance development of riparian vegetation, including cottonwoods and other riparian trees and shrubs. A gradual spring increase of flows, followed by a gradual decrease in flows, as YCWA proposes, would facilitate increased establishment of cottonwood, willow, and other riparian vegetation

compared to current operations. Extending the ramping control period into late August or late September, as proposed would provide little additional establishment of cottonwood because late-April to early-June is the peak seed dispersal period for cottonwood willow species in the project area. On uncontrolled rivers, receding spring pulse flows are typically followed with summer low flows. While drought conditions during the first few weeks following germination can result in seedling mortality, cottonwood and willow species have evolved to survive typical summer low-flow conditions. For example, Fremont cottonwood seedling roots grow 0.16 to 0.47 inches/day so seedlings can reach depths where alluvial water is available in summer (Taylor, 2000). Maintaining recession rates later into the summer months would provide minimal benefit to seedlings because their root systems are more established and are less dependent on surface moisture availability.

YCWA's study of riparian vegetation demonstrated that riparian areas are generally healthy and recovering from historical disturbances, based on the vigor and variety of age classes of the plants present. Cottonwood is one of the most abundant riparian trees in the study area, second only to willows, and its riparian gallery forests exhibit a diversity of age- and size-classes. The occurrence of mature trees, young trees, saplings, and seedlings suggests that cottonwood have been successfully regenerating for many decades. However, riparian vegetation communities tend to be simplistic in structure both vertically and horizontally, indicating that they are developing from an early seral stage and have not yet become complex as they recover from historical disturbances. In addition, large areas above the baseflow channel are unvegetated. Opening the low-level outlet valves at the Our House and Log Cabin Diversion Dams during high flows would increase sediment transport into the Middle Yuba River. This measure should benefit riparian vegetation as high flows recede and deposit fine sediment along the channel margins, creating suitable germination conditions for cottonwood and willow and promoting expansion of these species along the lower Yuba River.

The project's continued operation, as proposed, would result in flow reductions during the spring, reducing the amount of floodplain inundation in the lower Yuba River. The resource agencies propose riparian restoration actions to achieve greater floodplain inundation that would increase the extent of riparian vegetation on the lower Yuba River, providing for increased wetland habitat to benefit waterfowl, amphibians, and other terrestrial wildlife. The agencies' recommendations are based on extensive analysis of floodplain topography in the lower Yuba River and modeled flows for with-project and without-project scenarios using water data from 1970 to 2010. For each year, from February 1 through June 15, the agencies calculated daily acreage of inundation above the low flow channel (800 cfs). The agencies then summed daily inundation acreages to calculate cumulative acre-days (CAD) of inundation for the period. The agencies also calculated CAD for areas over the 5,000 cfs bankfull inundation level.

Across all water years, median CAD above the low flow channel was about 25 percent lower in the with-project scenario than the without-project scenario. Percent reductions in median CAD above the low flow channel in schedule 1, schedule 2, and

schedule 3–7 water years were about 9 percent, 39 percent, and 80 percent, respectively. For inundation levels above bankfull, median CAD values for the with-project scenario were 56 percent lower than the without-project scenario. Median CAD values for schedule 1, schedule 2, and schedule 3–7 water years were 29 percent, 89 percent, and 86 percent respectively.

Recognizing the limitations on water supply and project operation, the agencies recommend lowering floodplain elevations to increase CAD under with-project conditions as an alternative to increasing flows. The agencies' analysis indicates that removing floodplain sediments to lower 340 acres of floodplain currently inundated at 5,000 cfs to be accessible to flows between 1,500 and 3,000 cfs would increase median CAD values in schedule 2 water years from 13,170 (under YCWA's proposed flows) to 21,464. For comparison, CAD in schedule 2 water years for the without-project scenario is 21,472. For areas above bankfull, because CAD in schedule 1 years for the with-project scenario is 29 percent lower than the without-project scenario, the agencies recommend planting 29 percent of the 866 acres of floodplain inundated between flows of 5,000 and 21,100 cfs. Thus, the agencies recommend planting 251 acres in this inundation zone.

The agencies use of the CAD metric is based on relatively fine scale (daily) temporal data and provides a robust combination of inundation frequency, magnitude, and duration into a single, quantifiable metric. We agree this metric elucidates the degree to which project operation constrains inundation patterns in the bank ecotone (the area between the low flow channel and bankfull) and areas above the bankfull channel. Thus, this analysis establishes a nexus between the project and ecological effects of reduced floodplain inundation. However, the agencies do not provide a clear relationship between percent reductions in CAD and effects on woody riparian population structure, vegetation cover, or area of reduced inundation. Rather, FWS states CAD is used as a proxy to quantify how many acres of planting are needed to mitigate the effects of reduced CAD (letter from D. Welsh, Deputy Field Supervisor, FWS, to A. Mitchnick, FERC, dated October 1, 2018, and filed on October 2, 2018). We find the use of CAD as a metric to quantify restoration needs is arbitrary and lacks a clear correlation to actual project effects on riparian vegetation community structure.

Alternatively, staff conducted a separate analysis using graphs of average monthly flow data for with-project and without-project scenarios and area versus discharge curves presented in the cbec report (2013).[101] Based on the cbec figures, staff estimated the average monthly flow in the February 1 to June 31 period to be 3,000 cfs for the with-project scenario and 4,200 cfs for the without-project scenario (figure 3-45). Staff

[101] The cbec analysis was completed using water data from 1970–2010.

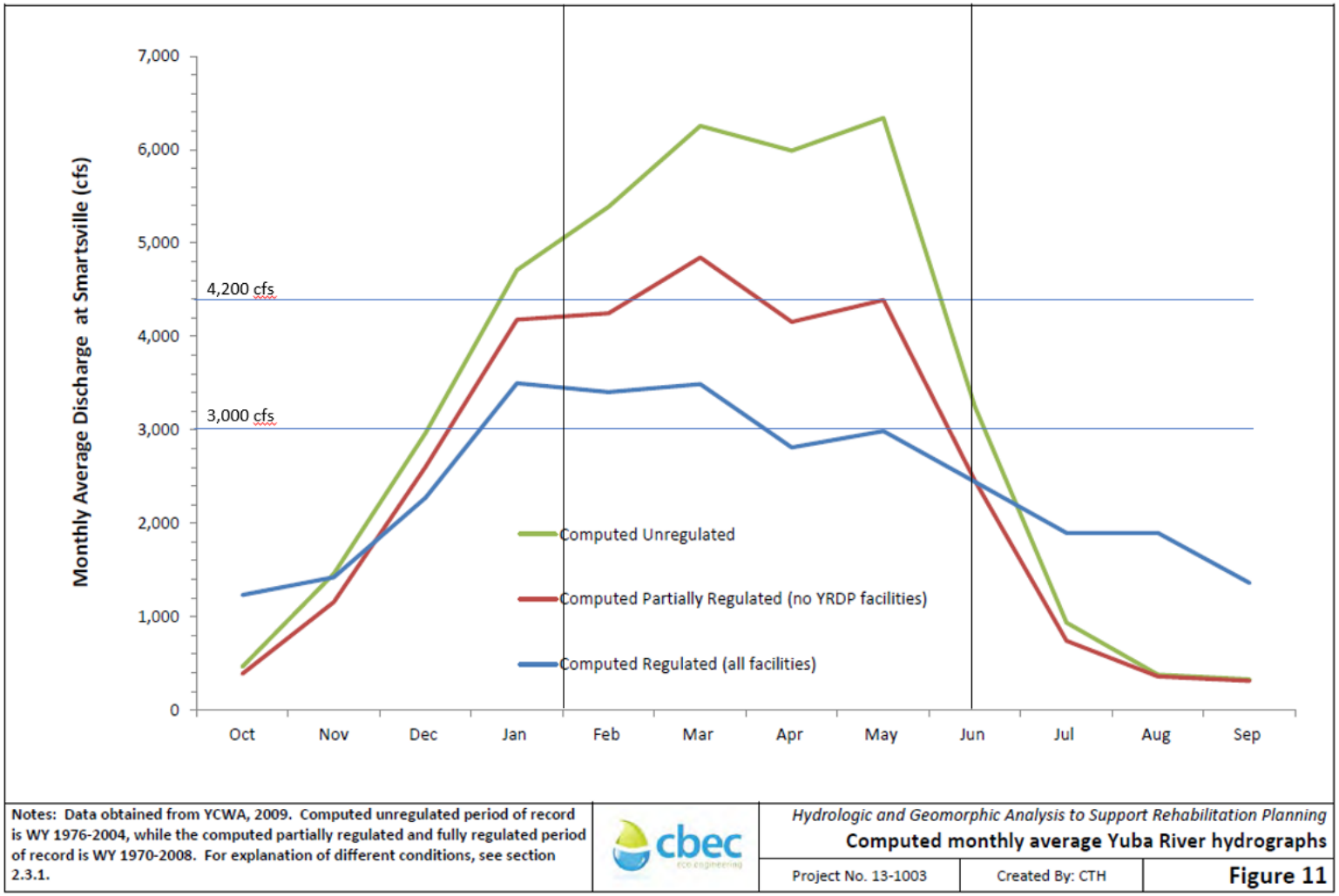
then translated these flows to the area versus discharge curve[102] for the Parks Bar to Marysville reaches and extrapolated the difference in inundation area between these two flows (figure 3-46). Staff estimates this difference to be about 80 acres. While this analysis relies simply on average flows to identify inundation levels and is less robust than the CAD metric because it does not incorporate daily variation to analyze the frequency, duration, and magnitude of inundation, it does provide a direct connection between differences in flow and acres of inundation. Therefore, we find this analysis provides a more reliable quantification of the extent of effects related to project operation moderation of spring flows.

Figure 3-47 provides a map of the river reaches identified in the cbec (2013) report. Because the Parks Bar Reach starts about 5.7 miles below Englebright Dam, staff recognizes that the flow versus discharge curve omits this stretch of the lower Yuba River. Because of the rough scale of the analysis and the additional effects that occur between Englebright Dam and Parks Bar, staff finds riparian planting of 100 acres of currently unvegetated areas would offset the effects of project moderation of spring flows on riparian vegetation in the lower Yuba River.

During the draft EIS meeting site visit, staff visited the Hammon Bar restoration site where riparian plantings occurred in 2011 and 2012 (SYRCL, 2018). Machinery was used to plant cottonwood and willow stingers to groundwater depth. This planting strategy eliminated the need for irrigation and substantially increased vegetation cover on the sandbar. The plantings withstood recent high flows in 2016 and reduced sediment particle size on the sand bar surface, which increased the potential for seedling colonization. Using similar methods would be a cost effective approach to restoration efforts associated with the project.

We further agree that lowering floodplain elevations in the lower Yuba River would restore connectivity between the main channel and adjacent floodplains. High spring flows would distribute fine sediments into these lowered areas and provide conditions suitable for establishment of native riparian tree species. The resource agencies' recommended measure would remove floodplain sediments to lower 340 acres of floodplain that is currently inundated above bankfull (>5,000 cfs) so that it would be inundated at flows between 1,500 and 3,000 cfs. We do not discount the potential ecological benefits of this recommendation.

[102] An area versus discharge curve depicts the relationship between flow (cfs) to acres of land inundated for a particular river reach.



Note: Vertical black lines mark the February 1–June 15 period of interest; horizontal lines mark approximate average flows during the period of interest.

Figure 3-45. Monthly average flows at Smartsville for without-project scenario (red line) and with-project scenario (blue line) (Source: cbec, 2013, as modified by staff).

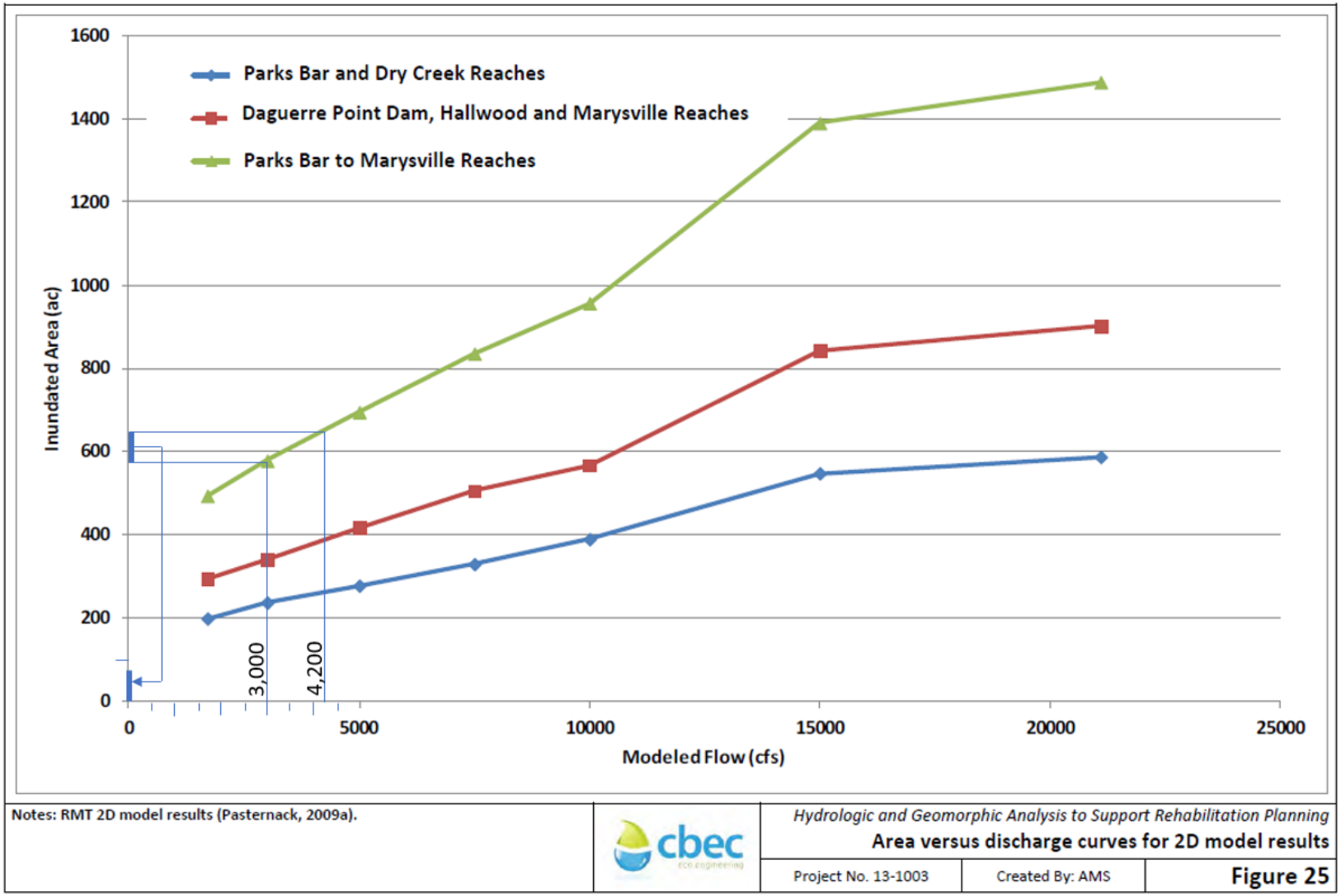
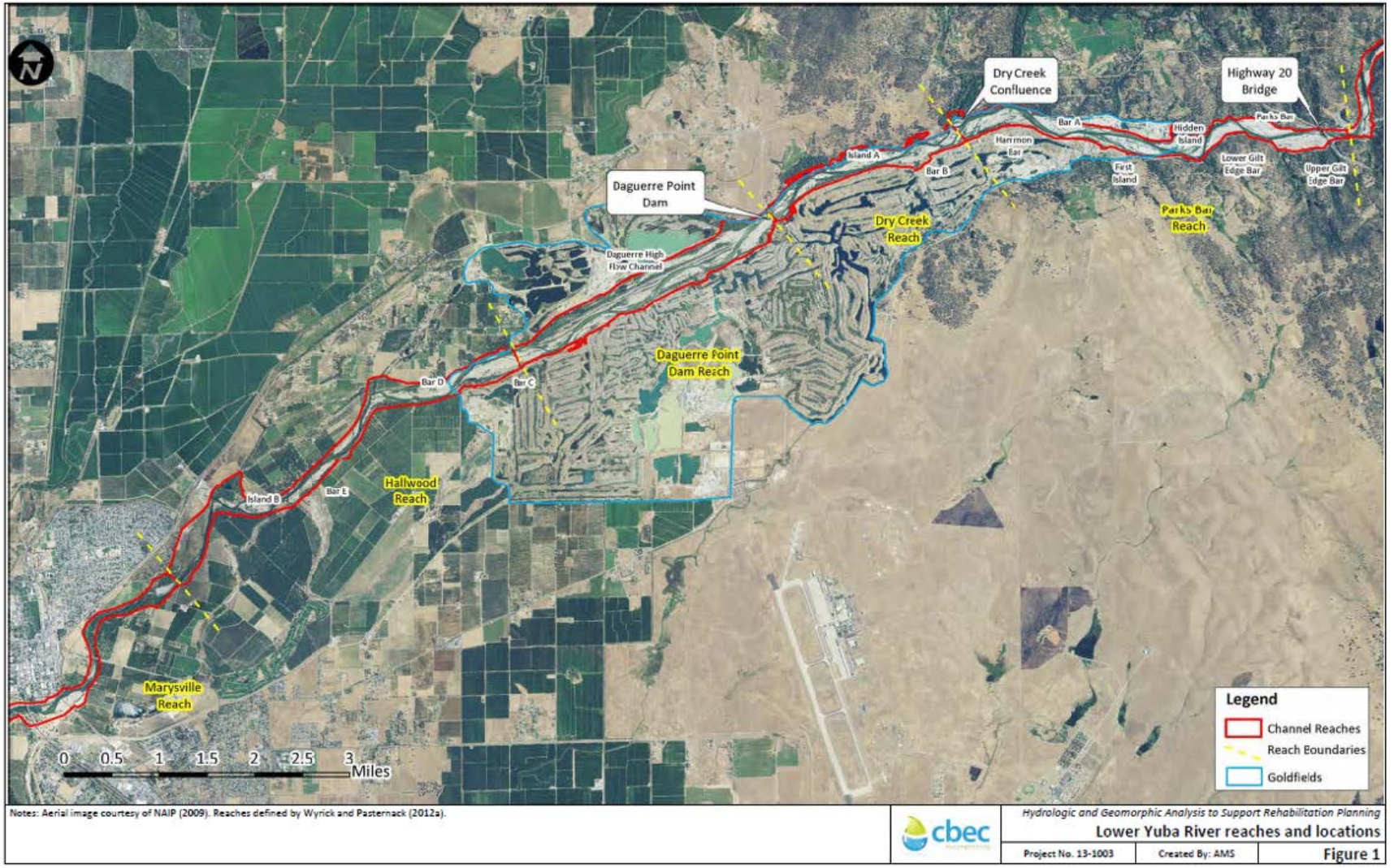


Figure 3-46. Staff extrapolations of the difference in inundated acres between 3,000 cfs (with-project average flow during period of interest) and 4,200 cfs (without-project average flow during period of interest) in the Parks Bar to Marysville reaches (Source: cbec, 2013, as modified by staff).



Note: Englebright Dam is about 5.7 river miles upstream of the upstream limit of the Parks Bar Reach.

Figure 3-47. Map of lower Yuba River reaches identified in cbec (2013) (Source: cbec, 2013).

However, as the agencies note, the extent of floodplain inundation depends on flows and topography. While the project moderates flows, we find that the project has minimal influence over floodplain topography. As discussed in section 3.3.2.2, in the subsection *Lower Yuba River Habitat Restoration and Large Woody Material Management*, floodplain connectivity and off-channel habitat availability in the lower Yuba River is largely a result of historical activities unrelated to modern project operations. Additionally, the cbec report (2013) describes the current lower Yuba River as being in "a state of quasi-equilibrium where locally derived sediment supplies provide rejuvenation of streambed substrate. A relatively unconstrained flood regime continually alters the morphology of the river. Meander migration and channel realignment in response to moderate and large floods has been observed in recent years." The report cites Ghoshal et al. (2010), stating "the [lower Yuba River] system is transitioning away from a period dominated by vertical incision . . . as the channel may be returning to pre-mining base levels." These statements suggest efforts to lower the floodplain may be transitory, with large floods depositing sediment in lowered areas. FWS and SYRCL present evidence from the Hammon Bar planting that indicates the plantings persist following large flood events. However, staff is unaware of evidence to suggest the same is true for floodplain lowering. As such, we find it would not be appropriate to require YCWA to lower floodplain elevations as part of riparian restoration efforts.

In response to the draft EIS, FWS and SYRCL provide a map and list of potential restoration sites where property access is possible. Coordinating restoration planting activities with FWS and SYRCL would substantially reduce concerns associated with property access and costs associated with infrastructure development or adverse effects on private property. Such coordination could also identify planting opportunities where other entities have implemented floodplain lowering activities. Implementation of 100 acres of planting in a phased approach that includes at least four separate planting sites, in coordination with other restoration efforts, would reduce costs and distribute restoration efforts along the lower Yuba River, increasing the benefits of these activities at a landscape scale.

The stated objective of YCWA's riparian vegetation monitoring component in its Lower Yuba River Monitoring Plan is to allow for comparison of post-license issuance riparian information with pre-license issuance information. While we agree this monitoring would provide valuable information to track the condition of riparian forests in the project area, it is not clear how the results of the monitoring would be used to inform project operation or assess mitigation needs. However, monitoring at planting locations associated with project restoration activities is necessary to measure planting success and to determine whether additional efforts are needed to meet success criteria.

Development of a lower Yuba River riparian restoration plan, in consultation with FWS, California DFW, NMFS, and SYRCL that includes: (1) planting riparian vegetation on 100 acres of floodplain in the lower Yuba River, including no fewer than four separate planting sites; (2) a species list for plantings that includes, at a minimum, cottonwood and willow species; (3) a description of planting methods consistent with

methods used at the Hammon Bar restoration site, including planting to ground water depth; (4) success criteria based on survivorship of plantings; (5) monitoring methods and a schedule for determining success; (6) provisions for additional plantings if success criteria are not met; (7) a process and schedule for identifying planting sites; and (8) a reporting schedule would guide restoration efforts and ensure riparian planting efforts achieve the desired ecological effects.

Planting 100 acres in currently unvegetated floodplain, in combination with the proposed measure to control spring recession rates to benefit riparian seedling establishment, would mitigate project effects that constrain floodplain inundation and impede natural riparian vegetation recruitment.

General Wildlife

Granting a new license for the project would have both short- and long-term, minor effects on wildlife habitat. Project construction activities could affect wildlife, including several special-status species (see below), directly through mortality, injury, disturbance, or displacement resulting from habitat destruction, alteration, or fragmentation. Direct effects would result from YCWA's proposed construction of several facilities, including the New Colgate Powerhouse tailwater depression system, the New Bullards Bar Dam auxiliary flood control outlet, modifications to Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets, modifications to Lohman Ridge Diversion Tunnel intake, and the construction of new recreation facilities. Other ground-disturbing activities that would directly affect wildlife as a result of project operation and maintenance activities include rehabilitating and enhancing recreation facilities, routine vegetation clearing around project facilities, grading roads and parking areas, vegetation management (e.g., mechanical clearing and pesticide use), and recreational use.

Direct, adverse effects on wildlife would include habitat destruction or alteration from the construction of new facilities that require permanent removal of vegetation and project maintenance. A small number of animals may also experience direct mortality as a result of these project operation and maintenance activities. Indirect effects of these activities on wildlife would likely result from habitat fragmentation or stress and disturbance to animals, which could potentially change wildlife habitat use, reduce animal fitness, and alter natural food webs.

Our Analysis

Project-related activities such as vegetation maintenance (e.g., tree trimming or removal), construction of the proposed auxiliary flood control outlet at New Bullards Bar Dam or other project facilities, routine project road and facility maintenance, and recreation have the potential to disturb and/or displace wildlife and damage or destroy their habitat, thus reducing the reproductive output of individuals and their long-term occupancy of areas within and adjacent to the project. The proposed license application for the project includes avoidance and minimization measures for all wildlife species.

Effects on vegetation and wildlife habitat would be reduced by implementation of the Integrated Vegetation Management Plan. YCWA proposes three measures that would minimize any adverse effects from the project on special-status wildlife, which are the same as described above under *Special-status Plants* (GEN1, GEN2, and GEN3) and generally are supported by FWS, Forest Service, California DFW, and the conservation agencies.

YCWA's new license application does not propose any additions (e.g., new dams, reservoirs, or roads) that would result in the permanent loss of existing winter range for migratory deer or loss of existing habitat for resident deer. YCWA's operation and maintenance of the project under a new license would be unlikely to contribute, either positively or negatively, to the major factors affecting Columbian black-tailed deer populations in the project vicinity. The relatively undeveloped lands of the project area would continue to provide habitat for Columbian black-tailed deer by restricting non-project development. The quality of that habitat would not substantially change as a result of project operation and maintenance. Additionally, implementation of the Integrated Vegetation Management Plan could enhance habitat by controlling the spread of non-native invasive plants and maintaining or increasing the availability of native browse species for deer. As succession is realized, revegetation projects would likely add to the acreage of existing deer habitat and increase the quality of forage and cover. Based on the lack of any moderate or major effects on Columbian black-tailed deer, the continued operation and maintenance of the project would have minimal, adverse effects on the species.

Under a new license, New Bullards Bar Reservoir would continue to be a migration barrier for Columbian black-tailed deer. However, numerous generations of deer have survived since its creation and have incorporated the reservoir into seasonal migration routes. Some level of mortality is expected and may increase over the term of the new license because of stable or increasing levels of vehicular use. However, deer-vehicle collisions are not a major source of mortality for Columbian black-tailed deer in the project area.

Special-status Wildlife

Project operation and maintenance activities, such as road grading, vegetation control, modification of existing facilities, and construction of new project facilities could have both short-term and long-term, direct and indirect effects on special-status wildlife, including but not limited to habitat modification, habitat destruction, mortality or disturbance to wildlife, or changes to predator-prey abundance.

YCWA describes four general protection, mitigation, and enhancement measures that it would take to avoid or minimize any potential adverse effects on special-status wildlife. These proposed measures are the same as those described above under *Special-status Plants* (GEN1, GEN2, and GEN3).

YCWA's proposed Integrated Vegetation Management Plan (TR1) would reduce project-related effects on special-status wildlife by instituting distance buffers around nest areas and limited operating periods during the breeding season of all birds. The plan also includes species-specific limited operation periods for northern goshawk, American peregrine falcon, bald eagle, osprey, California spotted owl, great gray owl, great blue heron, foothill yellow-legged frog, and western pond turtle. For all future project activities that would disturb vegetation (i.e., habitat), YCWA would map special-status species occurrence within 2 miles to facilitate evaluation of potential project effects. Where necessary, YCWA would implement protection measures, including limited operating periods and protective buffers, to reduce or avoid effects on special-status wildlife species. Additionally, YCWA proposes several measures specific to special-status species known to occur in the project area, including a Bald Eagle and American Peregrine Falcon Management Plan (TR2), Ringtail Management Plan (TR3), and Bat Management Plan (TR4). These plans are described below.

Our Analysis

Project maintenance activities and recreation have the potential to affect special-status wildlife species. Modifications to the low-level outlets of Log Cabin Diversion Dam would involve construction activities that could affect western pond turtles, a special-status species. Construction of the proposed auxiliary flood control outlet at New Bullards Bar Dam would involve ground disturbance and habitat alteration that could affect bald eagle and American peregrine falcon in proximity to the construction area. Details regarding these impacts are discussed below. In addition, project recreation on the Yuba River below New Bullards Bar Dam could disturb American peregrine falcons, although the specific location of a frequently documented pair's nest in the dam's vicinity is unknown at this time.

In general, project-related effects on sensitive wildlife species would be similar to those discussed above for general wildlife. The implementation of YCWA's proposed protection, mitigation, and enhancement measures would protect sensitive species. In particular, these measures include annual coordination with the resource agencies (GEN1), annual staff ecological training (GEN3), and periodic review of special-status species (GEN2). While the requirement for an annual ecological group meeting would be beneficial, and GEN1 (Forest Service 4(e) condition 2) is frequently referenced by the resource agencies and conservation groups as the best opportunity to review project activities and effects, it is not clear how such a meeting would specifically affect sensitive resources because the objectives of such a meeting are poorly defined and the outcome uncertain. YCWA's proposed plan includes the preparation of annual reports that would be submitted for agency review prior to being filed with the Commission. This provides a mechanism for YCWA to inform California DFW and the Forest Service of project activities, and for the agencies to comment on monitoring results and make recommendations to the Commission regarding needs for additional measures or modifications. In addition, staff anticipates that surveys would be conducted prior to construction activities, and necessary protective measures, such as limited construction

periods and buffers, would be developed after consultation with resource agencies. Therefore, a separate annual meeting would be redundant.

Annual review of sensitive species lists (GEN2) would help identify newly listed species that should be evaluated as potentially affected by the project. This measure would protect federally listed and special-status species by reducing the possibility that newly added species could be affected by maintenance activities. Annual consultation meetings (GEN1) would also provide an opportunity for the measures to be modified in the event of a species being delisted. Further, the process of annual consultation would allow California DFW and the Forest Service to provide input based on unpublished data, recent studies, and other sources of information that may not be available in public databases. Although we recognize the benefits of annual review and consultation, the Commission typically includes in its licenses a standard license article with a fish and wildlife reopener provision, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff*.

Ringtail

Ringtail that live in areas with frequent human activity often change their diet to include easily acquired human food scraps, which can have adverse implications for ringtail health and human safety. YCWA worked with the Forest Service and California DFW to develop a Ringtail Management Plan to ensure that project activities or facilities do not result in the adverse effects on ringtail and that project staff understand the correct procedures for preventing ringtail from entering project facilities. The plan provides protection measures and reporting and consultation requirements between YCWA and California DFW. YCWA would, in the first full calendar year after license issuance, implement ringtail exclusion devices at all known or potential ringtail access locations. The management plan includes a schedule for inspecting the exclusion devices to ensure that they remain functional and free of defect. If new evidence of ringtail activity is found within New Colgate Powerhouse, the New Colgate Powerhouse administrative building and shop, or Narrows 2 Powerhouse, YCWA would immediately inspect existing exclusion measures to ensure that they are functioning properly. YCWA would also exclude ringtail from the area surrounding the New Colgate Powerhouse during and after construction of the tailwater depression system, and install new wildlife protective devices on the project transformer and circuit breaker bushings in the New Colgate and Narrows 2 Switchyards. YCWA would confine all new construction activities to the existing New Colgate Powerhouse yard, with most of the work occurring inside the existing New Colgate Powerhouse.

The Ringtail Management Plan also includes annual employee training to provide staff with information regarding the locations and purpose of ringtail exclusion devices, potential signs that ringtail have entered a project facility, ringtail attractants (e.g., food), and reporting of ringtail observations or signs of ringtail. YCWA would inform staff about ringtail's fully protected state status and make it clear that in no instance should staff trap, relocate, or otherwise handle ringtails. Furthermore, the plan includes

procedures for YCWA to revise the plan if necessary in consultation with California DFW and with the Commission's approval. YCWA would, in the first full calendar year after license issuance, implement ringtail exclusion devices at all known or potential ringtail access locations. The management plan includes a schedule for inspecting the exclusion devices to ensure that they remain functional and free of defect. If new evidence of ringtail activity is found within New Colgate Powerhouse, the New Colgate Powerhouse administrative building and shop, or Narrows 2 Powerhouse, YCWA would immediately inspect existing exclusion measures to ensure that they are functioning properly. YCWA would also exclude ringtail from the area surrounding the New Colgate Powerhouse during and after construction of the tailwater depression system, and install new wildlife protective devices on the project transformer and circuit breaker bushings in the New Colgate and Narrows 2 Switchyards. YCWA would confine all new construction activities to the existing New Colgate Powerhouse yard, with most of the work occurring inside the existing New Colgate Powerhouse. Ringtail habitats would not be physically altered during construction.

Forest Service 10(a) recommendation 12 calls for YCWA's proposed Ringtail Management Plan to apply to all areas in the project boundary. California DFW 10(j) recommendation 3.4 supports implementation of YCWA's proposed plan. FWS also considers the plan to be adequate to protect ringtail in the project area for the term of the new license unless monitoring or other information indicates the goals and objectives of the plan are not being met or significant changes in existing conditions occur.

Our Analysis

Under a new project license, human activity, improper waste disposal, and the existence of project facilities (i.e., buildings) could adversely affect ringtail. When the species learns to acquire food from human sources, it may increase activities around buildings and areas with high human activity, resulting in an increased chance of direct and indirect human-ringtail interactions. Also, ringtails often seek to gain access to buildings for shelter and denning, so regular vigilance and maintenance is required to keep them away from project facilities. When buildings are made secure against the ringtails, the animals seek necessary energy, shelter, and reproductive requirements elsewhere. Active management of human activities and regular building maintenance in the project area is therefore required to decrease negative consequences of ringtail use and presence in and around developed areas.

The measures outlined in the Ringtail Management Plan should be adequate to protect ringtail in the project area for the term of the new license. The plan primarily focuses on preventing ringtail from using project facilities by deploying exclusion devices, which would improve the likelihood of survival for any ringtail found in the project area. The plan does not include language limiting its scope to NFS lands, so the plan is consistent with Forest Service 10(a) recommendation 12. The plan includes procedures for annual reporting to California DFW to provide for any future mitigation or enhancement measures if monitoring or other information indicates the goals and

objectives of the plan are not being met or significant changes in existing conditions occur. These measures could include repair to or replacement of existing ringtail exclusion measures and installation of new measures.

Bats

Project-related activities such as vegetation maintenance (e.g., tree trimming or removal, using chainsaws, and felling trees), other routine project maintenance, and recreation have the potential to disturb and/or displace bats and damage or destroy their habitat, thus reducing the reproductive output of individuals and their long-term occupancy of areas within and adjacent to the project. YCWA, in collaboration with the Forest Service and other resource agencies, developed a Bat Management Plan (TR4), to ensure project activities do not disturb roosting bats.

In the first full calendar year following issuance of the new license, YCWA would conduct a comprehensive survey of all project facilities, including a daytime visual assessment and nighttime emergence survey, during the peak of bat maternity season (July 1 through August 31) to determine where bats are present and/or roosting in the project area. At project facilities where human presence is frequent, with the exception of facilities where roosts or evidence of roosting behavior are present, YCWA would install humane exclusion devices and screens. YCWA would provide the Forest Service and Californian DFW all plans for exclusion devices for agency review prior to implementation. YCWA would conduct regular inspections (6 months after installation and annually thereafter) and repair or replace exclusion devices to ensure they are maintained in properly functioning condition. YCWA would also reevaluate all project facilities for roosting bats every 2 years. In addition, the Bat Management Plan includes annual employee awareness training to provide staff with the locations and purpose of bat exclusionary measures, recognize signs (e.g., guano, staining, or bats) of bat roosts, and report any newly discovered roosts. It also provides guidelines for reporting and consultation regarding bat management during the term of the license.

Implementation of YCWA's Bat Management Plan was supported by Forest Service 4(e) condition 42, and California DFW 10(j) recommendation 3.3. Forest Service 10(a) recommendation 11 recommends the plan apply to non-NFS project lands. These resource agencies comment that they consider the measures outlined in the plan to be adequate to protect roosting bats, especially during the maternity and winter hibernating seasons.

Our Analysis

Bats are sensitive to anthropogenic impacts, both as a direct result of human presence and indirect effects from disturbances to their roosts and surrounding habitat. Loss of roost habitat can be particularly harmful to bats since they use roosts during sensitive life-history periods, including the maternity season and winter hibernating, and many roosts are used by successive generation of bats over many years. Disturbance to maternity colonies can cause bats to abandon young, and effects on maternity colonies

can decrease fecundity of individuals and populations as well as subsequent generations of bats. If disturbed during hibernation, bats may awake prematurely, which can cause an elevation in body temperatures and promote the use of stored energy reserves, leaving insufficient energy to survive the rest of the winter. Changes in the microclimate of roosts from the removal of trees and other habitat degradation and alterations can make roosts unsuitable and contribute to a loss of roost habitat. Implementation of measures to protect roosting bats, especially during the maternity and winter hibernating seasons when bats are most sensitive to disturbance, is important when managing bat populations in a given area because of their low reproductive rate and roost site fidelity.

YCWA's proposed Bat Management Plan (TR4) includes measures to protect bats roosting at project structures (e.g., powerhouses, storage buildings, valve houses, and dams), recreation facilities, or other structures where project staff have a routine presence. Protection measures for bats in the plan include exclusion and protection measures and surveys to ensure these measures are effective.

The surveys included in the plan, as well as required maintenance of exclusion devices, would occur for the term of the new license. The plan would allow for adaptive measures to be taken if monitoring or other information indicates the goals and objectives of the plan are not being met, or if significant changes in existing conditions were to occur. Additionally, the procedures that YCWA would take to revise the plan are provided, through consultation with the Forest Service, other resource agencies, and the Commission. Therefore, implementation of the proposed plan would be protect bats within the project area, especially during the maternity and winter hibernating seasons. The proposed plan does not include any language limiting the plan to NFS lands, and as such, is consistent with Forest Service 10(a) recommendation 11.

Birds

Project operation and maintenance and recreation activities could disturb several birds of prey that nest and forage in the project area, including bald eagle, American peregrine falcon, northern goshawk, California spotted owl, and great gray owl. Bald eagles that roost during winter on New Bullards Bar Reservoir could also be affected.

YCWA developed a Bald Eagle and American Peregrine Falcon Management Plan based on recommendations from California DFW, FWS, and other resource agencies. For both species, the plan provides protection guidelines, including surveys, buffers, limited operating periods, and other measures. YCWA would perform annual nesting surveys in accordance with California DFW's Bald Eagle Breeding Survey Instructions throughout the life of the license. In consultation with the California DFW, FWS, and the Forest Service, YCWA would implement a limited operating period for each occupied nest and would install water and land barriers and appropriate signage around known active bald eagle nests to delineate a buffer of restricted activity around each nest. During the first full calendar year after license issuance, YCWA would conduct night winter roost surveys for bald eagles in December, January, and February, establishing a

current baseline regarding the presence of communal night roosts at New Bullards Bar Reservoir. If no communal night roosts are identified during initial surveys described above, YCWA would only conduct additional night roost surveys during the term of the new license if new project developments are proposed within 1 mile of the shoreline of New Bullards Bar Reservoir. If one or more communal night roosts are identified during initial surveys, YCWA would consult with the Forest Service, FWS, and California DFW to discuss the need for additional surveys and appropriate protection measures.

Specific protection measures for American peregrine falcon provided in the plan include: nesting surveys, establishing buffers and limited operating periods around nests, and staff training. According to the plan, YCWA would conduct initial nesting surveys for American peregrine falcons during the first year of license issuance at the documented eyrie (nest) downstream of Englebright Dam and search for new evidence of nesting behavior (i.e., courtship, egg laying, incubation, hatching, and fledging). The pair of falcons observed at New Bullards Bar Dam are speculated to be a different nesting pair that uses another eyrie in the dam's vicinity. YCWA proposes to search for new eyries during the first year, and once every 5 years for the term of the license or until a new eyrie is documented. It would focus this search on suitable American peregrine falcon habitat in the following three areas: (1) the North Yuba River canyon from New Bullards Bar Dam downstream 1 mile; (2) the Yuba River canyon within 1 mile upstream and downstream of the New Colgate Powerhouse facilities; and (3) the Middle Yuba River canyon within 1 mile upstream and downstream of Our House Diversion Dam. YCWA would identify the location of any nest site(s), determine the specific nesting chronology (i.e., clutch complete, hatch, and fledge dates) and success of the nest site(s), and determine the sensitivity of nesting pairs (when possible). Additionally, YCWA would conduct surveys at documented eyries and search for new eyries when new project developments and other ground-disturbing activities and helicopter use are proposed within 1 mile of documented eyries and suitable nesting habitat. For all documented eyries, YCWA would establish a 0.5-mile buffer (increased to 1 mile for helicopter use, blasting, chainsaws, and other similar loud noises) and implement a limited operating period from January 1 through August 15. YCWA also proposes to train project staff to identify American peregrine falcons and understand their habitat requirements.

Implementation of YCWA's Bald Eagle and American Peregrine Falcon Management Plan (TR2) was supported by the Forest Service, in 4(e) condition 41; the Water Board, in preliminary 401 condition 19; and California DFW, in 10(j) recommendation 3.2. Forest Service 10(a) recommendation 10 recommends that the plan include non-NFS project lands. FWS fully supports YCWA's proposed measure.

Under the Bald Eagle and American Peregrine Falcon Management Plan, YCWA would record all incidental observations of other special-status raptor species to opportunistically gather data. YCWA would maintain a map of all special-status raptors and their nests surveyed or incidentally observed within the project vicinity. Annual employee training (GEN3) would also seek to reduce any potential adverse project effects on special-status raptors. This training would include a review of mitigation measures;

how to recognize signs of disturbance or distress to nesting and roosting bald eagles; maintaining nest buffers and limited operating periods; and identification of bald eagle, American peregrine falcon, golden eagle, osprey, and other special-status raptor species that are known to occur or have the potential to occur in the project vicinity.

The proposed Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan would allow YCWA to continue to collect woody material floating on New Bullards Bar Reservoir and stockpile the wood in the coves at Garden Point Peninsula for later burn or disposal. Because this activity could affect bald eagles, the plan includes measures to implement a limited operating period (January 1 through August 30) and a 0.25-mile buffer to avoid adverse effects on nesting bald eagles on the Garden Point Peninsula. Wintering bald eagles on the reservoir would be protected by restricting activities from November 15 through March 15 within 0.25-mile of the NMWSE and within 0.25 mile of the dam and any winter night roosts. Also, to avoid disturbance to American peregrine falcon during construction of the proposed New Bullards Bar Dam auxiliary flood control outlet, YCWA would implement nest buffers, limit operating periods, and perform nest surveys as described above.

The Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2) has one mitigation measure to reduce effects on great gray owls during mechanical sediment removal at the Log Cabin Diversion Dam. YCWA would determine the current status and location (specific road segment) of great gray owl activity area through discussion with the TNF, Yuba River District Biologist. Prior to hauling sediment, YCWA would install appropriate barriers along an approximate 400-foot segment of road where great gray owls are active, as determined by the TNF, to avoid collisions between owls and trucks. These barriers would be 6 feet tall and constructed of temporary construction fencing raised 18 inches off the ground to allow smaller animals to pass underneath. They would be installed on the downhill side of the road segment. Perching deterrents, such as snow poles, would be placed onto metal road posts on the uphill side of the road segment. All YCWA contractor truck drivers would be informed of the presence of great gray owls, provided with identification cards, and asked to report sightings to the TNF and California DFW.

Our Analysis

Operation and maintenance activities, such as invasive species control, facility maintenance and construction, helicopter use for project inspections, and road and recreation area maintenance could create noise near active nests and winter roosting sites of special-status birds in the project area. Recreation users such as hikers, fishermen, and boaters could cause similar disturbances. Vegetation management activities could also result in the removal of nest or roost trees. Activities that require extended human presence or involving heavy equipment (e.g., backhoe or tracked equipment) or loud mechanized equipment (e.g., chainsaws, weed whackers, shredders, or chippers) would have the greatest potential adverse effect on these species. For example, bald eagles can

be sensitive to increased noise during the nesting period, and such disturbance could result in nest abandonment or reduced nesting success.

Project activities that require any vegetation manipulation would likely have the greatest effect on special-status birds in the project area. The protection measures set forth in the Integrated Vegetation Management Plan (TR1) include specific buffers around nests, limited operating periods, and survey requirements that are specifically described for each of the discussed special-status birds. Our analysis finds that these measures would be sufficient to ensure that project effects on these birds are minimized.

Removing and disposing floating debris, removing hazard trees, and reducing ladder fuels in administrative areas could potentially affect bald eagles on New Bullards Bar Reservoir. As a previously ESA-listed species, these activities were the subject of a 2004 FWS *Biological Opinion for the New Bullards Bar Reservoir Safety and Annual Maintenance Project.* Since YCWA proposes no changes to its Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan, the ongoing actions are unlikely to cause take of bald eagles, as defined under the Bald and Golden Eagle Protection Act.

Implementation of YCWA's proposed Bald Eagle and American Peregrine Falcon Management Plan would assure that disturbance is minimized surrounding nests and associated habitats important for nest success. YCWA's proposed measures to protect American peregrine falcons and bald eagles during new project construction (e.g., the New Bullards Bar Dam auxiliary flood control outlet) would sufficiently protect both species. YCWA would conduct surveys for the known peregrine falcon eyrie near Englebright Dam and conduct surveys for new eyries at three areas with suitable habitat in the vicinity of project facilities during the first year of license issuance and every fifth year thereafter. The Forest Service is concerned that any new eyrie in the vicinity of the New Bullard Dam would not be identified by this survey schedule because peregrines do not necessarily nest every year. Construction of a new auxiliary flood control outlet on New Bullards Bar Dam and development of public access below the dam could potentially disturb and adversely affect nesting peregrine falcons in the dam vicinity. Modifying the proposed surveys for new eyries in the Bald Eagle and American Peregrine Falcon Management Plan to occur every year, or until a new eyrie is documented, would increase the likelihood that an unknown peregrine falcon nesting location would be identified and protected. During the nesting and fledging periods, YCWA would conduct additional surveys and implement a limited operating period for project operation and maintenance, construction, and other ground-disturbing activities that are within a 0.5-mile radius of documented American peregrine falcon eyries and all other suitable nesting habitat within the project area. In these areas and during the limited operating period, a 1-mile buffer would be implemented for project activities that require use of a helicopter or other aircraft, blasting, chainsaws, and other similar loud noises. These protections would remain in effect until August 15 unless: (1) nest surveys determine that an active nest is outside the work buffer specified for the activity; or (2) an occupied nest is found within the work buffer and either additional nest surveys

demonstrate that the young have fledged and the 14-day post-fledge period has concluded or approval is received from the California DFW, FWS, and the Forest Service (if on NFS lands). Additionally, surveys at documented eyries and searches for new eyries would be conducted when new project developments and other ground-disturbing activities and helicopter use are proposed within 1 mile of documented eyries and suitable nesting habitat in the project area.

According to the Forest Service, construction of the proposed West Shoreline Trail and future recreational use of the trail could affect a bald eagle nest near Milk Ranch. Although the exact location of this nest is unspecified, YCWA's Bald Eagle and American Peregrine Falcon Management Plan would provide adequate resources for conducting future surveys, including annual nest surveys, annual winter population surveys, and wintering night roost surveys, to document year-round bald eagle activity along the New Bullards Bar Reservoir shoreline. The plan also includes protective measures that would reduce any adverse effects on falcon nests, including a limited operating period for occupied nests, water and land barriers, and appropriate signage to delineate a buffer of restricted activity. YCWA's plan is consistent with the FWS National Bald Eagle Management Guidelines (FWS, 2007) and is supported by the resource agencies and environmental organizations.

Recording incidental observations of other special-status raptor species during surveys for bald eagles and American peregrine falcons would also serve to increase data regarding the occurrence of those species, although the forested habitats typically occupied by northern goshawk, great gray owl, or California spotted owl would not be surveyed. Northern goshawk and California spotted owl are forest raptors that are sensitive to disturbance while nesting, and human activity could result in nest abandonment or nest failure. Potential project activities that could lead to nest disturbances include vegetation management, recreation activities, and facility maintenance. The location of two known northern goshawk occurrences and one northern goshawk nest are more than 5 miles from any project dam, powerhouse, or recreation facility. Therefore, ongoing project operation and maintenance, as well recreation within the project area (e.g., campgrounds), would likely have no effect on nesting northern goshawks. Project activities may affect California spotted owl because the abundance of nesting territories within the project area is higher than northern goshawk territories. However, most project activities are ongoing, routine, and limited in duration, and effects would be similar to existing conditions. Other periodic, non-routine removal of hazard trees, emergency facility repairs, and some recreation activities may affect nesting California spotted owl, especially if they occur during the breeding period.

Project operation and maintenance activities associated with the Log Cabin Diversion Dam impoundment would likely affect great gray owl, which reportedly nests within 1 mile of the Log Cabin Diversion Dam impoundment and access road. This state endangered species and Forest Service sensitive species is known to forage nearby along a section of the Ridge Road haul route (as of 2014). Potential effects would include daily visits, monthly maintenance, and an annual safety inspection. On the Log Cabin

Diversion Dam access road, annual surface maintenance and vegetation management could disturb the nesting pair. While no formal recreation facilities exist at the Log Cabin Diversion Dam impoundment, the public does use the area for fishing. Additionally, an active mining claim exists immediately upstream of the impoundment on Oregon Creek.

Sediment removal operations at Log Cabin Diversion Dam would potentially affect great gray owls if conducted near to either the unspecified nest location or important foraging areas, the latter of which has been documented along the Ridge Road haul route. The proposed mitigation measures would discourage gray owl from perching near the road or flying across the road, reducing potential for vehicular collisions with sediment removal haul trucks. YCWA's proposed measure to provide drivers with information about great gray owls and notify California DFW and the Forest Service if owls are observed would ensure drivers are aware of the issue and allow the agencies to track effects during sediment removal activities.

There are only three known occurrences of golden eagles in the project area, and none of these occurrences include nesting birds or evidence of nesting activities. This suggests golden eagles are nonresident visitors to the project area and a renewed project license would have no effect on nesting golden eagles. Furthermore, no information suggests that project dams, powerhouses, or operation and maintenance activities negatively affect golden eagles.

Foothill Yellow-legged Frog

Effects of Streamflows—New minimum flows, ramping rates, and flow pulses associated with continued operation of the project could affect water velocity, water levels, temperature, and channel morphology in reaches with foothill yellow-legged frogs. Flow changes and related alterations in water temperature would influence when foothill yellow-legged frogs breed because they time their breeding with the recession of spring river runoff, when river flows decrease and water temperatures increase.

YCWA proposes to avoid the release of high flows during sensitive life history periods and would consider the needs of foothill yellow-legged frog when developing minimum flow levels. YCWA's proposed spill cessation schedule for Our House Diversion Dam (AR2) and Log Cabin Diversion Dam (AR12) would minimize the frequency and magnitude of flow changes with the potential to adversely affect foothill yellow-legged frog. These measures would be in effect from April 1 or May 1 (depending on water year type) through July 31 of each year, encompassing the period during which foothill yellow-legged frog breeding and early development is most likely to occur.

YCWA's proposed Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2), which is designed to pass sediment though Our House and Log Cabin Diversion Dams, includes information about how sediment would be passed through both diversion dams in most years. The plan also specifies how material would

be removed from both impoundments, transported, and disposed of after large storms, which may overwhelm regular sediment bypass operations in other years. YCWA's proposed measure AR7, to implement the Upper Yuba River Aquatic Monitoring Plan, would evaluate the fate and transport of that sediment. Specifically, YCWA would monitor channel substrates, channel topography, residual pool depths, and fine sediment in pools at two sites in the Middle Yuba River, one site in Oregon Creek, and one site on the North Yuba River. Monitoring would occur once in 2 years in every 10-year period. Under proposed measure AR7, YCWA would provide a monitoring report to interested agencies for review and comment prior to filing the report with the Commission.

In preliminary 401 condition 5, the Water Board states that it would likely require YCWA to provide instream flow recession rates for spill events at New Bullards Bar Dam, Log Cabin Diversion Dam, and Our House Diversion Dam. The Water Board states this measure would prevent potential adverse effects on foothill yellow-legged frog caused by rapid changes in regulated streamflow that are inconsistent with recession rates that would occur on a natural hydrograph. The proposed spill cessation schedule provides for a stepped reduction in spills so that downramping is gradual.

FWS supports the proposed recession rates and expects they would adequately protect foothill yellow-legged frog downstream of the dams in Oregon Creek and the Middle Yuba River. FWS recommends that the results from the foothill yellow-legged frog monitoring be evaluated at the annual stakeholder meeting (GEN1) to determine if adjustments to the recession rates are necessary to adequately protect the species.

Our Analysis

The foothill yellow-legged frog is unique because it is the only river-breeding frog in California. The primary project-related risks to foothill yellow-legged frogs result from altered flow regimes and flow fluctuations because the species' life history is adapted to the natural hydrograph of rivers it inhabits. Changes in water management under a new license could increase stress on frogs, influencing the timing of breeding or reducing reproductive success. They generally start breeding once water temperatures reach 10 to 12°C and lay their egg masses under river rocks on the edges of creeks and rivers (see Hayes et al., 2016, table 1). Reduced water temperatures during tadpole rearing periods could increase development time and reduce size at metamorphosis, potentially resulting in poor or no recruitment. Unnaturally high flows can dislodge egg masses and wash tadpoles and adults downstream into unsuitable habitat, which could increase mortality. Conversely, pulse flows can rapidly dewater habitat as flows recede and can kill yellow-legged frog eggs and tadpoles, which are vulnerable to stranding and desiccation (Yarnell et al., 2010; Kupferberg et al., 2012). The results of foothill yellow-legged surveys demonstrate these effects on the species—populations downstream of the project dams and reservoir were reduced (in the Middle Yuba River and Oregon Creek) or non-existent (in the North Yuba River and Middle Yuba/North Yuba Rivers). By comparison, California DFW (2017c) indicates that relatively robust populations of foothill yellow-legged frogs occur upstream of the project area, as

evidenced by surveys of upstream reaches for the Yuba-Bear Hydroelectric Project (FERC No. 2266). These differences are evidence of potential project effects on foothill yellow-legged frogs and support the rationale for protection, mitigation, and enhancement measures, including proposed minimum flows, ramping rates, sediment regimes, and spill management below the project dams.

Foothill yellow-legged frog egg development time typically ranges from 5 to 30 days (Zweifel, 1955; Kupferberg, 1996), depending on water temperature (Ashton, Lind, and Schlick, 1998), and most egg masses are laid at water depths of 1 foot or less (Yarnell et al., 2010). Survival of foothill yellow-legged frog egg masses depends on consistency in both water depth and velocity (Hayes et al., 2016). Eliminating unnatural high flows in the spring and summer would reduce potential egg scouring and tadpole mortality. YCWA's proposed recession rates would help protect foothill yellow-legged frog egg masses from stranding due to dewatering by eliminating unnaturally fast recession rates. YCWA's proposed minimum flows on Oregon Creek downstream of Log Cabin Diversion Dam and on the Middle Yuba River below Our House Diversion Dam (AR1) are higher than current minimum flows and would provide more suitable habitat for foothill yellow-legged frog than current conditions. YCWA's proposed minimum flows below New Bullards Bar Dam would provide simulated water temperatures suitable for foothill yellow-legged frogs in the Yuba River downstream of the confluence of the North Yuba and Middle Yuba Rivers. However, increasing minimum flows below New Bullards Bar Dam as recommended by the resource agencies would provide suitable temperatures for salmonids for a smaller percentage of the time, compared to YCWA's proposal. YCWA also proposes to control spill events with measure AR4, which was would further increase habitat suitability for the foothill yellow-legged frog downstream of New Bullards Bar Dam. Furthermore, the new auxiliary flood control outlet at New Bullards Bar Dam would reduce peak flows during spill releases by allowing more water to be released earlier in anticipation of high flood control releases. High scouring flows would continue to occur in the North Yuba River, but YCWA's proposed measure AR11 and Forest Service 4(e) condition 35 would further reduce the magnitude of spill events in the North Yuba River downstream of New Bullards Bar Dam by periodically closing Lohman Ridge Diversion Tunnel and reducing the quantity of water diverted into New Bullards Bar Reservoir.

Changes in water temperature during breeding and tadpole development periods can affect foothill yellow-legged frog in regulated rivers. The foothill yellow-legged frog breeding period is triggered by water temperatures warming to 12°C following springtime high-water flows associated with snowmelt. In field and laboratory experiments, tadpoles reared at sites with daily average temperatures of 16.5°C to 22.2°C in July resulted in the highest survival rate, and frogs avoided water temperatures below 16°C (Catenazzi and Kupferberg, 2013). Avoiding the release of pulse flows between the date that water temperatures reach 10°C to 12°C and July 31 would help protect foothill yellow-legged frogs during their spring and summer periods of activity. YCWA proposes to change minimum instream flows (AR1), periodically close the Lohman

Ridge Diversion Tunnel (AR11), and control project spills (AR2 and AR12), which would generally maintain or reduce stream temperatures in Oregon Creek and Middle Yuba River. Temperature model results indicate YCWA's proposed minimum flows below New Bullards Bar Dam would provide water temperatures suitable for foothill yellow-legged frogs in the Yuba River downstream of the confluence of the North Yuba and Middle Yuba Rivers .

Temperature monitoring and field surveys of foothill yellow-legged frogs breeding downstream of dams in the Sierra Nevada has shown that reproductive populations are typically absent when average summer water temperatures are below 17.6°C. The most abundant populations occur where average summer water temperatures range from 20.3°C to 24.2°C (Kupferberg et al., 2012). YCWA's simulated water temperatures in project-affected reaches of Oregon Creek and the Middle Yuba River show that the proposed flows would have minimal overall effect on the frequency of temperatures favorable for foothill yellow-legged frog tadpole development at most locations, but could shift the timing of when they occur (YCWA, 2013e). The modeling of water temperature suggests that the proposed flows would have minimal effects on water temperatures during May, June, July, and August at locations immediately below Log Cabin Diversion Dam (RM 4.2) and Our House Diversion Dam (RM 12.6) (see table A-1). However, the proposed flow measures could cause water temperatures farther downstream in these reaches to warm later than under existing conditions, which may delay foothill yellow-legged frog breeding or increase development time, reduce size at metamorphosis, and potentially result in poor or no recruitment. YCWA argues that the proposed flow changes would not affect water temperatures enough to adversely affect the frog's breeding and rearing—an argument that is supported by the temperature modeling data. YCWA's proposed WR7 includes monitoring water temperature at 15-minute intervals at 14 stream locations from just downstream of the project's dams on the Middle Yuba River, Oregon Creek, and North Yuba River to just below the Yuba River confluence on the Feather River.[103] This long-term record of water temperature conditions in the project area would provide information for understanding project effects on foothill yellow-legged frog during the license term. In addition, the water temperature monitoring record would help to assess if increased minimum flows reduce the suitability of water temperatures for tadpole development, inform the timing of high-flow releases, and identify which periods are more desirable for project construction or facility maintenance activities that may interact with water conditions that affect foothill yellow-legged frogs. Monitoring conducted near known foothill yellow-legged

[103] YCWA proposes to monitor stream temperatures year-round at 13 stations, and from May into October of schedule 5, 6, and conference years at the station downstream of Daguerre Point Dam.

frog breeding areas from April 1 through September 15 would be sufficient to accomplish this goal.

The discharge of downstream sediment into Oregon Creek and the North Yuba River from Log Cabin and Our House Diversion Dams, respectively, could have beneficial or adverse effects on foothill yellow-legged frog. Currently, according to FWS, moderate-sized sediments (i.e., gravel and small cobbles) and shallow margin habitat are relatively scarce below Our House Diversion Dam, which may limit conditions for foothill yellow-legged frog breeding and rearing. We anticipate that opening the low-level outlets and passing sediment at the diversion dams would have beneficial effects on foothill yellow-legged frog because the passage of sediments would likely improve habitat by increasing the amount of substrate available for egg attachment and shallow margins for tadpoles. The Upper Yuba Aquatic Monitoring Plan (AR7) (Forest Service 4(e) condition 43), as designed, would provide data for future evaluation of project effects on channel morphology as they relate to foothill yellow-legged frog habitat, especially if the species is federally listed, but it does not include a mechanism for implementing future protective measures based on the data that would be collected.

Small populations of foothill yellow-legged frogs such as those in the project area are potentially not self-sustaining when abiotic factors (e.g., river flows and temperatures), biotic factors (e.g., bullfrog predation), or anthropogenic stressors (e.g., pesticide use) combine to decrease frog recruitment and survival. We conclude that YCWA's proposed changes to flows originating at Our House and Log Cabin Diversion Dams would have overall neutral or beneficial effects on foothill yellow-legged frogs within the project reaches. However, the degree to which YCWA's proposed hydrologic management would affect foothill yellow-legged frog habitat in the project area is uncertain. Monitoring populations of foothill yellow-legged frogs in Oregon Creek and the Middle Yuba River would quantify the benefits, or any adverse effects, of future project operation on the species; but, it would be difficult to develop a survey protocol that would isolate project effects. Increased minimum instream flows below New Bullards Bar Dam would discourage bullfrog population growth during dry water years, as would YCWA's measures to control spill events and augmenting gravel and LWM; however, their effects would not be great enough to adequately reduce the effects of bullfrogs on native frogs. We discuss the project's effects on bullfrog distribution and pesticide usage in further detail below.

Effects of American Bullfrogs

American bullfrog predation and competition is cited as a primary cause of foothill yellow-legged frog decline and range contraction in California. American bullfrog have become established downstream of both Our House and Log Cabin Diversion Dams and may threaten foothill yellow-legged frogs in the Middle Yuba River and Oregon Creek. YCWA documented a limited number of American bullfrogs on the Middle Yuba River, with one observation at a foothill yellow-legged frog survey site, in addition to incidental observations of bullfrogs on the Middle Yuba River and Oregon Creek. These

observations included first-year and second-year tadpoles in mid-channel, side channel, and backwater pools (YCWA, 2012f). In addition, bullfrogs occur in portions of the Yuba River downstream of New Bullards Bar Dam. YCWA has proposed focused American bullfrog suppression at Moran Cove and Little Oregon Creek as part of its Aquatic Invasive Species Management Plan (AR5), discussed above in section 3.3.2.2, in the subsection *Aquatic Invasive Species Management*. This recommendation pertains to California red-legged frogs, discussed below in section 3.3.4, *Threatened and Endangered Species*.

To protect foothill yellow-legged frog, FWS (10(j) recommendation 8) recommends that YCWA extend its American bullfrog suppression effort to include areas downstream of Our House and Log Cabin Diversion Dams in the event that foothill yellow-legged frogs become listed under the ESA. Such efforts would include timely surveys for bullfrogs downstream of the dams in late-spring and early summer of any below normal, dry, or critically dry water year following a normal, dry, or critically dry water year. If bullfrogs were detected in these reaches, FWS contends that bullfrog suppression efforts would be warranted.

YCWA argued that additional American bullfrog suppression efforts are not needed for two reasons: (1) if foothill yellow-legged frog become listed under the ESA and the project has a reasonable potential to affect it, the Commission would consult with the FWS under section 7; and (2) FWS has not demonstrated that its recommendation would provide any additional protection compared to YCWA's proposed measures. In comments on the draft EIS, YCWA also notes that bullfrog suppression would likely be ineffective because of the potential for recolonization.

Our Analysis

Foothill yellow-legged frog tadpoles are significantly less abundant in stream reaches where American bullfrogs occur; competition for food (algae) with large, second-year American bullfrog tadpoles and recently hatched first-year tadpoles is likely responsible. Small-scale, local control or eradication of American bullfrog may be effective early in an invasion or in relatively closed systems. However, no management approach has proven effective for large-scale control of existing populations of American bullfrog. Controlling the American bullfrog population in the project area would minimize their adverse effects on foothill yellow-legged frog in the Upper Yuba River. YCWA's proposed measure to increase the minimum instream flow downstream of these two diversions would also discourage bullfrogs and the risk that they spread the deadly,

invasive chytrid fungus[104] in these stream reaches because unnaturally low flows provide habitat that is suitable for bullfrogs.

During dry or critically dry water years, the absence of flushing flows could create stagnant pools that would provide bullfrog breeding habitat. However, once established, bullfrog populations could persist through wetter water years. Under these conditions, additional measures may be required to suppress bullfrog populations to the extent that their effects on foothill yellow-legged frogs are adequately reduced. YCWA's Upper Yuba Aquatic Monitoring Plan (AR7) (Forest Service 4(e) condition 43) would provide data to indicate if bullfrogs are increasing within foothill yellow-legged frog habitat in Oregon Creek and the Middle Yuba River because foothill yellow-legged frog surveyors would also record the number of juvenile and adult American bullfrog seen or heard during the surveys and estimate the number and age classes of American bullfrog tadpoles within each monitoring site. However, if American bullfrog numbers appear to be increasing and are detected in these reaches, additional suppression efforts would benefit foothill yellow-legged frog. In comments on the draft EIS, YCWA states that no effective American bullfrog suppression strategies are available, and successful bullfrog eradication is usually labor-intensive and costly, with methods not applicable to large, open aquatic systems or elimination of established populations. We agree with this assessment. Few efficient and effective bullfrog control methods are available, and many previous efforts have failed (Adams and Pearl, 2007; Krauss, 2009; Snow and Witmer, 2010) and/or require sustained funding commitments (Simberloff, 2005; Hull and Rushton, 2012). Efforts resulting in bullfrog eradication include localized populations in relatively small lentic wetlands, and require intense monitoring (Adams and Pearl 2007). No studies of efforts to control invasive bullfrogs within riverine systems have been published, and evidence suggests that managing habitat rather than directly controlling bullfrogs may be a more effective way to reduce the effects of bullfrogs on native amphibians (Adams and Pearl, 2007). YCWA's proposed flows below the Our House and Log Cabin Diversion Dams would better mimic the natural hydrologic conditions of the Middle Yuba River and Oregon Creek and would thus be most effective in controlling bullfrogs by reducing the availability of stable lentic habitats (Fuller et al., 2010).

Effects of Pesticide Use

The active and inert ingredients of pesticides are known to have deleterious effects on amphibians. For example, glyphosate (the active ingredient in Roundup®) has been found to be poisonous to frogs and other amphibians and is extremely toxic to the tadpoles (Interior, 2017). According to the Integrated Vegetation Management Plan (TR1), YCWA currently does not use pesticides on NFS lands but could request to use

[104] The chytrid fungus affects the skin of amphibians, causing a disease known as amphibian chytridiomycosis and has been linked to dramatic population declines in amphibian species across the United States.

them in the future. On non-NFS land, YCWA would use a state-certified applicator to apply pesticides in spring at project facilities and on roads located on private land. New Colgate Power Tunnel and Narrows 2 Powerhouse access road are the two locations indicated that would have pesticides applied, although the boundaries of these areas are not defined. The Forest Service's guideline from its most recent Forest Plan is to avoid application of pesticides to areas within 500 feet of sites known to be occupied by sensitive amphibian species.

Our Analysis

In its Integrated Vegetation Management Plan, YCWA proposes that any pesticide use that is deemed necessary on NFS land within 500 feet of known locations of foothill yellow-legged frog would be designed to avoid adverse effects on individuals and their habitats. On NFS lands, YCWA would be responsible for conducting appropriate monitoring of these populations, as determined by the Forest Service, if pesticides need to be used within 500 feet of a known occurrence of a California red-legged frogs and/or foothill yellow-legged frog. This would adequately protect foothill yellow-legged frog and other sensitive amphibians on NFS lands. The application of this same buffer stipulation for pesticide use on non-federal lands would provide additional protections for the species throughout the entire project area. Also, the inclusion of BMPs for any pesticide use that is deemed necessary in the project boundary and within 500 feet of known locations of foothill yellow-legged frog would further avoid or minimize adverse effects on individuals and their habitats. In comments on the draft EIS, YCWA requests that this modification to the plan be excluded because the specifics of such protocols cannot be determined until a project requiring the use of pesticides within 500 feet of foothill yellow-legged frogs has been defined. However, we find that the inclusion of such BMPs would simply describe techniques that have been found to be effective, practical, and based on up-to-date research on the latest toxicological information for particular herbicides. BMPs would serve as guidelines to YCWA rather than site-specific treatment strategies.

Although studies have found differences in tolerance among developmental stages of amphibians, our analysis of studies indicates no general pattern of differential sensitivity to pollutants between embryos, larvae, and adults. Thus, extending pesticide restrictions around all suitable stream and rivers that could provide suitable habitat for foothill yellow-legged frog would more likely protect all potential occurrences of the species. In our analysis of the project's effects on California red-legged frog, in section 3.3.4, *Threatened and Endangered Species*, we found that an avoidance buffer of 260 feet around the mean high-water mark of all aquatic features would minimize any adverse impacts from pesticide use.

Effects of Project Construction

Project activities that require heavy equipment for work in the bed, banks, stream channels, impoundments, and adjacent wetland and riparian areas may have the potential

to affect all lifestages of foothill yellow-legged frog, depending on when and how activities are conducted. Affected reaches include the Middle Yuba River, above and below Our House Diversion Dam, and on Oregon Creek, above and below Log Cabin Diversion Dam. California DFW notes foothill yellow-legged frog were documented on the Middle Yuba River, immediately upstream of Our House Diversion Dam, which is where sediment removal activities are most likely to adversely affect the species.

Our Analysis

The proposed mechanical sediment removal at Log Cabin and Our House Diversion Dams would potentially have direct adverse effects on foothill yellow-legged frog. However, YCWA has outlined several BMPs that would avoid or minimize any effects on the species. For example, YCWA would conduct surveys for foothill yellow-legged frog to confirm that tadpoles are not present within the work area and would not permit activities until it receives concurrence from the Forest Service and California DFW. Also, surveys for foothill yellow-legged frog would be conducted, and a wildlife biologist would visit the work site daily for the duration of activities that involve water diversion, grading, excavation, vegetation removal, or other ground-disturbing activities. A wildlife biologist would also be employed to remove all fish, frogs, turtles, and other aquatic vertebrate species in accordance with YCWA's Fish Rescue and Salvage Plan developed in coordination with the Forest Service, California DFW, FWS, and the Water Board. YCWA describes several additional BMPs in this plan, which provide confidence that adequate protections for foothill yellow-legged frog would be provided. With implementation of these proposed measures, the effects of construction activities on foothill yellow-legged frogs would be limited.

Sensitive Amphibians Management Plan

In 10(j) recommendation 8, FWS recommends that YCWA develop a sensitive amphibians management plan in collaboration with the FWS, California DFW, and the Forest Service. Most of the topics that it recommends focus on California red-legged frog and are discussed later in section 3.3.4, *Threatened and Endangered Species*. FWS recommends that the following topics related to foothill yellow-legged frog be addressed[105]:

- A(i): bullfrog suppression efforts in Moran Cove as proposed by YCWA, and additional efforts in Oregon Creek and Middle Yuba River in event that foothill yellow-legged frog becomes federally listed;
- A(iv): direction for formal consultation with the FWS for any pesticides planned for use within the project area;

[105] Numbering follows FWS's recommendation in its letter filed August 25, 2017.

- A(v): evaluation of the status of chytrid fungus within the project area, its vectors for movement, and potential interactions between the disease and other stressors (i.e., pesticides, recreation, American bullfrog, and flows);
- A(vi): establishment of decontamination protocols for project activities that require movement from one waterbody to another;
- B: monitoring foothill yellow-legged frog populations within the project area;
- B(i): provisions that any hazard tree removal or fuels reduction/slash that is to be cleared will be removed within 24 hours, or will be left in place and not removed, or removed the same day it is cut and not be stored within 1,000 feet of a wetland, riparian area, or critical habitat; and
- B(ii): developing additional protection measures for when ground-disturbing actions are planned within 300 feet of wetlands and riparian areas.

YCWA indicates that these recommendations are unnecessary for several reasons: (1) consultation regarding ESA species would occur between the Commission and FWS prior to issuance of a new license; (2) the proposed conditions already address many of the recommended topics; (3) an evaluation of chytrid fungus has no project nexus; (4) YCWA has already included decontamination protocols in its proposed conditions; (5) the Upper Yuba Aquatic Monitoring Plan already provides adequate monitoring; and (6) requirements related to hazard tree removal and ground-disturbing activities are already included in the Integrated Vegetation Management Plan.

Our Analysis

The development of a sensitive amphibians management plan would provide adequate protections for foothill yellow-legged frog. However, YCWA notes that most of the suggested topics related to foothill yellow-legged frog are already addressed as part of its Upper Yuba River Aquatic Monitoring Plan (AR7) (Forest Service 4(e) condition 43). YCWA proposes to collect data on the distribution and abundance of foothill yellow-legged frog and would monitor foothill yellow-legged frog annually through visual encounter surveys at six stream reaches where suitable habitat exists or where foothill yellow-legged frog have been observed, including two reaches on the Middle Yuba River, one above and one below Our House Diversion Dam; two reaches of lower Oregon Creek; one reach at the confluence of the Middle Yuba and North Yuba Rivers; and one reach on the Yuba River above New Colgate Powerhouse. A survey schedule is provided in the plan for the duration of a 30-year license. As proposed, this monitoring would provide information regarding any population increase or decline in response to changes in flow conditions, or other project effects. The monitoring would also identify changes in habitat use and inform the need for protection measures identified in the Integrated Vegetation Management Plan. This information would be needed to adjust the locations of protection buffers near breeding sites, should new breeding sites become available in response to modified flow regimes in Oregon Creek and Middle Yuba River.

The plan, however, does not include provisions for requiring protective measures based on the monitoring data.

Additional provisions recommended by FWS to conserve foothill yellow-legged frogs that pertain to vegetation management were not included in YCWA's protection, mitigation, or enhancement measures. The Integrated Vegetation Management Plan provides several measures, which include: (1) consultation with the Forest Service prior to any hazard tree management; (2) performing surveys for special-status amphibians prior to hazard tree removal; (3) following the Forest Service BMPs (e.g., per chapter 10 of its *Soil and Water Conservation Handbook*, Forest Service, 2011); and (4) implementing equipment exclusion zones off roads within 100 feet of perennial streams or permanent bodies of water and within 50 feet of intermittent streams and ponds. These measures may not provide adequate buffer distances to protect frogs from hazard tree removal or other vegetation management activities. The potential for adverse effects on foothill yellow-legged frogs would be reduced by implementing BMPs when vegetation management activities occur within 300 feet of streams, wetlands, or other aquatic features. The need for avoidance buffers to protect suitable aquatic habitat for the ESA-listed California red-legged frog is discussed later in section 3.3.4, *Threatened and Endangered Species*.

Two other recommended issues not fully addressed by YCWA pertain to chytrid fungus. While we agree that an evaluation of the status of chytrid fungus in the project area would provide useful information, FWS provides no details on how this evaluation would be used to inform project operation or indicate how the project affects the spread of chytrid. The Aquatic Invasive Species Management Plan (AR5) addresses the establishment of decontamination protocols for project activities that require movement from one waterbody to another. Although this plan does not include any measures specific to chytrid fungus prevention, the decontamination protocols described in the plan would be effective at minimizing its potential spread. However, other project activities such as treatment of weeds in riparian areas, would require movement from one waterbody to another and could spread chytrid fungus or other undesirable aquatic invasive species. Ensuring procedures for decontaminating field equipment to prevent spread of aquatic pests and disease between waterbodies, as described in the Upper Yuba Aquatic Monitoring Plan, are applied to all activities where equipment is transported from one body of water to another would provide additional protections for fish and wildlife.

Western Pond Turtle

Water level fluctuations in New Bullards Bar Reservoir, Oregon Creek, and the Middle Yuba River, associated with project operation, could affect western pond turtle habitat by changing the availability of both basking substrates and the vegetated, shallow-water areas that are necessary for juvenile western pond turtles. Traffic associated with project operation and recreation, and maintenance activities such as pesticide applications, may also affect the species. YCWA proposes several measures

with potential to affect western pond turtle habitat, including: implementing the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Large Woody Material Management Plan (GS3); maintaining a minimum pool in New Bullards Bar Reservoir (WR5); modifications to spills at Our House and Log Cabin Diversion Dams (AR2); implementing the Upper Yuba River Aquatic Monitoring Plan (AR7); closures to the Lohman Ridge Diversion Tunnel (AR11); and implementing the Integrated Vegetation Management Plan (TR1). The specifics of WR5, AR2, and AR11 are discussed in section 3.3.2.2, in the subsections *Drought Management, Ramping Rates and Controlling Project Spills Upstream of Englebright Dam,* and *Fish Entrainment*, respectively.

The proposed Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Large Woody Material Management Plan states that if western pond turtle nesting sites are identified, YCWA would coordinate with the Forest Service and California DFW to determine appropriate protection measures for western pond turtles during woody material management activities.

The proposed Upper Yuba River Aquatic Monitoring Plan includes future surveys for western pond turtles at six locations: three in New Bullards Bar Reservoir; one in Our House Diversion Dam impoundment; one in Log Cabin Diversion Dam impoundment; and one in the Middle Yuba River. These sites would be the same locations as the pre-license sampling or where incidental observations of western pond turtle were reported, and would generally use the same methods, but with a greater emphasis on trapping to better collect information on age, size, and relative abundance of turtles. The surveys would occur twice between late May and the end of July during license year 3 and then once every fifth year thereafter.

The proposed Integrated Vegetation Management Plan states that if any nesting sites are identified in the future, YCWA would coordinate with the Forest Service (on NFS lands) and California DFW to determine appropriate protection measures. The plan also says that YCWA would make special considerations for western pond turtles and their habitats when considering the use of pesticides that are deemed necessary on NFS land within 500 feet of known locations of the species.

As described previously, the agencies support implementing the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Large Woody Material Management Plan (GS3); modifications to spills at Our House and Log Cabin Diversion Dams (AR2); implementing the Upper Yuba River Aquatic Monitoring Plan (AR7); closures to the Lohman Ridge Diversion Tunnel (AR11); and implementing the Integrated Vegetation Management Plan (TR1). There were no specific agency 10(a) or 10(j) recommendations or 4(e) conditions for western pond turtles.

Our Analysis

Western pond turtles nests were not found during relicensing studies in the project area. However, observations of western pond turtles in New Bullards Bar Reservoir at

Moran Cove, Garden Point, Tractor Cove (i.e., east of Garden Point), and the mouth of Indian Creek suggest that potentially suitable aquatic habitat and nesting habitat for western pond turtles is abundant in the reservoir. Some potential nesting habitat that was mapped around New Bullards Bar Reservoir occurs below the NMWSE. Thus, fluctuating reservoir water levels could cause western pond turtle nests to fail if eggs become inundated or too saturated. Water level fluctuations in New Bullards Bar Reservoir could also affect the availability of western pond turtle nesting and basking habitat, which tends to occur in coves and tributary mouths. Turtles would adjust their use of habitat based on existing conditions, and project effects would be minimal. Furthermore, because peak water surface elevation in the reservoir generally occurs in May or June, relatively little suitable nesting habitat below NMWSE is likely to be exposed during most of the May to July egg-laying season or during the 90- to 120-day incubation period. Therefore, reservoir water level fluctuations would be unlikely to affect availability of nesting habitat if any exists on New Bullards Bar Reservoir. Western pond turtles that inhabit river environments are adapted to the natural hydrologic cycles of wet winters and dry summers. As described above for foothill yellow-legged frog, YCWA's proposed flows at Our House and Log Cabin Diversion Dams would more closely resemble the natural hydrograph and would likely benefit western pond turtles in Oregon Creek and Middle Yuba River.

For western pond turtles that occupy Oregon Creek and Middle Yuba River, changes in project flows could change abundance of basking habitat and frequency of unseasonal high flows. The implementation of Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan (GS3) would increase downstream habitat quality and quantity by allowing woody material larger than 8 inches in diameter and up to 36 feet in length to pass downstream of the Our House and Log Cabin Diversion Dams. Western pond turtles could also be affected by project infrastructure, including roads and canals, because they spend a significant amount of time in upland environments (for nesting and overwintering). Project infrastructure could act as barriers to turtle movements, and collisions with vehicles could occasionally cause injury or mortality to western pond turtle, although no known instances have been reported within the project area. Vehicle traffic associated with project operation and maintenance and recreational use would be similar to existing conditions. Future training of project staff, in addition to wildlife monitoring over the term of the license, would document potential future effects of project infrastructure or roads on western pond turtle.

Potential entrainment of western pond turtles in project intakes would be a potential mortality source, although YCWA's focused surveys for western pond turtles in 2013 provided no evidence of entrainment of western pond turtle at either location (YCWA, 2013j). Entrainment of western pond turtle is unlikely partly because stream-dwelling western pond turtles typically leave stream environments in the autumn and over-winter on land. Therefore, closing the Lohman Ridge Diversion Tunnel (AR11) would have minimal effects on western pond turtle. This result was not surprising given the small number of western pond turtles that were tagged (n=2) and other evidence that

relatively few western pond turtles occur in the vicinity of the Log Cabin Diversion Dam impoundment and no individuals have been observed at Our House Diversion Dam. Repeated surveys in 2012 documented only one adult western pond turtle in the Log Cabin Diversion Dam impoundment.

3.3.3.3 Cumulative Effects

Riparian Vegetation

Riparian vegetation development in the lower Yuba River is constrained by a number of cumulative factors. Historical land use practices, including hydraulic mining, channelization, and development of dams in the watershed have resulted in a buildup of sediments in the floodplain and a lowering of the river channel. Habitat degradation from hydraulic mining was particularly severe from 1852 through 1906 from the immense influx of mining debris (estimated at 367 million cubic yards of sediment) causing aggradation on the order of 26 to 85 feet. Subsequently, the Corps constructed the Daguerre Point and Englebright Dams to trap sediment from the upper Yuba River. Additionally, the Sacramento River Flood Control Project levees were also constructed on the Yuba River and some tributaries to prevent flooding of valley communities. As a result, the historical floodplain is generally disconnected from the river and is not inundated on a regular basis.

Under more natural conditions, spring floods would scour vegetation and deposit sediments on the floodplain above the normal water level. When wetted by receding water levels, these deposits provide suitable conditions for cottonwood and willow seed germination. Under current conditions, high water levels do not spill onto the floodplain and development of riparian forest is limited. FWS, in cooperation with commercial aggregate suppliers and community conservation groups like SYRCL have implemented conservation projects to remove sediment and restore floodplain connectivity.

Operation of the project attenuates flood flows to some degree; however, YCWA studies found evidence of riparian vegetation establishment and survival at all survey sites. This indicates that project operation is supporting some regeneration of riparian forests, although the spatial extent is constrained by other factors. The buildup of sediments on the floodplain and channelization are the primary constraints on riparian vegetation in the lower Yuba River. YCWA's proposed spring pulse flow schedules, spill recession rates, and development of a lower Yuba River riparian restoration plan to plant 100 acres with riparian trees would continue to support regeneration of riparian forests where floodplain connectivity is present. Therefore, continued operation of the project would contribute to beneficial cumulative effect on this resource as restoration activities progress.

Mule Deer

Between the 1950s and 1990s, the mule deer population in the project area has declined substantially. Recent population estimates for both the Mooretown and

Downieville herds show a downward trend in population from an estimated high of more than 130,000 deer in 1991, to a low of fewer than 60,000 in 1995. Factors influencing population levels include habitat loss and conversion; habitat condition (acreage of habitat and quality of forage and cover); timber harvest and reforestation practices (e.g., biomass thinning, hardwood removal, and clear-cutting); livestock grazing; wildfire (prescribed fire and fires suppression); developments (residential, reservoirs, ski areas, golf courses, and agriculture); natural predation; hunting (legal and illegal); drowning; disease; weather; composition of the deer population relative to their habitat; competition with non-native wildlife species; and highway mortality. Factors associated with the continued operation of the project that could influence mule deer include the presence of the New Bullards Bar Reservoir, which could be considered a barrier to historical migration routes, and vegetation management, which could affect habitat. The reservoir has been part of the landscape for several decades and multiple mule deer generations. The herds have adjusted their migration routes, and the reservoir would have negligible effects on migration routes. Implementation of YCWA's proposed Integrated Vegetation Management Plan would protect deer habitat from invasive weeds. Therefore, continued operation of the project would have minor cumulative effects on mule deer.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Aquatic Species

Central Valley spring-run Chinook salmon, Central Valley steelhead, and North American green sturgeon are listed as threatened under the federal ESA and are under the jurisdiction of NMFS. NMFS manages Chinook salmon and EFH under the Magnuson-Stevens Fishery Conservation and Management Act. Information regarding these species is primarily from the draft Biological Assessment prepared by YCWA in 2014 (YCWA, 2014b).

Englebright Dam, located on the Yuba River about 24.3 river miles upstream of the Yuba River's confluence with the Feather River, has no fish passage facilities. Since its construction in 1941, the dam has been a complete barrier to fish migration. New Bullards Bar Dam on the North Yuba River and Our House Dam on the Middle Yuba River are also complete barriers to fish passage. Prior to the construction of dams in the basin, the South Yuba, Middle Yuba, and North Yuba Rivers are believed to have provided prime habitat for spring-run Chinook salmon and steelhead (Lindley et al., 2006; Yoshiyama et al., 1998; 2001). Both of these species currently occur in the lower Yuba River below Englebright Dam. NMFS (2014a) considers the elimination of access to historical spawning and rearing habitat upstream of Englebright Dam to be the greatest effect on listed salmonids in the Yuba River Watershed. In its 2009 Public Draft Recovery Plan for Central Valley Salmon and Steelhead, NMFS identified Englebright Dam as one of the dams where fish passage would contribute to recovery of the Central Valley spring-run Chinook salmon ESU and the Central Valley steelhead Distinct

Population Segment (DPS). In July 2014, NMFS published its recovery plan for the evolutionarily significant units of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the DPS of California Central Valley steelhead (NMFS, 2014b).

Central Valley Spring-run Chinook Salmon ESU

NMFS listed the Central Valley ESU of spring-run Chinook salmon as threatened on September 16, 1999 (64 FR 50394). On June 14, 2004, following a 5-year species-status review, NMFS proposed that the Central Valley spring-run Chinook salmon remain listed as threatened based on the Biological Review Team's strong majority opinion that the Central Valley spring-run Chinook ESU is ''likely to become endangered within the foreseeable future'' because of the greatly reduced distribution of Central Valley spring-run Chinook salmon and hatchery influences on the natural population. This threatened status was reaffirmed on June 28, 2005, when the Feather River Fish Hatchery spring-run Chinook salmon population, a part of the Central Valley spring-run Chinook salmon ESU, was included in the listing (70 FR 37160).

The California ESA (California Fish and Game Code sections 2050–2089) establishes various requirements and protections regarding species listed as threatened or endangered under state law. The California Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under the California ESA. Spring-run Chinook salmon in the Sacramento River Basin, including the lower Yuba River, was listed as threatened under the California ESA on February 2, 1999.

*Distribution and Abundanc*e—Adult spring-run Chinook salmon enter Sacramento River tributaries primarily from April through June as sexually immature fish and hold in deep, cold pools for several months before spawning. Spawning generally occurs between mid-August and October, peaking in September. In the Sacramento River Basin, studies have shown that water temperatures greater than 15.6°C are usually stressful for spawning adults, and developing eggs require water temperatures less than 14.4°C for normal development. Spring-run Chinook salmon typically spend 1 year or more rearing in fresh water before migrating to sea. Although rearing juvenile spring-run Chinook salmon can survive for short periods in water temperatures up to 25°C, evidence suggests that they can become physiologically stressed at temperatures above 18.3°C.

For the lower Yuba River, adult spring-run Chinook salmon immigration and holding has previously been reported to primarily occur from March through October (Vogel and Marine, 1991; YCWA et al., 2007), with upstream migration generally peaking in May (SWRI, 2002). The RMT's examination of preliminary data obtained from the infrared and videographic sampling system (operating from 2003–present) found variable temporal modalities of Chinook salmon ascending the fish ladders at Daguerre Point Dam. The RMT (2013) identified the spring-run Chinook salmon adult immigration and holding period as extending from April through September.

Previously, spring-run Chinook salmon in the lower Yuba River were reported to hold over during the summer in the deep pools and cool water downstream of the Narrows 1 and Narrows 2 Powerhouses or farther downstream in the Narrows Pool (California DFG, 1991; Water Board, 2003), where water depths can exceed 40 feet (YCWA et al., 2007). Congregations of adult Chinook salmon (approximately 30 to 100 fish) have been observed in the outlet pool at the base of the Narrows 2 Powerhouse, generally during late August or September. During this time period, the pool becomes clear enough to see the fish (YCWA, 2014b). While it is difficult to visually distinguish spring-run from fall-run Chinook salmon in this situation, the fact that these fish are congregated this far up the river at this time of year indicates that some of them are likely to be spring-run Chinook salmon (NMFS, 2007).

Central Valley-wide spring-run Chinook salmon abundance estimates are available on the internet through California DFW's GrandTab system (California DFW, 2016b). Since 1983, in-river estimates for the lower Feather River have not been included in the system-wide estimates, although Feather River Fish Hatchery estimates are provided separately. Additionally, spring-run Chinook salmon are not estimated in GrandTab for the lower Yuba River, and all lower Yuba River Chinook salmon escapement estimates are reported as fall-run Chinook salmon. For the Sacramento River system (excluding the Feather River Fish Hatchery and the lower Yuba River) since 1983, spring-run Chinook salmon run size estimates have ranged from a high of 24,903 in 1998 to a low of 1,195 in 2015. The abundance of in-river spawning Central Valley spring-run Chinook salmon declined from a high of 11,927 in 2008 to a low of 2,962 in 2010. It increased again to 18,688 in 2012 and 19,402 in 2013, then declined to 7,125 in 2014 and only 1,195 in 2015 (California DFW, 2016b). Spring-run Chinook salmon lifestages observed in the lower Yuba River are presented in table 3-59.

Table 3-59. Lifestage-specific periodicities for spring-run Chinook salmon in the lower Yuba River (Source: YCWA, 2014b).

Lifestage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spring-run Chinook Salmon												
Adult Immigration & Holding												
Spawning												
Embryo Incubation												
Fry Rearing												
Juvenile Rearing												
Juvenile Downstream Movement												
Smolt (Yearling+) Emigration												

Critical Habitat Designation—Critical habitat was designated for the Central Valley spring-run Chinook salmon ESU on September 2, 2005 (70 FR 52488), and includes stream reaches of the Feather and Yuba Rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear Creeks, the Sacramento River, and portions of its northern Delta. On the Yuba River, critical habitat is designated from the confluence with the Feather River upstream to Englebright Dam. This critical habitat includes the stream channels in the designated stream reaches and their lateral extents, as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent is defined by the bankfull elevation (defined as the level at which water begins to leave the channel and move into the floodplain; the level is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series) (70 FR 52488, September 2, 2005).

Steelhead

On March 19, 1998, NMFS listed the Central Valley steelhead as threatened (63 FR 13347). NMFS concluded that the risks to Central Valley steelhead had diminished since the completion of the 1996 status review, based on a review of existing and recently implemented state conservation efforts and federal management programs (e.g., Central Valley Project Improvement Act Anadromous Fish Restoration Project, CALFED Bay-Delta Program) that address key factors for the decline of this species. Furthermore, NMFS noted that additional actions benefiting Central Valley steelhead included efforts to enhance fisheries monitoring and conservation actions to address artificial propagation (NMFS, 2014b).

On September 8, 2000, pursuant to a July 10, 2000, rule issued by NMFS under section 4(d) of the ESA (16 U.S.C. § 1533(d)), the take restrictions that apply statutorily to endangered species began to apply with specific limitations to Central Valley steelhead (65 FR 42422). On January 5, 2006, NMFS reaffirmed the threatened status of the Central Valley steelhead and applied the DPS policy to the species because the resident and anadromous life forms of steelhead remain "markedly separated" as a consequence of physical, ecological, and behavioral factors, and may therefore warrant delineation as a separate DPS (71 FR 834). NMFS based its conclusion on conservation and protective efforts that, "mitigate the immediacy of extinction risk facing the Central Valley steelhead DPS" (NMFS, 2014b).

On January 5, 2006, NMFS issued a final decision that defined Central Valley steelhead as a DPS rather than an ESU and retained the status of Central Valley steelhead as threatened (71 FR 834). The DPS includes all naturally spawned anadromous *Oncorhynchus mykiss* (steelhead) populations below natural and human-made impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries (63 FR 13347). Steelhead in two artificial propagation programs—the Coleman National Fish Hatchery and Feather River Fish Hatchery steelhead hatchery programs are considered to be part of the DPS. NMFS determined that these artificially propagated stocks are no more

divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (71 FR 834).

Distribution and Abundance—Adult steelhead migrate upstream into the Sacramento River during most months of the year, beginning in July, peaking in September, and continuing through February or March (table 3-60). Steelhead adults typically spawn in small streams and tributaries where cool, well-oxygenated water is available year-round. Spawning occurs from December through April, peaking from January through March. During egg incubation, steelhead require water temperatures less than 12.8°C to ensure successful embryonic development. After hatching, steelhead have a highly variable life history strategy. Juveniles may rear in fresh water for 2 to 4 years before emigrating to the ocean, typically from April through June. In the Sacramento River Basin, steelhead generally emigrate as 2-year olds during spring and early summer months. Juvenile steelhead generally require water temperatures lower than 20°C to avoid physiological stress; however, some strains of Oncorhynchus mykiss have been shown to grow well at temperatures as high as 22°C and maintain weight at temperatures as high as 25°C. Information regarding steelhead observed in the project area is presented in tables 3-12 and 3-14.

Table 3-60. Lifestage-specific periodicities for steelhead in the lower Yuba River (Source: YCWA, 2014b).

Lifestage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Adult Immigration & Holding																								
Spawning																								
Embryo Incubation																								
Fry Rearing																								
Juvenile Rearing																								
Juvenile Downstream Movement																								
Smolt (Yearling+) Emigration																								

Critical Habitat Designation—On February 16, 2000 (65 FR 7764), NMFS published a final rule designating critical habitat for Central Valley steelhead. This critical habitat includes all river reaches accessible to listed steelhead in the Sacramento and San Joaquin Rivers and their tributaries in California, including the lower Yuba River upstream to Englebright Dam. NMFS proposed new critical habitat for spring-run Chinook salmon and Central Valley steelhead on December 10, 2004 (69 FR 71880), and published a final rule designating critical habitat for these species on September 2, 2005. This critical habitat includes the Yuba River (70 FR 52488) from the confluence with the lower Feather River upstream to Englebright Dam.

North American Green Sturgeon

The Southern DPS of North American green sturgeon was listed as federally threatened on April 7, 2006 (71 FR 17757), and includes the green sturgeon population spawning in the Sacramento River and using the Sacramento-San Joaquin River Delta, and San Francisco Estuary. The *Draft Environmental Assessment for the Proposed Application of Protective Regulations under Section 4(D) of the Endangered Species Act for the Threatened Southern Distinct Population Segment of North American Green Sturgeon* indicates that the Southern DPS of North American green sturgeon faces several threats to its survival, including the loss of spawning habitat in the upper Sacramento River, and potentially in the Feather and Yuba Rivers, due to migration barriers and instream alterations (NMFS, 2009a).

Distribution and Abundance—Few green sturgeon have been observed in the Yuba River historically or in recent years. The few confirmed observations occurred downstream of Daguerre Point Dam and were of adult green sturgeon. Green sturgeon acoustic tag detections do not indicate substantive use of the Yuba River (YCWA, 2013i). However, California DFW recently collected approximately 270 green sturgeon eggs downstream of Daguerre Point Dam. In its comments on the draft EIS, FWS states that these observations indicate that green sturgeon spawning conditions downstream of Daguerre Point Dam exist in wet and above normal water years.

Limited information regarding green sturgeon abundance, distribution, movement, and behavioral patterns and lifestage-specific habitat utilization preferences is available for the Sacramento and Feather Rivers. According to NMFS (2009b), the current population status of the Southern DPS of North American green sturgeon is unknown. Currently, no reliable data on population sizes are available, and population trends are lacking (NMFS, 2009c). Insufficient information is available to evaluate the productivity of green sturgeon (NMFS, 2009c), and recruitment data for green sturgeon are essentially nonexistent (NMFS, 2009b). Essentially no information regarding these topics is available for the lower Yuba River.

Critical Habitat Designation—On October 9, 2009, NMFS (74 FR 52300) designated critical habitat for the Southern DPS of North American green sturgeon. This designated critical habitat includes most of the DPS' occupied range, including: (1) coastal marine waters from Monterey Bay to the Washington/Canada border; (2) coastal bays and estuaries in California, Oregon, and Washington; and (3) fresh water rivers in California's Central Valley. In the Central Valley, critical habitat for green sturgeon includes the Sacramento River, lower Feather River, lower Yuba River, the Sacramento-San Joaquin River Delta, and San Francisco Estuary. NMFS (74 FR 52300) defined specific habitat areas in the Sacramento, Feather, and Yuba Rivers in California to include riverine habitat from each river mouth upstream to and including the farthest known site of historical and/or current sighting or capture of North American green sturgeon, as long as the site is still accessible. Critical habitat in the lower Yuba River

includes the stream channels to the ordinary high water line extending from the confluence with the mainstem Feather River upstream to Daguerre Point Dam.

Salmon/Steelhead Recovery Plan

Section 4(f) of the ESA (16 U.S.C. § 1533(f)) directs NMFS to develop and implement recovery plans for the conservation and survival of ESA-listed species under NMFS's authority. On July 22, 2014, NMFS published its adoption of a *Final Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead* (79 FR 42504) (NMFS, 2014b).

The recommended recovery actions under the NMFS recovery plan on the Yuba River include:

- Develop and implement a program to reintroduce spring-run Chinook salmon and steelhead to historical habitats upstream of Englebright Dam. The program should include feasibility studies, habitat evaluations, fish passage design studies, and a pilot reintroduction phase prior to implementation of the long-term reintroduction program.
- Develop programs and implement projects that promote natural river processes, including projects that add riparian habitat and instream cover.
- Modify Daguerre Point Dam to provide unobstructed volitional upstream passage of adult steelhead and Chinook salmon (and sturgeon) and to minimize predation of juveniles moving downstream.
- Develop and implement a LWM restoration program along the lower Yuba River utilizing sources of wood that enter upstream reservoirs.
- Increase floodplain habitat availability in the lower Yuba River.
- Curtail further development in active Yuba River floodplains through zoning restrictions, county master plans, and other Federal, State, and county planning and regulatory processes.
- Create and restore side channel habitats to increase the quantity and quality of off-channel rearing and spawning areas in the Yuba River.
- Federal, state, and local agencies should use their authorities to develop and implement programs and projects that focus on retaining, restoring and creating river riparian corridors within their jurisdiction in the Yuba River watershed.
- Implement flow fluctuation and ramping rates found to be protective of embryos and juveniles.
- Implement programs and measures designed to minimize predation by non-native fish in the Yuba River, including harvest management techniques

and programs for non-native predators (e.g., striped bass, largemouth bass, and smallmouth bass).

- Improve efficiency of screening devices at Hallwood-Cordua and Brophy-South Yuba water diversions, and construct screens at unscreened diversions.
- Evaluate whether salmonid straying between the Feather and Yuba Rivers can be minimized through flow management.
- Identify the benefits, risks, and costs associated with various techniques and locations for spatially segregating spring-run Chinook salmon and fall-run Chinook salmon during spawning in the Yuba River. If the benefits sufficiently outweigh the risks and costs, then implement a project to segregate spring- and fall-run Chinook salmon.

While all of the above measures are applicable to the Yuba River, not all of them have a direct link to project operations. The project's consistency with the recovery plan is provided in section 3.3.4.2, *Environmental Effects*.

Proposed construction activities associated with the tailrace depression system, New Bullards Bar Dam auxiliary flood control outlet, modifications to the Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets, modification to the gates at Lohman Ridge Diversion Tunnel, and construction of various recreation facilities would have no effect on listed fish species, except as discussed below.

Terrestrial Species

California Red-legged Frog

California red-legged frog was listed as threatened in 1996. FWS designated critical habitat for this species in 2010. The California red-legged frog is primarily associated with perennial ponds or pools and slow-moving perennial or seasonal streams where water remains continuously for a minimum of 20 weeks beginning in the spring (i.e., sufficiently long for breeding to occur and tadpoles to complete development). The California red-legged frog is not expected to breed successfully at sites holding water for less than 15 weeks. The minimum depth of breeding habitat is 20 inches; however, deep water pools, ponds, and lake areas are not suitable. Dense, shrubby riparian vegetation (e.g., willow, bullrush, and tule species) and bank overhangs are important features of California red-legged frog breeding habitat, although they sometimes use sites that lack these features. Locations with the highest densities of California red-legged frogs exhibit dense emergent or shoreline riparian vegetation closely associated with moderately deep (greater than 2.3 feet), still, or slow-moving water.

Distribution and Abundance—The current range of California red-legged frogs is greatly reduced, with most remaining populations found along the coast from Marin County to Ventura County. In the Sierra Nevada foothills, where the species was once

widespread, there are only six known extant populations, most of which contain few adults (75 FR 12815). The most recent observation of California red-legged frogs in the project area was in 2005, within a mile of New Bullards Bar Reservoir near Little Oregon Creek. This observation is within FWS-designated critical habitat, discussed below, and is the only documented occurrence of California red-legged frog in the project area. No California red-legged frogs were observed during habitat assessments or other project-related studies; however, protocol-level surveys were not conducted.

In its prelicensing study, YCWA (2013k) identified 274 aquatic habitat locations for site assessments. The results of this habitat characterization study indicated the presence of at least 182 aquatic habitat sites within the study area, which covered areas within 1 mile of the project or project-affected stream reaches, that are potentially suitable as California red-legged frog breeding habitat. None of the project impoundments or project-affected streams provide documented breeding habitat for this species. The stream reaches on Oregon Creek, Middle Yuba River, and the Yuba River could represent non-breeding or dispersal habitat for the frog.

Loss and degradation of existing habitat from urban development, agriculture, mining, and water development are ongoing threats to California red-legged frog. Other factors that cause population declines or limit recovery include contamination from pesticides and diseases, such as chytrid fungus and ranavirus. In addition, American bullfrog is a non-native invasive predator that threatens California red-legged frogs through predation and competition.

Critical Habitat Designation—FWS-designated critical habitat unit YUB-1 encompasses 6,322 acres around the documented historical occurrence of California red-legged frog near Little Oregon Creek. The California red-legged frog study area (1-mile project buffer) includes 2,562 acres of YUB-1, which encompasses the area surrounding Moran Cove, where Little Oregon Creek enters the reservoir, as well as upstream portions of the Little Oregon Creek watershed. This critical habitat includes the only records of California red-legged frog occurrences within the project area, a population that is presumed extant despite any confirmed sightings since 2005. The occurrences were within two small, spring-fed depressions near Oregon Hill Road, about 0.5-mile west of New Bullards Bar Reservoir. These wetlands are close to Little Oregon Creek, a tributary to New Bullards Bar Reservoir, and are within an area with evidence of substantial historical mining excavations and tailings.

The primary constituent elements (PCEs) of California red-legged frog critical habitat are aquatic areas for breeding (PCE 1), as described above, non-breeding habitat (PCE 2), and upland habitat for foraging and shelter (PCE 3), interconnected by unfragmented dispersal habitat (PCE 4). Outside the breeding season, adult California red-legged frog may disperse upstream, downstream, or upslope of breeding habitat to forage and seek shelter in small-mammal burrows, leaf litter, and other moist sites near riparian areas. The PCE for nonbreeding upland habitat (PCE 3), as identified in the

2006 final critical habitat designation, was limited to upland areas within 200 feet of a water feature. However, data from new studies led FWS to revise its critical habitat designation in 2010, allowing for the determination of upland critical habitat to be made on a case-by-case basis. In general, the upland habitat surrounding aquatic breeding (PCE 1) and non-breeding habitat (PCE 2) is within 300 feet of an aquatic feature, depending on the surrounding landscape. Suitable dispersal habitat (PCE 4) consists of all upland and wetland habitat that connect two or more patches of aquatic breeding habitat that is free of barriers and that connects two or more patches of aquatic breeding habitat within 0.7 mile of one another. Dispersal barriers would include heavily traveled roads or moderate to high density human development (75 FR 12815).

Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetle was listed as threatened in 1980. FWS has designated critical habitat for this species. The valley elderberry longhorn beetle is associated with various species of elderberry (*Sambucus* spp.) throughout the California Central Valley and foothills below 3,000 feet mean sea level. The project is outside the designated critical habitat zones, but portions of the project are within the potential habitat range of the beetle. The valley elderberry longhorn beetle occurs within riparian vegetation communities where it feeds exclusively on elderberry in both adult and larval stages. Adult valley elderberry longhorn beetles appear to feed externally on the flowers and foliage of the elderberry. Adult females lay eggs in crevices in the bark of the host elderberry plant. After hatching, larvae spend 1 to 2 years feeding inside the plant. Prior to pupating, valley elderberry longhorn beetle larvae chew an exit hole in the elderberry trunk for the emerging adult, leaving boreholes in the elderberry stems.

YCWA (2012i) conducted surveys in 2012 for elderberry plants following the California Department of Fish and Game's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (California DFW, 2009). Surveyors examined elderberry plants for evidence of valley elderberry longhorn beetle presence. The study included the area surrounding all project facilities within the project boundary. In addition, YCWA surveyed 2.5 miles of Garden Valley Road and two unnamed spur roads that had been added to the project area in 2014. In 2015, YCWA surveyed an additional 22.4 acres surrounding the proposed new auxiliary flood control outlet at New Bullards Bar Dam for elderberry shrub and valley elderberry longhorn beetle presence. YCWA located one elderberry plant on land managed by the Sierra Foothill Research and Extension Center of the University of California. The plant was found in a non-riparian community dominated by annual grasses and blue oak, about 20 feet from the northeast edge of the Narrows 2 access road and separated from the road by a fence. Surveyors reported eight stems, two with a diameter of 3.5 inches at the ground and six that were less than 3 inches. No boreholes were observed.

Stebbin's Morning Glory

Stebbin's morning glory was listed as endangered under the ESA in 1996. FWS has not designated critical habitat for this species. Stebbin's morning glory is a leafy herbaceous perennial that flowers from April to June. This species occurs in chaparral and woodland habitats with gabbro soils in the central Sierra Nevada foothills. FWS cites habitat loss and ecologic effects of wildfire suppression as primary threats for this species. The Pilot Hill, Grass Valley, and Lake Combie USGS quad maps include known locations of this plant; however, this species was not encountered during YCWA's surveys for sensitive plants conducted between March 26 and July 29, 2012 (YCWA, 2012d). The species was not detected during May 13 and June 13, 2014, surveys of 2.5 miles of Garden Valley Road and two unnamed spur roads that had been added to the proposed project boundary. Nor was it detected during the March 30, 2015, survey of an additional 22.4 acres as part of the proposed New Bullards Bar Dam auxiliary flood control outlet (YCWA, 2017a). Because this species does not occur in the area of project effects, granting YCWA a new project license would have no effect on Stebbin's morning glory, and no further discussion is warranted.

Pine Hill Flannelbush

Pine Hill flannelbush was listed as endangered under the ESA in 2002. FWS has not designated critical habitat for this species. Pine Hill flannelbush is a small evergreen shrub that flowers from late April to early July. This species occurs in chaparral and woodland habitats with gabbro or serpentine soils in the central Sierra Nevada foothills. FWS cites habitat loss, fragmentation, and ecologic effects of wildfire suppression as primary threats for this species. This species is known from one localized area in the Grass Valley USGS quad map but was not encountered during YCWA's surveys for sensitive plants conducted between March 26 and July 29, 2012 (YCWA, 2012d). The species was not detected during the May 13 and June 13, 2014, surveys of 2.5 miles of Garden Valley Road and two unnamed spur roads that had been added to the proposed project boundary. Nor was it detected during the March 30, 2015, survey of an additional 22.4 acres as part of the proposed New Bullards Bar Dam auxiliary flood control outlet (YCWA, 2017a). Because this species does not occur within the area of project effects and is not likely to colonize the project area, granting YCWA a new project license would have no effect on Pine Hill flannelbush, and no further discussion is warranted.

Layne's Ragwort

Lane's ragwort was listed as endangered under the ESA in 1996. FWS has not designated critical habitat for this species. Lane's ragwort is a perennial aster that flowers from April to August. This species occurs in chaparral and woodland habitats with gabbro or serpentine soils in the central Sierra Nevada foothills. FWS cites habitat loss and fragmentation as primary threats for this species. The Rackerby, Challenge, and Clipper Mills USGS quad maps, show known locations of this plant, including one population 0.6-mile west of upper New Bullards Bar Reservoir and one population east of

Indian Creek. However, this species was not encountered during YCWA's surveys for sensitive plants conducted between March 26 and July 29, 2012 (YCWA, 2012d). The species was not detected during the May 13 and June 13, 2014, surveys of 2.5 miles of Garden Valley Road and two unnamed spur roads that had been added to the proposed project boundary. Nor was it detected during the March 30, 2015, survey of an additional 22.4 acres as part of the proposed New Bullards Bar Dam auxiliary flood control outlet (YCWA, 2017a). Because this species does not occur within the area of project effects and is not likely to colonize the project area, granting YCWA a new project license would have no effect on Lane's ragwort, and no further discussion is warranted.

Hartweg's Golden Sunburst

Hartweg's golden sunburst was listed as endangered under the ESA in 1997. FWS has not designated critical habitat for this species. Hartweg's golden sunburst is a small annual herb that flowers from March through April. This species occurs in foothill grassland and cismontane woodland within California's Central Valley, primarily on shallow, well-drained, fine-textured soils, and nearly always on the north or northeast facing side of Mima mounds.[106] Today, the eastern edge of the San Joaquin Valley is home to 16 populations. Remaining populations are concentrated in the Friant region of Fresno and Madera Counties and the La Grange region in Stanislaus County. This species is known from one localized area in the Grass Valley USGS quad map and was not encountered during YCWA's surveys for sensitive plants conducted between March 26 and July 29, 2012 (YCWA, 2012d). The species was not detected during the May 13 and June 13, 2014, surveys of 2.5 miles of Garden Valley Road and two unnamed spur roads that had been added to the proposed project boundary. Nor was it detected during the March 30, 2015, survey of an additional 22.4 acres as part of the proposed New Bullards Bar Dam auxiliary flood control outlet (YCWA, 2017a). Because this species does not occur in the area of project effects, granting YCWA a new project license would have no effect on Hartweg's golden sunburst, and no further discussion is warranted.

Brachipods

Vernal pool fairy shrimp and vernal pool tadpole shrimp were listed as threatened in 1984. The revised final rule for critical habitat was published in 2006; however, the project area does not contain any critical habitat.

Fairy shrimp are generally restricted to seasonal aquatic habitats (vernal pools) where predatory fish do not occur. When the pool dries, the eggs dry and remain dormant in the dry pool bed until rain and other environmental stimuli cause them to hatch. In California, the vernal pool fairy shrimp occurs from Shasta County south to

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[106] Mima mounds are mounds of earth roughly 1 to 6 feet high and 10 to 100 feet in diameter at the base, interspersed with basins that may pond water in the rainy season.

Tulare County. Most of the known occurrences are on the eastern side of the Central Valley and in the central Coast Ranges, with disjunct populations in San Luis Obispo County, Santa Barbara County, and Riverside County, California. The vernal pool tadpole shrimp is currently distributed across the Central Valley of California and in the San Francisco Bay area. No vernal pool habitat exists within the project boundary or in areas with project effects. Therefore, granting YCWA a new project license would have no effect on ESA-listed brachiopods, and no further discussion is warranted.

Proposed construction activities associated with the tailrace depression system, New Bullards Bar Dam auxiliary flood control outlet, modifications to the Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets, modification to the gates at Lohman Ridge Diversion Tunnel, and construction of various recreation facilities would have no effect on listed plant and animal species, except as discussed below.

3.3.4.2 Environmental Effects

Review of Listed Species during the License Period

As described above in section 3.3.3.2, in the subsection *Special-status Plants*, YCWA's proposed measure GEN2 would provide for an annual review of ESA-listed and special-status species, thereby, assuring an up-to-date understanding of threatened and endangered species that may be affected by the project. FWS comments that an annual review is not consistent with the ESA because species lists cover a period of 90 days, and it is not clear how YCWA would respond to a new listing between the listing and the annual review. Thus, FWS, in 10(j) recommendation 6, recommends that YCWA develop new list of threatened and endangered species every 120 days and consult with FWS if a new species is listed. In addition, the recommendation would require YCWA to: (1) complete ESA consultation prior to initiating project improvements; (2) contact FWS if a hazardous materials spill occurs; (3) consult with FWS regarding use of pesticides; and (4) perform surveys for elderberry shrubs prior to the start of project activities and consult with FWS if the surveys find elderberry shrubs. NMFS 10(j) recommendation 7 supports YCWA's proposal.

YCWA's proposal to conduct an annual review of federally listed and special-status species lists is consistent with the Forest Service 4(e) condition 30, and FWN supports the annual review of species measure with the modification to expand to lands "immediately adjacent to" the project boundary and to not limit review "to NFS lands." The Water Board (preliminary 401 condition 29) reserves its authority to require additional conditions if new species are listed or new effects identified.

Our Analysis

An annual review, or more frequent review recommended by FWS, could increase the opportunities to determine if the project could affect newly listed or detected species. The process of annual consultation regarding ESA-listed species would allow the agencies to provide input based on unpublished data and other sources of information that

may not be publicly available. Although we recognize the benefits of periodic review of threatened, endangered, and special-status species and their habitats, the Commission, FWS, and NMFS have developed a framework to address post-licensing ESA issues (FERC et al., 2000), including the need for consultation, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff*. In addition, the Commission typically includes a standard license article with a fish and wildlife reopener provision in its licenses that can be used to address post-licensing ESA issues. Therefore, the additional requirement for annual or more frequent review of special-status species would have limited additional environmental benefits.

Aquatic Species

Central Valley Spring-run Chinook Salmon and Central Valley Steelhead

YCWA's proposal includes a number of construction-related modifications or enhancements to existing project facilities and features located in the upper watershed at and around New Bullards Bar Dam and Reservoir, or at or near project facilities on the Middle Yuba River or Oregon Creek. These actions include construction of the New Colgate Powerhouse tailwater depression system; construction of the New Bullards Bar Dam auxiliary flood control outlet; modifications to Lohman Ridge Diversion Tunnel intake; modifications to Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets; and the construction of project roads, trails, and recreation facilities. YCWA's proposal also includes changes in project operation, including modified minimum flows, water temperatures, ramping rate restrictions; and the monitoring of juvenile salmonid outmigration using rotary screw traps.

Our Analysis

Potential Effects on Individuals of the Listed Species—YCWA's proposed construction-related activities have the potential to adversely affect ESA-listed spring-run Chinook salmon and steelhead in the lower Yuba River. Ground-disturbing activities could result in temporary increases in turbidity, loss of habitat, degradation of water quality, construction debris, and disturbance and noise. Heavy equipment also has the potential to release hydrocarbon-based contaminants that could enter the Yuba and Feather Rivers. However, implementation of YCWA's proposed construction BMPs, erosion prevention and control measures, SWPPP, Streamflow and Reservoir Level Compliance Monitoring Plan, and Hazardous Materials Management Plan would minimize the potential for adverse effects on ESA-listed fish species. Furthermore, any construction and maintenance activities associated with roads or trails and other land uses would be subject to the approval of the department or agency of the United States with supervision over the lands involved. Given these measures, any construction or maintenance-related modifications or enhancements to existing project facilities, as well as non-routine ground-disturbing activities are expected to have an insignificant effect on ESA-listed species.

Changes in project operation are anticipated to have no effect on harvest/angling, poaching, hatchery practices, entrainment, or predation. However, YCWA's proposed and staff's recommended instream flow regime in the lower Yuba River is expected to improve aquatic habitat conditions for *O. mykiss* and Chinook salmon downstream of Englebright Dam. These flows would also maintain favorable water temperatures for immigration and holding, spawning, embryo incubation, rearing, and emigration, and would minimize potential stressors to fish species. In addition, staff's recommended LWM augmentation program would likely increase aquatic habitat diversity in the lower Yuba River and provide cover and holding habitat for juvenile salmonids. The LWM program would also aid in the retention of spawning gravel, organic debris, and marine-derived nutrients, create habitat for macroinvertebrates and other aquatic organisms, and create hydraulic refugia.

While rotary screw traps are an accepted means of capturing juvenile fish, monitoring juvenile salmonids using rotary screw traps, as proposed by YCWA in measure AR8, has the potential to result in the "take" of a small number of juvenile Chinook salmon and steelhead (as a result of trapping and handling large numbers of fish). However, this level of take is not expected to result in adverse impacts at a population level. In addition, while YCWA's proposed ramping rate restrictions would likely reduce the risk of juvenile salmon and steelhead stranding and redd dewatering in the lower river and Narrows Reach, impacts associated with ramping (i.e., stranding and redd dewatering) cannot be entirely avoided during flow reductions.

Because the project has the potential to "take" ESA-listed fish, we conclude that it may affect, is likely to adversely affect spring-run Chinook salmon and steelhead in the lower Yuba River.

Potential Effects to Designated Critical Habitats—The ESA defines critical habitat as "specific areas within the geographical area occupied by the species at the time it is listed . . . .on which are found those physical or biological features (1) essential to the conservation of the species and (2) which may require special management considerations or protection." NMFS further defines "physical or biological features" as "the features that support the life history needs of the species, including but not limited to water characteristics, soil type, geological features, sites, prey, vegetation, symbiotic species, or other features. A feature may be a single habitat characteristic, or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity." The overall value of critical habitat for the conservation of a listed species is the sum of the quantity, quality, and availability of the physical or biological features (PBF). Therefore, reductions in the quantity, quality, or availability of one or more PBF reduce the value of these features, which in turn reduce the function of the overall critical habitat.

The 2005 critical habitat designation (70 FR 52488) identifies the following PBF for both Central Valley spring-run Chinook salmon and California Central Valley steelhead critical habitat:

- **Freshwater spawning sites** with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.
- **Freshwater rearing sites** with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- **Freshwater migration corridors** free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
- **Estuarine areas** free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
- **Nearshore marine areas** free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
- **Offshore marine areas** with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Effects on designated critical habitat are evaluated with respect to whether they impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of the impaired habitat toward properly functioning conditions. Extensive evaluations and discussions of the potential effects of the project on the PBF of spring-run Chinook salmon in the action area, including the frequencies and magnitudes of potential effects, are provided in Section 8.0 of the applicant-prepared draft Biological Assessment. A summary of these evaluations is provided here.

Freshwater Spawning Sites—Under existing conditions, spring-run Chinook salmon have been reported to spawn in the mainstem Sacramento River between Red Bluff Diversion Dam and Keswick Dam and in Mill, Deer, and Butte Creeks. All lower Yuba River Chinook salmon escapement estimates are reported as fall-run Chinook

salmon. Existing wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries, including Antelope, Deer, and Mill Creeks and the Yuba River.

The availability of anadromous fish habitat in the lower Yuba River is limited by a lack of LWM, an absence of off-channel spawning and rearing habitat, restricted floodplain connectivity, and an underdeveloped riparian corridor. Coarse sediment (i.e., spawning gravel) does not appear to be a limiting factor for anadromous salmonids in the lower Yuba River because gravel recruitment from the banks of the lower river and ongoing gravel injection efforts by the Corps to collect and transport gravel downstream of Englebright and Daguerre Point Dams provide spawning gravel. Whereas many of the existing degraded habitat conditions are unrelated to project operation, project operation does block the downstream movement of coarse sediment and LWM, both of which are key components of complex spawning and rearing habitat. Therefore, this PBF is impaired under existing conditions.

Implementation of YCWA's proposed instream flows and our recommended LWM augmentation program would likely increase aquatic habitat diversity in the lower Yuba River and provide cover and holding habitat for juvenile salmonids. Spring-run Chinook salmon spawning habitat availability under proposed project operation would be generally similar to that under existing conditions, and proposed project operations would provide more habitat during conference water years. Under YCWA's proposed minimum flows, the long-term average spring-run Chinook salmon spawning habitat availability in the lower Yuba River would be 98.8 percent of the maximum and provide more than 80 percent of maximum spawning WUA during all water year types. Proposed project operation would provide the same amount of long-term average steelhead spawning habitat availability as existing conditions and would provide similar amounts of spawning habitat during conference water years. Long-term average steelhead spawning habitat availability in the lower Yuba River would 92.4 percent of maximum WUA. In addition, our recommended flow regime would maintain adequate water temperatures for spring-run Chinook and steelhead spawning. The recommended LWM augmentation program would also likely aid in the retention of spawning gravel, organic debris, and marine-derived nutrients (salmon carcasses); create habitat for macroinvertebrates and other aquatic organisms (which are important components of the aquatic food web); and provide hydraulic refugia. Based on these findings, proposed project operation would not affect this PBF in a manner likely to appreciably diminish or preclude the role of that habitat in the recovery of the Central Valley spring-run Chinook salmon.

Freshwater Rearing Sites—Rearing habitat condition is strongly affected by habitat complexity, food supply, and the presence of predators of juvenile salmonids. The channelized, leveed, and riprapped river reaches and sloughs that are common in the Sacramento River system typically have low habitat complexity, relatively low production of food organisms, and offer little protection from either fish or avian predators. As noted above, the availability of anadromous fish habitat in the lower Yuba River is currently limited by a lack of LWM, an absence of off-channel spawning and

rearing habitat, restricted floodplain connectivity, and an underdeveloped riparian corridor. Rearing habitat is also limited by low flows, shallow water depths, and limited cover. Therefore, this PBF is impaired under existing conditions.

As described above, implementation of the staff-recommended LWM augmentation programs would likely increase aquatic habitat diversity in the lower Yuba River and help retain spawning gravel, organic debris, and marine derived nutrients. The staff-recommended flow regime would also maintain adequate water temperatures for Chinook and *O. mykiss* rearing because water temperature exceedance probabilities generally would be similar under the flows proposed in measure AR10 relative to existing conditions for all lifestages of spring-run Chinook and steelhead. Long-term average spring-run Chinook fry and juvenile rearing in-channel habitat availability (percent of maximum WUA) in the lower Yuba River would be the same under YCWA's proposed measure and existing conditions. It would also result in similar amounts of in-channel steelhead rearing habitat by water year type. Based on these findings, proposed project operation would not affect this PBF in a manner likely to appreciably diminish or preclude the role of that habitat in the recovery of the Central Valley spring-run Chinook salmon or Central Valley steelhead.

Freshwater Migration Corridors—Freshwater migration corridors provide upstream passage for adults to upstream spawning areas, and downstream passage for outmigrant juveniles to estuarine and marine areas. Migratory corridors are downstream of the spawning areas and include the lower reaches of the spawning tributaries, the mainstem of the Sacramento River, and the Delta.

Migratory habitat condition is strongly affected by the presence of barriers, which can include dams (i.e., hydropower, flood control, and irrigation flashboard dams), unscreened or poorly screened diversions, degraded water quality, or behavioral impediments to migration. Red Bluff Diversion Dam, completed in 1964, features a series of 11 gates that, when lowered, provided for gravity diversion of irrigation water from the Sacramento River into the Tehama-Colusa and Corning Canals for potential delivery to the Sacramento Valley National Wildlife Refuge and to approximately 140,000 acres of irrigable lands along the Interstate 5 corridor between Red Bluff and Dunnigan, California. The Red Bluff Diversion Dam was a serious impediment to upstream and downstream fish migration, and a significant portion of the Sacramento River spawning habitat for Chinook salmon and steelhead occurred upstream of the dam. Until recently, the Red Bluff Diversion Dam created an upstream migratory barrier in the mainstem Sacramento River during its May 15 through September 15 "gates in" configuration. In response to a NMFS biological opinion, the Red Bluff Diversion Dam gates were permanently raised in September 2011; thus, fish passage conditions have likely improved at the Red Bluff Diversion Dam. The Red Bluff Fish Passage Improvement Project, which included construction of a pumping plant to allow for diversion of water from the Sacramento River without closing the Red Bluff Diversion Dam gates, was completed in 2012.

Sacramento River flow, along with many juvenile spring-run Chinook salmon, enters the Delta Cross Channel (when the gates are open) and Georgiana Slough, and subsequently the central Delta, especially during periods of increased water export pumping from the Delta. Mortality of juvenile salmon entering the central Delta is higher than for those continuing downstream in the Sacramento River. This difference in mortality could be caused by a combination of factors, including (1) the longer migration route through the central Delta to the western Delta; (2) exposure to higher water temperatures; (3) higher predation rates; (4) exposure to seasonal agricultural diversions; (5) water quality impairments due to agricultural and municipal discharges; and (6) a more complex channel configuration that makes it more difficult for salmon to successfully migrate to the western Delta and the ocean. In addition, state and federal pumps and associated fish facilities increase mortality of juvenile spring-run Chinook salmon through various means, including entrainment into state and federal canals, and salvage operations.

Englebright Dam was not designed for fish passage, presents an impassable barrier to the upstream migration of anadromous salmonids, and marks the upstream extent of currently accessible spring-run Chinook salmon habitat in the lower Yuba River, whereas Daguerre Point Dam presents a potential impediment to upstream migration. Therefore, this PBF is "not properly functioning" under existing conditions.

Proposed project operation would not directly or indirectly affect freshwater migration corridors;, and their stressor level categorizations would not change relative to existing conditions. As a result, proposed project operation would not change the existing "not properly functioning" condition of the PBF.

Estuarine Habitat Areas—Estuarine habitat in the Sacramento River Delta has been substantially degraded from historical conditions. More than 90 percent of the fresh, brackish, and salt marshes have been lost because of human activities, thereby reducing the availability of forage species and eliminating the cycling of nutrients from marsh vegetation into the waterways. In addition, raising levees and armoring levee banks with riprap have modified the channels of the Delta, decreasing habitat complexity by reducing the amount of woody and vegetative material incorporated into the nearshore area, minimizing and reducing local variations in water depth and velocities, and simplifying the community structure of the nearshore environment. Heavy urbanization and industrial actions have also lowered water quality and introduced persistent contaminants to the sediments that surround points of discharge (e.g., refineries in Suisun and San Pablo bays and creosote factories in Stockton). In addition to these impacts, Delta hydraulics have been modified, and the resulting changes in the salinity transition zone have contributed to reductions in the phytoplankton and zooplankton populations in the Delta, as well as to alterations in nutrient cycling within the Delta ecosystem. Because the proposed project area would be limited to the mainstem Yuba River, it would have no effect on the estuarine habitat PBF.

Nearshore Coastal Marine and Offshore Marine Areas—Oceanic and climate conditions such as sea surface temperatures, air temperatures, strength of upwelling, El Niño events, salinity, ocean currents, wind speed, and primary and secondary productivity affect all facets of the physical, biological, and chemical processes in the marine environment. However, the proposed project area would be limited to the mainstem Yuba River, and it would have no effect on the nearshore coastal marine and offshore marine PBF.

Based on the above analysis, the aggregate effects of the proposed action would not introduce new stressors or substantially exacerbate ongoing stressors to Central Valley steelhead relative to existing conditions. Consequently, the proposed action may affect but is not likely adversely affect designated critical habitat for Central Valley Spring-run Chinook salmon and Central Valley steelhead.

Central Valley Salmon/Steelhead Recovery Plan—NMFS's *Final Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead* (NMFS, 2014b) was filed with the Commission on October 6, 2014. This guidance document outlines a strategy to recover and safeguard the future of three salmonid species in the Central Valley so that protection under the ESA is no longer needed.

The recovery strategy is based on two scientific principles: (1) functioning, diverse, and interconnected habitats are necessary for a species to be viable; and (2) species viability is determined by its spatial structure, diversity, productivity, and abundance (McElhany et al., 2000). Based on these two scientific principles, the recovery plan outlines a strategy for recovery that secures extant populations and reintroduces populations to historical habitat.

However, the recovery plan also acknowledges that implementation and recovery of listed species will require the support, efforts, and resources of many entities, from federal and state agencies to individual members of the public. Another goal is to encourage and support effective partnerships with regional stakeholders to meet the objectives and criteria of the plan.

As discussed above, the recovery plan's recommended priority actions on the Yuba River include the development and implementation of programs to: (1) reintroduce spring-run Chinook salmon and steelhead to historical habitats upstream of Englebright Dam; (2) promote natural river processes; (3) provide unobstructed volitional upstream passage at Daguerre Point Dam; (4) restore LWM and floodplain habitat availability in the lower Yuba River; (5) create and restore side channel habitats; (6) limit flow fluctuation and ramping rates; and (7) minimize predation by non-native fish in the Yuba River.

YCWA's proposed protection, mitigation, and enhancement measures would be consistent with some but not all of these recovery plans goals. For example, YCWA's

proposed minimum flows would provide a contemporary "functional flow" program for anadromous salmonids in the lower Yuba River because they are intended to more closely mimic the natural hydrograph and water temperature regime. YCWA's proposed ramping rates would be similar to those observed in undammed river systems in the region, while its proposed LWM program would help to improve habitat complexity in the lower river (although this measure would require the support of other entities interested in habitat improvement projects in the basin). YCWA's proposed habitat improvement measures may also serve to increase natural salmon and steelhead production in the Yuba River, which would facilitate the potential reintroduction of anadromous fish upstream of Englebright Dam (if the resource agencies decide to pursue such a program in the future). YCWA does not proposed any measures to address fish passage issues at Daguerre Point and Englebright Dams because these dams were constructed in 1906 and 1941, respectively, and are now owned by the United States and maintained by the Corps. They are not part of the project.

Under the staff alternative, the project would include most of YCWA's proposed measures. Furthermore, the staff alternative would require YCWA to develop a comprehensive LWM enhancement plan that: (1) identifies sources of LWM in the project reservoirs; (2) includes viable options for storing and transporting collected LWM; (3) identifies suitable LWM size classes for placement; (4) identifies locations for placement in the lower Yuba River; (5) details a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests; and (6) contains a monitoring and mapping process to provide an indication of the stability of these enhancements and inform the need for future placement activities for the project. All of these measures are consistent with the recovery plan.

The resource agencies' recommended instream flows (including spring snowmelt pulse and recession flows) would likely result in conditions that even more closely mimic the natural hydrograph. Similarly, the resource agencies' recommended lower river habitat enhancement and LWM programs would increase aquatic habitat diversity and provide cover and holding habitat for juvenile fishes; aid in the retention of gravel, organic debris, and marine-derived nutrients (salmon carcasses); create habitat for macroinvertebrates and other aquatic organisms (which are important components of the aquatic food web); and create hydraulic refugia. While these additional measures are expected to benefit all lifestages of Chinook and steelhead habitat in the Yuba River, many of these measures lack a clear nexus to the project. In addition, the existing degraded floodplain conditions downstream of Englebright Dam are not the result of project operation.

Green Sturgeon Distinct Population Segment in the Lower Yuba River

Adult migration and spawning and early development and growth of green sturgeon in the Central Valley occur primarily in the Sacramento River between Red Bluff Diversion Dam and Keswick Dam and in some tributaries, including Feather River (NMFS, 2012). Although adults exhibiting spawning behavior were observed below

Daguerre Point Dam in 2011, and 270 green sturgeon eggs were observed downstream of Daguerre Point Dam in 2018, suitable spawning habitat above the dam has been inaccessible since its construction. It does not appear that adult green sturgeon historically migrated above the Englebright Reservoir, consequently, NMFS has not proposed passage of green sturgeon above Englebright Dam. Daguerre Point Dam includes two fish ladders; however, these facilities have been found to either impair or completely block the upstream passage of adult salmonids, and completely block the upstream migration of green sturgeon.

Our Analysis

Green sturgeon use freshwater riverine systems for spawning and for adult holding after spawning. Green sturgeon eggs hatch in freshwater, and the larvae spend their initial days and weeks in freshwater, migrating to estuarine areas in a relatively short time. The current condition of critical habitat for the Southern DPS of North American green sturgeon is degraded over its historical conditions. It does not provide the full extent of conservation values necessary for the survival and recovery of the species, especially in the upstream riverine habitat. In particular, human actions have affected passage and water flow, substantially altering the historical river characteristics in which the Southern DPS of North American green sturgeon evolved. In addition, the alterations to the Sacramento-San Joaquin River Delta may have a particularly strong effect on the survival and recruitment of juvenile green sturgeon because of the protracted rearing time in the delta and estuary. Loss of individuals during this phase of the life history of green sturgeon represents losses to multiple year classes, which can ultimately affect the potential population structure for decades to come. Consequently, the Southern DPS for North American green sturgeon is at substantial risk of extinction. The DPS is compromised by low abundance, limited distribution, and lack of population redundancy. The DPS has only one viable population, the Sacramento River population, upon which Yuba River green sturgeon depend. The role of the Yuba River for green sturgeon survival and recovery is unknown, but it is considered to have a high conservation value for the species.

In its *Biological Opinion for Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities on and around Englebright Reservoir*, NMFS identified factors affecting the green sturgeon population and viability, including blocked access to spawning habitat upstream of Daguerre Point Dam, lack of suitable spawning substrate and deep pools, low flows, and elevated water temperatures (NMFS, 2012). Designated critical habitat for green sturgeon does not exist above Daguerre Point Dam.

As noted earlier, YCWA has been releasing the minimum flows developed in the Yuba Accord since 2008 and proposes to continue to release the same flows with the exception of “conference year” flows. The minimum flows proposed by YCWA would continue to provide higher volumes compared to the flow requirements included in YCWA’s existing license (article 33), and would continue to better mimic the natural

hydrograph of the lower Yuba River. YCWA's proposed flow rates (AR3) would also provide more suitable water temperatures for green sturgeon. Suitable water temperatures include: (1) 11 to 17°C (optimal range = 14 to 16°C) in spawning reaches for egg incubation (March through August); (2) water temperatures below 20°C for larval development; and (3) water temperatures below 24°C for juveniles. An analysis of simulated mean monthly water temperatures in the Daguerre Point Dam and Simpsons Lane reaches under YCWA's proposed flow rates shows that mean monthly water temperatures would generally be within these ranges downstream of the Daguerre Point Dam and near Marysville, except when occasional maximum summer temperatures above 24°C occur from June through September near Marysville.

FWS (10(j) recommendation 3), BLM (10(a) recommendation 4), NMFS (10(j) recommendation 3), and California DFW (10(j) recommendation 2.29) all recommend a similar lower Yuba River enhancement plan that contains a provision for LWM placement in the lower Yuba River. As noted in section 3.3.2.2, in the subsection *Lower Yuba River Habitat Restoration and Large Woody Material Management*, implementation of the resource agencies' recommended LWM augmentation program would likely increase aquatic habitat diversity in the lower Yuba River (including the creation of deep pools) and provide cover and holding habitat for juvenile fishes; aid in the retention of gravel, organic debris, and marine derived nutrients (salmon carcasses); create habitat for macroinvertebrates and other aquatic organisms (which are important components of the aquatic food web); and create hydraulic refugia. All these habitat enhancements would benefit all lifestages of green sturgeon in the lower Yuba River and enhance designated critical habitat downstream of Daguerre Point Dam. The placement of LWM is not likely to result in incidental take of green sturgeon.

In 2012, YCWA documented the occurrence, temporal and spatial distributions, and movement of the federally listed Southern DPS of North American green sturgeon in the Yuba River downstream of Englebright Dam (YCWA, 2013i). A review of several monitoring programs indicated that no green sturgeon occurred upstream of Daguerre Point Dam. As discussed previously in section 3.3.1.2, in the subsection *Sediment Transport in Lower Yuba River Downstream of Englebright Dam*, sediment transported in the North Yuba River, Middle Yuba River, and Oregon Creek below their respective dams would continue to be trapped behind Englebright Dam, except for some of the finest size fractions that may remain in suspension within the reservoir (clay/silt). Downstream of Englebright Dam, finer sediment, such as sand and fine gravel, would continue to be mobilized at flows lower than bankfull conditions, with coarser particles becoming mobile as flows increase. These processes would remain unchanged from existing conditions.

Because of the low potential for interaction between green sturgeon and the proposed action, the project is not expected to result in the injury or death of green sturgeon, and based on the above information and YCWA's draft Biological Assessment, relicensing the project would not likely adversely affect green sturgeon or their critical habitat in the lower Yuba River.

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 waterbodies 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). 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.

The geographic extent of a Chinook salmon EFH in the Yuba River Basin includes the portion of a watershed within specific hydrologic units that "are currently, or were historically, accessible to the anadromous fish species." The lower Yuba River hydrologic unit (USGS HUC 18020107) is one of these designated units (50 CFR 660, subpt. H, table 1). Based on this designation, the project area includes three sections of the river that are EFH for Pacific salmon. These are (1) approximately 40.0 miles of the Yuba River from the confluence with the Feather River upstream to the confluence of the North Yuba River and Middle Yuba River; (2) about 17.8 miles of the North Yuba River from the confluence of the North Yuba River and Middle Yuba River upstream to the NMWSE of New Bullards Bar Reservoir; and (3) about 1.5 miles of the Middle Yuba River from the confluence of the North Yuba River and Middle Yuba River upstream to an historical barrier (NMFS, 2012; Yoshiyama et al., 2001).

Yuba River Watershed Upstream of Englebright Dam

Under existing conditions, Englebright Dam blocks Chinook salmon access to all EFH in the upper Yuba River and its tributaries upstream of Englebright Dam. Consequently, EFH in the Yuba River Watershed upstream of Englebright Dam is

considered to be "not properly functioning." Because proposed project operation would not affect fish passage conditions at Englebright Dam, lack of access to EFH in the upper Yuba River would not change.

The project would continue to capture sediment, reduce peak lows, and augment low flows during the summer, and could affect unoccupied EFH downstream of project facilities in the Yuba River Watershed, upstream of Englebright Dam. However, these effects would be largely beneficial. For example, implementation of YCWA's spill cessation measures (including protective downramping rates) would reduce the frequency and magnitude of spill events at Our House Diversion Dam and New Bullards Bar Dam to be protective of the foothill yellow-legged frog (breeding and early development lifestages) and stream fish (i.e., rainbow trout) populations.

Simulated flows and water temperatures in the North Yuba River below New Bullards Bar Dam, in the Middle Yuba River above the Yuba River confluence, and in the Yuba River upstream of New Colgate Powerhouse under the proposed action indicate that aquatic habitat conditions would be improved in these reaches, particularly during the summer months, relative to existing conditions.

In addition to cooler water temperatures during the summer months, water quality conditions related to sediment transport and chemical contamination/nutrients generally are not expected to change in the upper watershed as a result of the proposed action. Passage of sediments at Our House and Log Cabin Diversion Dams would likely improve salmonid spawning habitat in the Middle Yuba River by increasing the amount of suitably sized substrate gravel. Therefore, the proposed action is expected to improve EFH conditions associated with substrate.

As noted previously, YCWA proposes to construct the New Colgate Powerhouse tailwater depression system and New Bullards Bar Dam auxiliary flood control outlet, and modify the Our House and Log Cabin Diversion Dams' fish release outlets and Lohman Ridge Diversion Tunnel intake and various recreation facilities. Construction-related avoidance/minimization measures (e.g., YCWA proposed measures GEN1, GEN2, GEN3, GS1, AR7, WR7, and WR8) also are incorporated into the project-specific construction components. Therefore, construction-related effects would be temporary and localized, and are not expected to result in long-term, adverse effects on EFH in project-affected waters.

Overall, the proposed action is expected to result in similar or improved aquatic habitat conditions, relative to those that occur under existing conditions. Consequently, it is reasonable to conclude that if aquatic conditions are improved, then these habitat conditions also would improve unoccupied EFH in the Yuba River Watershed upstream of Englebright Dam.

Yuba River Downstream of Englebright Dam

Under the proposed action, YCWA's project would continue to operate under the Yuba Accord flow schedules, except for proposed changes to conference year flow

requirements, revised flow fluctuation criteria at the Narrows 2 Development, and coordinated operations with the Narrows Project. The changes in conference year requirements would provide similar or more suitable habitat conditions for Chinook salmon compared to existing conditions. The revised flow fluctuation criteria under the proposed action are expected to further minimize the potential for Chinook salmon redd dewatering and fry and juvenile stranding and isolation in the lower Yuba River. The proposed action is not expected to introduce any new stressors or substantially exacerbate ongoing Chinook salmon stressors that occur in the lower Yuba River.

Of the other 31 non-fishing threats to Pacific Coast salmon EFH identified in Appendix A to the Pacific Coast Salmon Fisheries Management Plan, as modified by Amendment 18 to the Pacific Coast Salmon Plan, the proposed action may potentially affect Chinook salmon EFH through changes in flows and water temperatures in the Yuba River downstream of Englebright Dam. However, flow and water temperature-related effects on EFH associated with the proposed action are expected to result in non-substantial adverse effects or beneficial effects. The proposed action also would not adversely affect EFH conditions in the Feather River downstream of the Yuba River, the Sacramento River downstream of the Feather River, or in the Delta.

Based on the above analyses, we conclude that the proposed project would have only minor and, in most cases, beneficial effects on Chinook salmon EFH. We also conclude that staff-recommended measures would likely improve EFH over the long term. By way of this draft EIS, we are providing NMFS with our EFH assessment and request that NMFS provide any EFH conservation recommendations.

Terrestrial Species

California Red-legged Frog

Project operation and maintenance activities that have a potential to affect California red-legged frog and its critical habitat include the management of water levels in New Bullards Bar Reservoir, vegetation management and other ground-disturbing activities, the application of pesticides, recreation, and LWM management.

In the Integrated Vegetation Management Plan (TR1), YCWA proposes to avoid conducting routine vegetation management activities within 300 feet of California red-legged frog breeding sites without prior coordination with the Forest Service (on NFS lands), California DFW, and FWS, as appropriate. FWS and California DFW support the implementation of a 300-foot buffer around breeding sites and also recommend including critical habitat and occupied California red-legged frog habitat.

YCWA's Integrated Vegetation Management Plan (TR1) indicates that pesticide use on federal lands within 500 feet of known locations of California red-legged frogs would be designed to avoid adverse effects on individuals and their habitats. FWS notes that because pesticide use could adversely affect California red-legged frogs, YCWA should consult with FWS regarding chemical-based vegetation management.

The construction of the new West Shoreline Trail crosses designated critical habitat for California red-legged frog and includes four stream crossings that could affect the species. Although neither YCWA nor any of the resource agencies identify any potential threat to California red-legged frogs from other project recreation facilities, YCWA's Recreation Facilities Plan (RR1) includes two measures for the protection of California red-legged frogs: (1) installing drainage plates with circular openings no larger than 0.25 inch on all water hydrant drainage basins (when existing hydrants are replaced or new hydrants are installed) at recreation facilities to prevent the California red-legged frogs from entering the drains; and (2) applying pesticides only in campgrounds following the pesticide use protocols described in Section 6.0 of the Integrated Vegetation Management Plan. Also, Moran Road is closed from October 15 to May 1 to minimize potential for road traffic to affect California red-legged frogs making overland movements. In its updated Recreation Facilities Plan filed on September 19, 2018, YCWA would protect California red-legged frogs with additional provisions to: (1) include footbridges over stream crossings and signs to make users aware of the sensitive nature of California red-legged frog habitat along the West Shoreline Trail; and (2) continue to close Moran Road annually from October 15 to May 1 to protect the frogs.

The revised Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan provides for the collection, storage, and disposal of floating woody material to avoid colonization by predatory bullfrogs at New Bullard Bar Reservoir.

The resource agencies are concerned about American bullfrog establishment in New Bullards Bar Reservoir and spread into other project-affected reaches. Bullfrog establishment is promoted by low water levels in some coves. FWS specifically recommends targeting an area at the mouth of Little Oregon Creek at Moran Cove on New Bullards Bar Reservoir, which YCWA includes as part of its Aquatic Invasive Species Management Plan (AR5). The measure would involve capturing and lethally removing adult, juvenile, and larval American bullfrogs annually for the first 5 years after license issuance (i.e., license years 1 through 5) during late summer/early fall at Moran Cove within the project boundary. In the fifth annual American bullfrog population suppression report, YCWA would report on its consultation with the Forest Service, FWS, California DFW, and the Water Board regarding whether to continue the suppression efforts and, if so, any modifications to the suppression methods. FWS expresses concern regarding the potential effects of LWM management at New Bullards Bar Reservoir on California red-legged frog and the effects on the PCEs of its critical habitat. FWS preliminary 10(j) recommendation 7 and FWN recommendation IX recommend a revision to YCWA's initial Woody Material Management Plan to avoid collecting and removing woody debris from Moran Cove in New Bullards Bar Reservoir. YCWA's revised Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan incorporates these recommended measures.

FWS indicates that these changes negate the need for preliminary 10(j) recommendation 7.

Moran Road is situated about 0.5 mile from sites where California red-legged frogs have been reported to occur (YCWA, 2013k). The closure of Moran Road from October 15 to May 1 has been in effect for many years (approved by the Commission in 2003) to protect California red-legged frogs and bald eagles. Continued closure of the road would eliminate potential effects on the frog from collisions with vehicles during annual movements after the first significant rainfalls in the fall. YCWA's proposed Recreation Facilities Plan (RR1) would continue implementation of these closures.

FWS preliminary 10(j) recommendation 8 recommends that YCWA develop a sensitive amphibians management plan in collaboration with FWS, California DFW, and the Forest Service. Specific recommendations that pertain to California red-legged frogs would include:[107]

- A(ii): considering California red-legged frogs in the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan;
- A(iii): protecting potential California red-legged frog habitat along West Shoreline Trail, including foot bridges over stream crossings and signage; A(iv) conducting formal consultation with FWS for any pesticides planned for use within the project area;
- A(v): evaluating of the status of chytrid fungus within the project area;
- A(vi): establishing decontamination protocols to ensure that any chytrid fungus is not spread between water bodies;
- B(i): requiring that any hazard tree removal or fuels reduction/slash material not be stored within 1,000 feet of a wetland, riparian area, or critical habitat;
- B(ii): providing that YCWA work with FWS, the Forest Service, and California DFW to develop additional minimization measures for when ground-disturbance actions are planned within 300 feet of wetlands, riparian areas, and critical habitat;
- B(iii): considering if any actions within the Recovery Plan for the California Red-legged Frog are appropriate for the project area, including actions to protect wetlands within the watershed and reestablishing populations or supplementing existing populations with additional individuals;

[107] Numbering follows FWS's description of its recommended plan in its letter filed August 25, 2017.

- B(iv): collaborating with the Forest Service and FWS in developing recovery actions for the California red-legged frog within the project area, including conservation actions at Cottage Creek Pond; and
- B(v): including California red-legged frog consultation during the annual meeting (GEN1) and conducting formal ESA consultation with FWS for potential effects from the West Shoreline Trail to the frog, prior to the start of construction.

Likewise, FWS (10(j) recommendation 6) requests that YCWA consult with FWS regarding California red-legged frog.

YCWA responded that these recommendations are unnecessary for several reasons: (1) consultation regarding ESA species would occur between the Commission and FWS prior to issuance of a new license; (2) the proposed conditions already address many of the recommended topics; (3) an evaluation of chytrid fungus has no project nexus; (4) YCWA has already included decontamination protocols in its proposed conditions; (5) the Upper Yuba Aquatic Monitoring Plan already provides adequate monitoring; and (6) requirements related to hazard tree removal and ground-disturbing activities are already included in the Integrated Vegetation Management Plan.

Our Analysis

Under a new license, YCWA's proposed construction projects (tailrace depression system, New Bullards Bar Dam auxiliary flood control outlet, modifications to Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets, modification to the gates at Lohman Ridge Diversion Tunnel, and the construction of various recreation facilities) would be unlikely to adversely affect California red-legged frogs because neither the species nor its habitat is known to occur near any of those particular project sites (i.e., New Colgate Powerhouse, New Bullards Bar Dam, Our House Diversion Dam, Log Cabin Diversion Dam, Lohman Ridge Diversion Tunnel, and the various recreation areas). New Bullards Bar Reservoir is a deep reservoir with mostly steeply sloped banks, which supports predatory fish species that would prevent California red-legged frog survival. The two diversion impoundments, Our House Diversion Dam on the Middle Yuba River and Log Cabin Diversion Dam impoundment on Oregon Creek, are not suitable breeding habitat (PCE 1), and California red-legged frogs are believed to be extirpated from these drainages. The affected reaches of Oregon Creek and Middle Yuba River would provide non-breeding (PCE 2) or dispersal habitat (PCE 4) during low-water periods but are unlikely to be used for breeding by California red-legged frogs because they experience seasonal high flows driven by snow-melt runoff, conditions that are not suitable for California red-legged frog. Accordingly, the potential for project flows or spills to affect California red-legged frog is low. Potential effects on upland habitat (PCE 3) and dispersal habitat (PCE 4) with respect to vegetation management are discussed below.

While project reservoirs are not suitable habitat, project operation and maintenance would have minor effects on potentially suitable habitat elsewhere in the project area. Project operation could indirectly affect California red-legged frogs by causing seasonally low-water surface elevation at the mouths of certain tributaries (coves) on New Bullards Bar Reservoir, which provide conditions that are suitable for American bullfrogs, a well-known predator of California red-legged frogs. American bullfrog suppression in Moran Cove during the first 5 years after license issuance would reduce the potential spread of American bullfrog into California red-legged frog critical habitat. In spite of the negative impacts of American bullfrogs, California red-legged frog populations have been shown to persist: (1) in sub-optimal habitat where conditions are unfavorable to American bullfrogs; (2) in marginal habitat adjacent to American bullfrog-occupied areas; (3) where habitat is managed to reduce establishment of American bullfrogs; or (4) where American bullfrog suppression has been implemented. The Forest Service has developed a plan to restore and improve habitats for California red-legged frogs within the surrounding critical habitat unit YUB-1 and is also considering efforts to remove juvenile American bullfrogs from regularly monitored mining legacy sites within the YUB-1 critical habitat area. Thus, while YCWA's proposed American bullfrog removal effort may not directly benefit California red-legged frogs by itself, the combination of these efforts with continued Forest Service restoration projects would potentially have substantial benefit on the only (presumed) extant population of California red-legged frogs in the project area.

Possible risk to California red-legged frogs from the use of pesticides would be similar to those described for foothill yellow-legged frogs in section 3.3.3.2, in the subsection *Special-status Wildlife.* If pesticides need to be used within 500 feet of a known occurrence of California red-legged frogs, YCWA would be responsible for conducting appropriate monitoring of these populations, as determined by the Forest Service on NFS lands. Mechanical and manual vegetation removal methods could result in ground-disturbance, which when carried out within 300 feet of a wetland or aquatic feature, could result in negative effects on California red-legged frogs. This would include tree felling, such as hazard tree removal, which could result in injury or mortality of California red-legged frogs within suitable upland habitat (PCE 3) or dispersal habitat (PCE 4) within YUB-1. As discussed for foothill yellow-legged frog in section 3.3.3.2, in the subsection *Special-status Wildlife*, YCWA's proposed Integrated Vegetation Management Plan may not provide adequate buffer distances to protect sensitive amphibians from hazard tree removal or other vegetation management activities. Extending the proposed 300-foot avoidance buffer within critical habitat unit YUB-1 to also include all wetlands, riparian areas, or critical habitat would minimize potential effects on California red-legged frogs. Stockpiling woody debris within suitable upland habitat (PCE 3) or dispersal habitat (PCE 4) could also attract California red-legged frogs and cause them to be killed if YCWA's burns or removes the debris. Such impacts could be avoided by removing any fuels, slash, or hazard trees within 24 hours, leaving them in

place or removing them the same day when cut, and not storing any debris within at least 1,000 feet of a wetland, riparian area, or critical habitat, as FWS recommends.

YCWA's proposed no-use buffer zones for pesticides around potential California red-legged frog habitat would be consistent with a 2006 stipulated injunction and order issued by the U.S. District Court for the Northern District of California, which requires a buffer zone of 60 feet around California red-legged frog habitat where pesticide use is restricted.[108] The court order defines California red-legged frog habitat as both aquatic and upland habitat, which includes aquatic features, aquatic breeding habitat, non-breeding aquatic habitat, and upland habitat. Upland habitat is defined as extending 200 feet from the mean high-water mark of an aquatic feature. This can be interpreted to mean that pesticide usage should be restricted within a 260-foot buffer of the mean high-water line of all aquatic features that meet the minimum California red-legged frog habitat requirement of 20 weeks of standing or slow-moving water. Because surveys for California red-legged frog in the project area are not comprehensive of all potential habitat, FWS would consider any potentially suitable habitat that has not been surveyed to be occupied. Therefore, it would be prudent to apply YCWA's proposed 300-foot no-use buffer of pesticides surrounding California red-legged frog breeding sites to all potentially occupied habitat, which, as described, would include many unsurveyed wetlands in the project area. However, restricting pesticide use within 260 feet of all aquatic features could prevent YCWA from applying pesticides to dam faces and groins, including spillway areas, where they are essential for the control of pest species (e.g., ground squirrels, invasive weeds and vegetation). Controlling vegetation around project facilities is also necessary for YCWA to perform visual inspections and to minimize the risk of wildfire. Because both vegetation and burrowing animals could threaten the structural integrity and performance of project dams, it would be prudent to stipulate that any prohibition on pesticide use be waived if necessary to ensure the proper and safe functioning of project facilities (i.e., project safety). YCWA's Integrated Vegetation Management Plan states that any herbicides applied within or adjacent to any river, stream, lake, impoundment, and/or associated riparian habitat and/or floodplain would be registered for aquatic use by the California Department of Pesticide Regulation.

The introduction of hazardous chemicals into the aquatic environment from improper storage, leaks, or accidents could degrade water quality or upland habitat, potentially injuring California red-legged frogs. The implementation of the proposed Hazardous Materials Management Plan (WR1) would reduce the possibility of the introduction of oil and other hazardous chemicals into the aquatic environment.

Erosion and sedimentation of aquatic habitats used by California red-legged frog could be caused by facility maintenance and construction, recreation, or road

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[108] Center for Biological Diversity v. Environmental Protection Agency, Case No.: 02-1580-JSW, October 20, 2006.

maintenance. Although no aquatic habitats within YUB-1 would be directly subject to sedimentation as a result of proposed project activities, the use and maintenance of project roads could contribute minor sedimentation into adjacent aquatic habitats. For example, the rehabilitation of the Moran Cove Road within 3 years of license issuance and proposed upgrades to the Moran Cove boating site would potentially affect California red-legged frog critical habitat within YUB-1. The implementation of YCWA's proposed Transportation System Management Plan (LU1) would include measures to protect California red-legged frog, such as implementing surface erosion and sediment control BMPs.

Non-native invasive plants, if left uncontrolled, could spread into California red-legged frog habitat and degrade its ability to support the frogs. YCWA's Integrated Vegetation Management Plan (TR1) would maintain or enhance habitat by controlling the spread of non-native invasive plants, thereby maintaining or increasing the availability of native habitat for California red-legged frog.

The potential for project recreation to affect sites with suitable habitat for California red-legged frogs is low. The proposed construction of the West Shoreline Trail would increase recreation use in designated critical habitat for California red-legged frogs. Its construction and use would potentially cause increased soil compaction, increased runoff, vegetation alteration, modification of stream hydrology, and bank trampling, all of which may result in erosion, sedimentation, or the filling in of ponds, lakes, or pools in streams. YCWA's Recreation Facilities Plan would include footbridges over stream crossings, and signage to make users aware of the sensitive nature of California red-legged frog and its critical habitat, and would reduce potential effects of recreational use on this species. YCWA's proposed installation of drainage plates with smaller openings on the drain pipes of outdoor faucets at project recreation areas would prevent frogs from entering the pipes. Other recreation improvements near Moran Cove include replacing gravel at the car-top boat launch, widening the turnaround area, adding gravel to the parking area, and installing a vehicle barrier to prevent access beyond the third turnout. These activities have low potential to affect California red-legged frogs because they would occur in areas already disturbed by vehicles, and frogs are not likely to occur in these areas. Implementation of the BMPs detailed in YCWA's Erosion and Sediment Control Plan would protect habitat for California red-legged frogs.

Stockpiling LWM collected from New Bullards Bar Reservoir could allow American bullfrogs to increase in number and disperse into California red-legged frog habitat. Stockpiled wood on the shoreline of New Bullards Bar Reservoir could also become occupied by California red-legged frogs, and if the wood were burned or hauled away, California red-legged frogs could be injured or killed. Prior to 2005, YCWA used a portion of Moran Cove as its primary location for the storage of LWM. An area of documented occurrences of California red-legged frogs occurs approximately 0.7-mile west of Moran Cove, and the cove is within designated California red-legged frog critical habitat unit YUB-1. Use of the cove was discontinued in 2005 because of the potential effect on California red-legged frogs.

YCWA has addressed this concern by revising its Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan (GS3). As recommended by FWS, YCWA demonstrated in 2017 that a viable solution exists to the problem of stockpiling wood within California red-legged frog critical habitat. This includes the elimination of stockpiling LWM in Moran Cove. When the amount of LWM to be removed from New Bullards Bar Reservoir exceeds the capacity of the two designated storage sites (i.e., approximately 3,000 cubic yards), YCWA would remove LWM from the reservoir upstream of Cottage Creek Boat Launch using an excavator placed on less than 1 acre of dry land owned by YCWA. The material would be loaded onto trucks or stored for no more than one day at YCWA's operations ramp, and be disposed of off-site. This practice, as outlined in the plan, would help protect red-legged frogs during future wood-flow events.

The development of a sensitive amphibians management plan, as recommended by FWS, may not be necessary to provide adequate protections for California red-legged frog. The majority of the items that FWS recommends to be included in such a plan are related to ESA consultation, specifically including A(iv), B, B(iii), B(iv), and B(v). YCWA has committed to follow appropriate consultation regarding ESA species, which would occur between the Commission and FWS prior to the issuance of a new license. Many other topics are already addressed by YCWA's proposed protection, mitigation, or enhancement measures or can be addressed by previously discussed modifications to YCWA's proposed management plans, including LWM management, vegetation management, pesticide use, and American bullfrog management. The proposed annual employee training (GEN3) would reduce any potential adverse project effects on California red-legged frog by educating the operations and maintenance staff about the species' life history and habitat requirements and directing staff to avoid disturbing any suitable habitat in the project area. Although our analysis finds little evidence for a project nexus regarding an evaluation of chytrid fungus, implementing decontamination protocols would provide further protection for California red-legged frog. Other topics that FWS specifies for inclusion in the management plan would remain unaddressed, but are lacking in sufficient detail at this time. For example, FWS does not specify the additional actions that it recommends YCWA take to protect certain wetlands within YUB-1, such as the Cottage Creek pond, or how YCWA should work to reestablish California red-legged frog populations by supplementing extant populations with additional individuals. If such future habitat restoration or population supplementation actions were performed, YCWA's proposed American bullfrog suppression under AR5 would contribute to any success. These control efforts would also provide for continued annual consultation with the Forest Service, California DFW, and FWS during the first 5 years after license issuance.

The Recovery Plan for the California Red-legged Frog (FWS, 2002) identifies the following conservation needs in the Yuba River Watershed: "Protect existing populations, remove non-native predators, protect and restore wetlands within watershed, reestablish populations within this watershed and/or augment existing populations with

additional individuals." Our analysis find that YCWA's proposed measures to avoid and minimize effects on California red-legged frog would address the project's potential threats to the species and its habitat within the project area. Furthermore, because it is believed that American bullfrog predation is the primary cause of the species' uncertain status within historically occupied critical habitat, YCWA's commitment to address invasive bullfrogs is a necessary action prior to any effort to reestablish or augment populations within the project area. We therefore conclude that the proposed issuance of a new license may affect, but is not likely to adversely affect California red-legged frog or designated critical habitat.

Valley Elderberry Longhorn Beetle

Project operation and maintenance activities such as vegetation management and soil disturbance could affect elderberry shrubs, which valley elderberry longhorn beetles require for survival. FWS assumes the valley elderberry longhorn beetle is present for any elderberry shrub located within a riparian area and uses exit holes to evaluate the site for occupancy when a shrub is in non-riparian habitat.

FWS indicated that ESA consultation has not been concluded for valley elderberry longhorn beetle and commented on YCWA's draft license application that a condition should be added to address future project effects on valley elderberry longhorn beetle. In its 10(j) recommendation 6, FWS recommends that YCWA consult with FWS for potential effects on the species. FWS also states that previous surveys in 2012 did not comply with updated 2017 survey protocols (FWS, 2017b), which increased the required survey area from 100 feet to at least 165 feet from project activities. FWS extended the survey area because field studies indicate that the beetle typically stay within 65 to 165 feet of the elderberry host plants after emerging. FWS notes that it considers exit holes in the bark of elderberry plants to be extremely rare and to be evidence of occupation by the valley elderberry longhorn beetle.

Our Analysis

Only one blue elderberry shrub was found during surveys—on land managed by the Sierra Foothill Research and Extension Center, University of California. YCWA proposes no construction or maintenance activities that could affect habitat in the area where this blue elderberry shrub was located. Implementation of YCWA's proposed measures would help protect this shrub from project-related activities.

Continued operation of the project under a new license would include some activities that could adversely affect valley elderberry longhorn beetle, or their habitat of elderberry shrubs, if conducted in proximity without proper BMPs. These activities include vegetation management such as the application of pesticides to non-native invasive plants and routine vegetation management. YCWA does not conduct weed control within the vicinity of the known blue elderberry shrub. Under a new license, areas for proposed construction projects (tailrace depression system, New Bullards Bar Dam auxiliary flood control outlet, modifications to Our House Diversion Dam and Log

Cabin Diversion Dam fish release outlets, modification to the gates at Lohman Ridge Diversion Tunnel, and the construction of various recreation facilities) do not include any nearby elderberry; thus, the areas do not include potential habitat for valley elderberry longhorn beetles.

Project operation and maintenance would have negligible effects on valley elderberry longhorn beetle because the Integrated Vegetation Management Plan (TR1) includes specific avoidance and minimization measures for sensitive areas, which include the location of the known elderberry shrub. The measures include conducting pre-construction surveys for elderberry plants and beetles, implementing buffers around elderberry plants, flagging or fencing potential habitat, emphasizing manual over chemical vegetation management, instituting limited operating periods, and following BMPs such as those provided by Forest Service. The plan also includes comprehensive special-status plant surveys in the first full calendar year following issuance of the new license and then once every 10 years, as well as requirements for reporting and consultation with the Forest Service, which would contribute to the disclosure of any new occurrence of valley elderberry longhorn beetle or blue elderberry shrubs. YCWA'S proposed annual environmental training (GEN3; Forest Service 4(e) condition 28) would also contribute to the documentation by project staff of any other additional occurrences of valley elderberry longhorn beetle in the project area.

According to FWS (2017b), if elderberry shrubs occur within 165 feet (50 meters) of the project area, adverse effects on the beetle may occur as a result of project implementation. YCWA surveyed for elderberry shrubs within 100 feet of project activities, so it is possible that elderberry shrubs exist within the unsurveyed area between 100 and 165 feet from project activities. Although impacts from project activities to nearby elderberry shrubs would be unlikely because ground-disturbing activities would be localized, these activities could affect beetles dispersing from the plants. Therefore, a survey for elderberry plants within this larger radius (165 feet) around ground-disturbing activities would effectively ensure that future project operation and maintenance do not affect the beetle. Based on this analysis, we conclude the project may affect, but is not likely to adversely affect valley elderberry longhorn beetle.

3.3.5 Recreation

3.3.5.1 Affected Environment

General Recreational Setting

The project's recreation facilities and opportunities are located in the North and Middle Yuba River Watersheds. The project area provides developed and undeveloped recreation opportunities at New Bullards Bar Reservoir and the Our House and Log Cabin Diversion Dam impoundments. The project's developed recreation facilities are located at New Bullards Bar Reservoir and include overnight camping, picnicking, trails, and boat launching facilities. Recreation activities at New Bullards Bar Reservoir

include fishing, swimming, camping, hiking, and bicycling. Motorized boating, including houseboating, is one of the more popular activities at this reservoir. The two project diversion dam impoundments provide undeveloped recreation opportunities primarily for day use activities such as fishing, wildlife viewing, gold panning, and hiking. Dispersed camping is allowed but rarely observed at these two impoundments.

New Bullards Bar Recreation Area

New Bullards Bar Reservoir provides a variety of water-related recreation opportunities, including water skiing, wakeboarding, houseboating, power boating, personal watercraft (e.g., jet ski) use, wildlife viewing, non-motorized boating, warm and coldwater fishing, hiking, and lake side camping (accessed by boat only). Some boating occurs year round; however, the higher use boating season extends from early May through mid-October. Because 90 percent of the New Bullards Bar shoreline is composed of federal land, most of the shoreline is available to the public for recreation. However, the sides of the reservoir are generally steep, which limits public access for boating and recreation to three boat launches.

New Bullards Bar Reservoir contains populations of rainbow trout, kokanee salmon, brown trout, spotted bass, smallmouth bass, largemouth bass, crappie, bluegill, and channel catfish for anglers. California DFW stocks catchable-size—most often one-half pound, or 12 inches in length—rainbow trout in the reservoir. The reservoir also offers anglers shoreline and boat-based fishing opportunities with varied settings ranging from deeper, larger pools near the dam to the sinuous arms at the upstream ends of the reservoir.

Land-based recreation opportunities available on non-project, public land in the vicinity of New Bullards Bar Reservoir include wildlife viewing, hiking, mountain biking, horseback riding, picnicking, and camping.

The project has 16 developed recreation facilities: (1) Hornswoggle Group Campground; (2) Schoolhouse Campground; (3) Dark Day Campground; (4) Cottage Creek Campground[109]; (5) Garden Point Boat-in Campground; (6) Madrone Cove Boat-in Campground; (7) Frenchy Point Boat-in Campground; (8) Dark Day Picnic Site; (9) Sunset Vista Observation Site; (10) Dam Overlook Observation Site; (11) Moran

[109] Cottage Creek Campground was burned in 2010 and has not been rebuilt. YCWA is in discussions with the Forest Service regarding rebuilding the burned campground. YCWA and the PNF have reached an agreement to develop small-group campsites at this location. Construction is scheduled for 2019, pending Commission approval (YCWA, 2018a).

Road Boating Site; (12) Cottage Creek Boat Launch[110]; (13) Dark Day Boat Launch,[111] including the Overflow Parking Area; (14) Schoolhouse Trail (non-motorized, multi-use); (15) Bullards Bar Trail (non-motorized, multi-use); and (16) floating restrooms. All of the recreation facilities are located on Forest Service land, with the exception of the Dam Overlook Observation Site, Cottage Creek Boat Launch, and short sections of the Bullards Bar Trail, which are located on land owned by YCWA. Figure 3-48 shows the location of the recreation areas, and table 3-61 lists the facilities provided at the recreation areas and their capacities. Campgrounds with vehicle and boat-in access typically include vault restrooms, picnic tables, pedestal grills/fire rings, and food lockers. Campgrounds with vehicle access have group, single- and multi-family sites for tent and RV camping that may have paved or gravel-surfaced parking spurs, flush restrooms, and potable water spigots throughout the campground. Picnic areas may have vault restrooms, potable water, parking areas, picnic tables, and pedestal grills. Boat launches have parking areas, surfaced launch lane(s), courtesy docks, and restrooms.

All of the project trails are located within the existing project boundary, except for a few short sections of the Bullards Bar Trail to the east of Dark Day Boat Launch. The project also includes two undeveloped recreation sites at Our House and Log Cabin Diversion Dams located on NFS land within the existing project boundary.

[110] Emerald Cove Marina provides visitor services at Cottage Creek Boat Launch, including houseboat and boat rentals, boat slips and moorings, fuel, and a general store. The marina is operated by a private company under a lease from YCWA. Expansion of the parking area at the boat launch is scheduled for 2020, pending Commission approval (YCWA, 2018a).

[111] Expansion of the Dark Day Boat Launch parking area is scheduled for 2020, pending Commission approval (YCWA, 2018a).

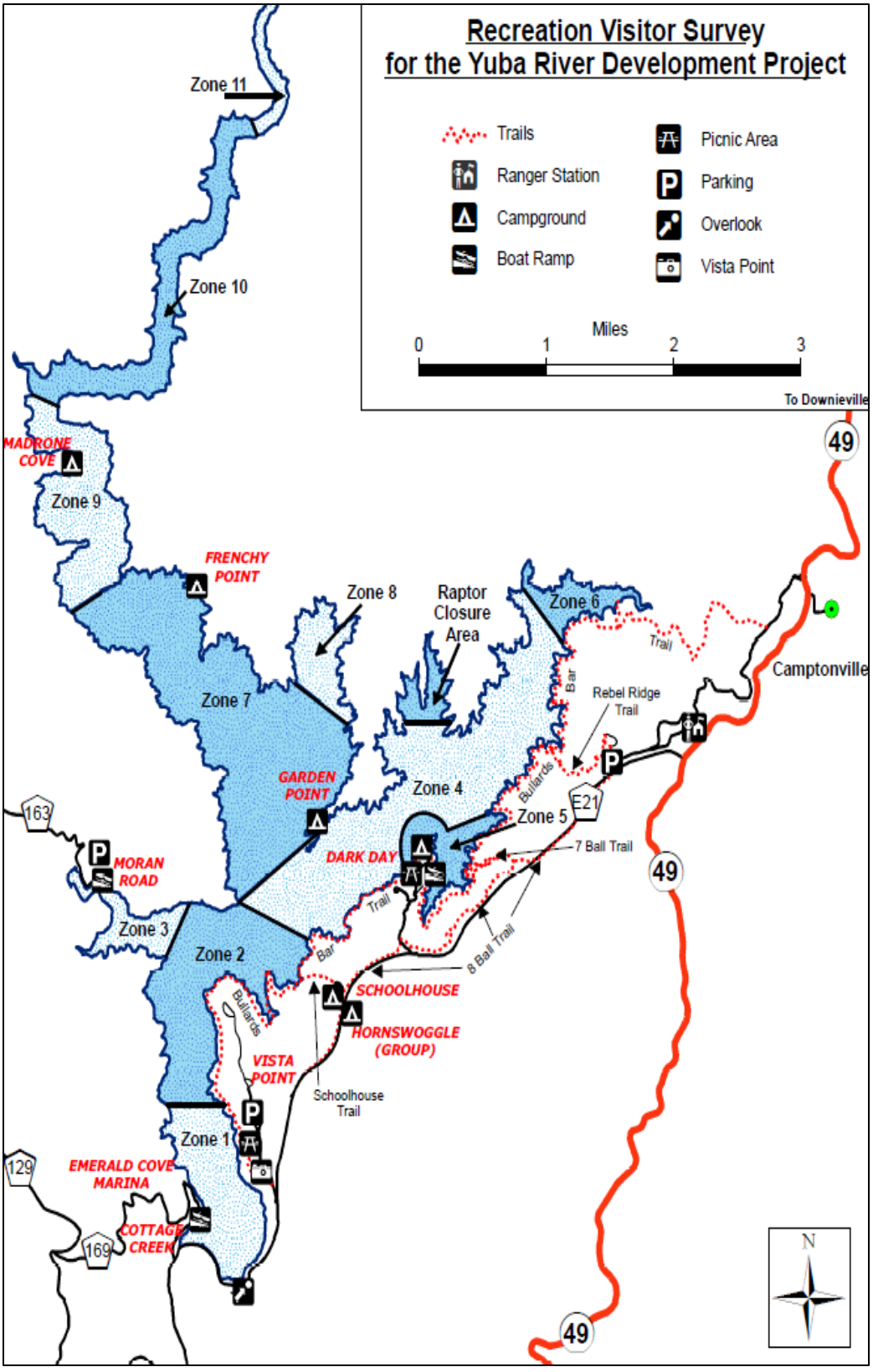

Figure 3-48. Visitor information map identifying the reservoir zones and project recreation trails at New Bullards Bar Reservoir (Source: YCWA, 2013l).

Table 3-61. Developed and undeveloped recreation facilities at New Bullards Bar Reservoir (Source: YCWA, 2017a, as modified by staff).

Recreation Facility	Capacity	Amenities	Landownership/ Management Responsibility	Condition[a]
New Bullards Bar Reservoir				
Schoolhouse Campground	57[b] campsites (tent/RV) (44 single, 13 double) 20 parking spaces (single)[c] Single sites have a 1-car capacity vehicle spur Double sites have a 2-car capacity vehicle spur	4 flush restrooms 1 vault restroom Potable water system Trailhead Single sites have a cooking grill/fire ring, and food locker Double sites have 2 picnic tables, cooking grill/fire ring, and 2 food lockers 5 information boards (one 3-panel at entrances and four 1-panel at each restroom)	NFS land/Forest Service	The campground is in overall good condition. The six restrooms are in fair-to-good condition with well-maintained exteriors and deteriorating interiors. The campground does not meet accessible standards for NFS lands.

Recreation Facility	Capacity	Amenities	Landownership/ Management Responsibility	Condition[a]
Hornswoggle Group Campground	6 group campsites Campsites have parking areas (number of spaces not identified)	2 flush restrooms Potable water system 2 vault restrooms Group sites include tables, food lockers and a group fire ring/grill Six 1-panel information boards	NFS land/Forest Service	The campground is in good overall condition. Most of the facilities and amenities are in good condition, except for the bathrooms, which are in fair condition. The campground does not meet current accessible standards for NFS land.
Dark Day Campground	10 campsites (6 single, 3 double, 1 triple) Single sites have a 1-car capacity vehicle spur Double sites have a 2-car capacity vehicle spur Triple site has a 3-car capacity vehicle spur	Two vault restrooms Potable water system Trailhead Single sites have a picnic table, cooking grill/fire ring, and food locker. Double sites have 2 picnic tables, cooking grill/fire ring, and 2 food lockers Triple site includes 3 picnic tables, a cooking grill/fire ring, and 3 food lockers 2 information boards (one 3-panel and one 1-panel)	NFS land/Forest Service	The campground is in good overall condition. Most of the facilities and amenities are in good or excellent condition. The campground does not meet current accessible standards for NFS land.

Recreation Facility	Capacity	Amenities	Landownership/ Management Responsibility	Condition[a]
Cottage Creek Campground	No campsites or parking spaces	1 vault restroom	NFS land/Forest Service	This facility remains closed from a fire in 2010.
Garden Point Boat-in Campground	16 campsites (tent) (12 single, 4 double)	3 vault restrooms Single sites include a picnic table, fire ring, and Klondike stove Double sites include 2 picnic tables, fire ring, and Klondike stove. One 2-panel information board	NFS land/Forest Service	The campground is in good overall condition. Most of the facilities and amenities are in good condition with the exception of the restrooms and Klondike stoves, which are in fair condition. The campground does not meet current accessible standards for NFS land.
Madrone Cove Boat-in Campground[e]	10 single campsites (tent)	One vault restroom Campsites include a picnic table, fire ring, and Klondike stove. One 2-panel information board	NFS land/Forest Service	This campground is in fair overall condition. All facilities and amenities are in fair condition except for the restrooms, retaining walls, Klondike stoves and some of the picnic tables, which are all in poor condition. The campground does not meet current accessible standards for NFS land.

Recreation Facility	Capacity	Amenities	Landownership/ Management Responsibility	Condition[a]
Frenchy Point Boat-in Campground[e]	7 campsites (tent) (6 single, 1 double)	Single sites include a picnic table, fire ring and Klondike stove. The double site includes a picnic table, fire ring, and 2 Klondike stoves. Two 1-panel information boards	NFS land/Forest Service	This site is used as an undeveloped shoreline camping area. The facilities and amenities remaining at this site are in fair-to-poor condition. The campground does not meet current accessible standards for NFS land.
Dark Day Boat Launch (Main)	103 parking spaces (39 single, 64 double)	Boat launch with 2 lanes (3 lanes on the top section of the launch) and a floating boat dock 1 vault restroom (4 units) Trailhead One 2-panel information board	NFS land/Forest Service	The site is in good overall condition. The main amenities are in fair condition, including the boat ramp, parking area and restroom. This facility does not meet current accessible guidelines.
Dark Day Boat Launch (Overflow)	73 parking spaces (18 single, 55 double)	1 vault restroom (2 units)	NFS land/Forest Service	The overflow parking and restroom are in excellent condition. The overflow parking area and restroom meet the accessible guidelines.

Recreation Facility	Capacity	Amenities	Landownership/ Management Responsibility	Condition[a]
Cottage Creek Boat Launch	209 parking spaces (130 single, 79 double)	1 picnic site Boat launch with 2 lanes 2 vault restrooms	YCWA	The boat launch site is in excellent overall condition as most of the facilities and amenities were constructed around 2012. The lower portion of the boat ramp is in excellent condition. The parking area and restrooms all meet accessible guidelines.
Dark Day Picnic Site	14 single parking spaces	13 picnic sites (each with a picnic table and cooking grill/fire ring) 1 vault restroom Potable water system Two 1-panel information boards	NFS land/Forest Service	The facility is in good overall condition; however, the amenities (including picnic tables, the Klondike stoves and restrooms) are in fair condition. The site does not meet current accessible standards for NFS land.
Sunset Vista Observation Site	60 single parking spaces	1 vault restroom 1 picnic table Trailhead One 1-panel information board	NFS land/Forest Service	The facility is in good overall condition; however, the amenities (table and interpretive display) are in good to excellent condition. The site does not meet current accessible standards for NFS land.

Recreation Facility	Capacity	Amenities	Landownership/ Management Responsibility	Condition[a]
Dam Overlook Observation Site	24 single parking spaces	1 interpretive plaque	YCWA/Forest Service	The facility is in excellent overall condition with the parking and interpretive display in good to excellent condition. The facility does not meet current accessible standards for private land.
Moran Road Boating Site[d]	8 single parking spaces	Boat launch with 1 lane 1 vault restroom Informal car-top boat ramp (gravel) One 1-panel information board	NFS land/Forest Service	The facility is in good overall condition. The restroom is in excellent condition while the signs and access road are in poor condition. The site does not meet current accessible standards for NFS land.
Bullards Bar Trail	N/A[g]	Trailhead	NFS land, YCWA/Forest Service	Erosion exists at 13 locations on the Bullards Bar Trail. Of these 13 locations, 4 consisted of downed trees.
Schoolhouse Trail	N/A[g]	Trailhead	NFS land/Forest Service	Schoolhouse Trail remains in good condition with no identified erosion locations.
Floating Restrooms	No campsites or parking spaces	7 vault restrooms (each with 2 stalls)	N/A/ YCWA	The floating restrooms remain in excellent condition but do not meet accessible standards.

Recreation Facility	Capacity	Amenities	Landownership/ Management Responsibility	Condition[a]
Diversion Impoundments				
Our House Diversion Dam	25 single parking spaces[c]	None	NFS land/ N/A	The impoundment area is in good condition; accessibility was not intended.
Log Cabin Diversion Dam	N/A[g]	None	NFS land/ N/A	The impoundment area is in good condition; accessibility was not intended.

[a] Condition descriptions based on 2012 site assessments.

[b] Includes host site.

[c] Parking area is not striped, so the total number of spaces is estimated.

[d] The Madrone Cove Boat-in Campground and Moran Road Boating Site facilities lie within the PNF boundary. TNF manages the facilities through an agreement between forests, but management direction is still provided by PNF in its Land and Resource Management Plan, as amended.

[e] Frenchy Point Boat-in Campground is no longer managed as a developed campground, but rather for dispersed shoreline camping. The restroom facility has been removed; only the campsite amenities remain, including the picnic tables, fire rings, and Klondike stoves.

[f] Trailhead parking is available where the trail intersects other existing facility parking areas, including at the Schoolhouse Campground overflow parking area (20 spaces), Sunset Vista Observation Site (20 spaces), Dark Day Picnic Site (16 spaces), and Dark Day Boat Launch (39 single spaces).

[g] Parking at Log Cabin Diversion Dam impoundment is informal along the shoulder of Highway 49, which does not have a defined area to estimate the parking capacity.

Project recreation facilities located on NFS land are within the TNF's Bullards Management Area. The TNF and PNF Recreation Opportunity Spectrum (ROS) settings for the management area are Rural (i.e., substantially modified with structures or other cultural modifications) for the developed recreation facilities and Roaded-Natural (i.e., an area 0.5 mile or less from roads, where resource modifications range from evident to strongly dominant) in all other areas. The exception is Madrone Cove Boat-in Campground, which has a Roaded-Modified classification (i.e., sights and sounds of people are moderate; roads, landings, slash and debris are evident). YCWA also leases some land adjacent to the Cottage Creek Boat Launch within the project boundary to Emerald Cove Marina.

Operation and Maintenance Responsibilities

YCWA constructed the project recreation facilities and remains responsible for them under the current license. The Forest Service owns and operates the recreation facilities, with the exception of the Cottage Creek Boat Launch, Dam Overlook Observation Site, and water treatment plant. YCWA has also entered into a lease with Emerald Cove Marina, LLC, for operation and maintenance of the marina.

All of the recreation facilities are accessed for maintenance by vehicle, except for Madrone Cove Boat-in Campground, which is accessed by boat only. Garden Point Boat-in Campground is accessed by boat for minor maintenance and by vehicle for major maintenance (e.g., pumping the vault restrooms).

Responsibility for law enforcement and public safety at the New Bullards Bar Reservoir and recreation facilities is shared by the TNF and the Yuba County Sheriff's Department. The Forest Service enforces campground regulations, occupancy limits, vehicle limits, quiet hours, and federal laws. The Yuba County Sheriff boat patrol maintains safety and enforces the state and county regulations at Cottage Creek Boat Launch and on the water surface within the New Bullards Bar Reservoir recreation area. Yuba County ordinances contain provisions specific to New Bullards Bar Reservoir (Title VIII, Public Peace and Safety, Chapter 8.50 – Bullards Bar Recreation Area[112]). These ordinances detail the rules and regulations for all types of use on public land, including vehicle traffic, boating, shoreline use, swimming, houseboating, and fire prevention. The ordinance also authorizes YCWA to adopt ordinances and special rules and regulations with reference to the public use of New Bullards Bar Recreation Area. Rules and regulations contained in the ordinance pertaining to recreation use include:

- No person shall camp on the reservoir if the elevation of the water of the reservoir is above 1,940 feet above sea level.

[112] Defined in the ordinance as surface water in the New Bullards Bar Reservoir and the surrounding land to the top of the ridge nearest to the reservoir.

- No person shall camp or stay overnight on the reservoir without a valid camping permit.
- Private mooring facilities may not be installed on the reservoir or shoreline.
- Swimming or floating more than 100 feet from the shoreline is not permitted except when engaged in aquaplaning or within designated beach areas.
- No person shall place in use, or operate, on the waters of New Bullards Bar Reservoir any houseboat over 60 feet in length or 15 feet in width.
- No person shall place in use, or operate, a houseboat without a valid, annual houseboat permit.
- Houseboats are subject to inspections and require pump-outs at least every 6-months.
- It is unlawful to light, build or maintain any open fire within the recreation area except in a camp stoves or a fireplace provided, maintained or designated for such purpose, unless by authority of the Fire Protection Agency and authorized permit. Oil, butane, or gasoline camp stoves may be used in established camp sites or picnic areas where other stoves are provided, or in other areas where authorized by permit.

In addition, speed limit restrictions are posted on the reservoir for public safety near the boat launching facilities, mooring areas, the narrow upper North Yuba River arm of the reservoir, and for fisheries protection in certain coves.

Figure 3-48 shows the project recreation trails and reservoir zones at New Bullards Bar Reservoir.

Floating Restrooms

Seven floating restrooms are dispersed throughout the reservoir, each with two stalls on a floating dock, cleats for tying boats, and informational signs. In 2012, all of the facilities were in excellent condition; however, they do not meet accessible standards.

Project Diversion Dam Impoundments

The project's Our House and Log Cabin Diversion Dam impoundments do not have developed recreation facilities, but offer undeveloped recreation opportunities along the Middle Yuba River and Oregon Creek, respectively.

The Our House Diversion Dam impoundment is located on NFS land along the Middle Yuba River (RM 12.6) and provides undeveloped day use recreation opportunities. Vehicle access to the diversion dam is by way of Highway 49 to Ridge Road and then 1.8 miles along the paved Our House Dam Road. Informal parking for approximately 25 vehicles is available at the end of the Our House Dam Road, where

visitors can access the shoreline on foot. In 2012, the impoundment area was in good condition and use impact was low (YCWA, 2013l).

The Log Cabin Diversion Dam impoundment is located on NFS land along Oregon Creek (RM 4.3) and provides undeveloped day use recreation opportunities. YCWA, as authorized by the Forest Service, installed and maintains a locked gate on NFS land across Log Cabin Road at Highway 49 to restrict public vehicular access to the diversion dam. Visitors may park their vehicles along the shoulder of Highway 49 and hike into the diversion dam. In 2012, the impoundment area was in good condition and use impact was low (YCWA, 2013l).

Visitor Use

Table 3-62 provides estimated recreation visitation numbers for 2012 and recreation use estimates until 2050. In 2012, the estimated total project recreation use was 116,630 recreation days (RDs)[113] with the majority of use (82 percent or 95,870 RDs) occurring in the peak season,[114] compared to use (18 percent or 20,760 RDs) occurring in the non-peak season.[115]

Analysis of the data underlying these recreation visitation estimates show that overnight use (52 percent or 60,220 RDs) accounted for slightly more of the total use than day use (48 percent or 56,410 RDs). However, during the non-peak season, day use accounted for 69 percent (14,380 RDs) of the total use, compared to overnight use (31 percent or 6,380 RDs). During the peak season, overnight use accounted for 56 percent (53,840 RDs) of the total use, compared to day use (44 percent or 42,030 RDs). When comparing use by day type overall, total use was highest on the weekends (53,820 RDs) compared to weekdays (46,950 RDs) and holidays (15,860 RDs).

When comparing overall use by facility type, the day use facilities (i.e., boat launches, day use areas, and trailheads) accounted for the highest percentage of use (48 percent or 55,440 RDs) followed by the developed campgrounds (38 percent or 45,310 RDs) and houseboating use (11 percent or 12,470 RDs). Undeveloped uses accounted for the remaining 3 percent of total project use, which included permitted shoreline camping use (2 percent or 2,360 RDs) and diversion dam impoundment use (1 percent or 1,050 RDs).

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[113] A recreation day is each visit by a person to a development for recreational purposes during any portion of a 24-hour period.

[114] The peak recreation season is from the Memorial Day holiday weekend to the Labor Day holiday weekend.

[115] The non-peak recreation season is from after the Labor Day holiday weekend to immediately before the Memorial Day holiday weekend.

Future Recreation Use Estimate through 2050

YCWA used the 2012 project recreation use estimates and population growth rates for the applicable visitor counties of origin to develop a projected use estimate for the project by type of season (overall or annual, peak and non-peak) and day type (weekday, weekend and holidays).

By 2050, YCWA projects annual recreation use to increase by 50.9 percent (175,920 RDs) to 144,640 RDs for the peak season and to 31,330 RDs for the non-peak season (table 3-62). The increases in recreation uses are generally projected for each activity, including campgrounds/overnight use, picnic sites, day use areas (developed and undeveloped), boat launches, hiking, and parking lots.

Table 3-62. Annual recreation use estimate projections through 2050 based on county population growth rates (Source: YCWA, 2017a).

		2012 Use Estimate	Project Recreation Use Estimates				Increase	
Season	**Day Type**	**(RDs)**	**2020**	**2030**	**2040**	**2050**	**RDs**	**Percent**
Annual	Overall	116,630	128,610	143,480	159,280	175,920	59,320	50.90
	Weekday	46,950	51,770	57,760	64,120	70,820	23,880	
	Weekend	53,820	59,330	66,190	73,480	81,150	27,360	
	Holiday	15,860	17,510	19,530	21,680	23,950	8,080	
Peak Season	Overall	95,870	105,750	117,970	130,960	144,640	48,770	50.90
	Weekday	38,310	42,260	47,140	52,330	57,800	19,490	
	Weekend	41,700	45,990	51,310	56,960	62,910	21,210	
	Holiday	15,860	17,500	19,520	21,670	23,930	8,070	
Non-peak Season	Overall	20,760	22,900	25,560	28,370	31,330	10,570	50.90
	Weekday	8,640	9,530	10,640	11,810	13,040	4,400	
	Weekend	12,120	13,370	14,920	16,560	18,290	6,170	
	Holiday	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note RD – recreation day

Visitor Needs

YCWA's survey responses provide the project users' perspective about the adequacy of project recreation facilities and unmet demand for recreation opportunities at the project. Key findings of YCWA's study identified several needs including:

- additional facilities for public shoreline access, including day use parking areas near the shoreline;

- improved maintenance of project recreation facilities;
- campsites and facilities that accommodate RV use; and
- improved restrooms, showers, boat launch facilities, and more trails.

Boating Capacity and Functional Use Periods of Project's Developed Boat Ramps

In the 1993 Revised Exhibit R, YCWA and the Forest Service developed a maximum water surface carrying capacity of 420 boats-at-one-time (BAOT) and identified recommended a balance of uses (400 BAOT) between houseboats, inland camping, boat-in camping, and day use. A boat is considered any motorized watercraft, which at New Bullards Bar Reservoir generally consists of houseboats, power boats, and personal watercrafts. The carrying capacity of 420 BAOT was determined based on a range of water ROS settings existing on the reservoir:

- Urban natural – estimated capacity of 144 BAOT
- Rural natural – estimated capacity of 180 BAOT
- Semi primitive – estimated capacity of 96 BAOT

The Forest Service BAOT monitoring data from 2002 through 2012, show the carrying capacity was exceeded in 7 of the 11 years. In 2010, the exceedance occurred on a non-holiday weekend day, but all other exceedances occurred on holiday days. A summary of these observations from 2002 through 2012 are provided in table 3-63.

Table 3-63. Peak numbers of boats-at-one-time (2002–2012) (Source: YCWA, 2017a).

Year	Boats-At-One-Time (BAOT)			Number of Days that Exceeded the Capacity (420 BAOT)		
	Total	Houseboats[a]	Other	Total	Holiday	Non-Holiday
2002	453	No data	No data	2	2	0
2003	425	No data	No data	2	2	0
2004	474	No data	No data	1	1	0
2005	410	No data	No data	0	0	0
2006	424	No data	No data	1	1	0
2007	454	No data	No data	1	1	0
2008	403	No data	No data	0	0	0
2009	404	No data	No data	0	0	0
2010	421	No data	No data	1	0	1

Year	Boats-At-One-Time (BAOT)			Number of Days that Exceeded the Capacity (420 BAOT)		
	Total	Houseboats[a]	Other	Total	Holiday	Non-Holiday
2011	397	58	350	0	0	0
2012	453	45	408	1	1	0
Average	429	52	379	0.8	0.7	0.1

[a] Only the total BAOT counts were available from the Forest Service for 2002 through 2010. A breakdown of the types of boats and the counts by day were only available from the Forest Service for 2011 and 2012.

YCWA identified the functional periods of the project's two developed boat ramps at Cottage Creek and Dark Day Boat Launch facilities. First, YCWA identified the constructed top and lower end of each boat ramp to determine the functional water surface elevation (WSE) range of each boat ramp. A boat ramp was considered functional from the constructed top of the boat ramp down to 3 feet above the lower end of the constructed ramp per the California Department of Boating and Waterways design guidelines (CDBAW, 1991).

Second, YCWA compared the daily median reservoir WSE from water year 1970 through water year 2010 by water year type against the functional WSE range of each ramp to identify the periods of the recreation season (year-round) that the boat ramps are functional. YCWA made this comparison by water year type to identify how different water year conditions affected the functionality of the boat ramps. For the purpose of this study, YCWA used five water year types—wet, above normal, below normal, dry, and critical. These water year types correspond to the Yuba River Index that was developed by YCWA to support the Water Board's Revised Decision 1644 (Water Board, 2003).

The minimum functional WSE is 1,853.0 feet for the Cottage Creek Boat Launch and 1,758.0 feet for Dark Day Boat Launch. The Dark Day Boat Launch is open year-round, but the Cottage Creek Boat Launch is only open when the ramp is at a functional WSE. The functional use periods of the boat launch ramps by water year type are:

- Cottage Creek Boat Launch
  - Wet water years: Year-round
  - Above normal water years: Late January through September
  - Below normal water years: Late February through early October
  - Dry water years: Year-round, except for two periods in med-September and mid-November through mid-December

- Critically dry water years: Year-round, except for a period from early September through the end of September

- Dark Day Boat Launch
  - All water years: Year-round

When comparing the functional use periods to the peak recreation season, the boat ramps were always functional during the peak recreation season with the possible exception of critically dry water years when Cottage Creek Boat Launch may not be functional, depending on when Labor Day falls in early September.

The Dark Day Boat Launch has had a functionality issue when the reservoir lowers to about 1,856 feet because of slope instability in the upslope side of the ramp. At times, the eroding slope deposits sediment on the boat ramp—typically during the non-peak season. The sediment buildup affects the functionality of the boat ramp by making the boat ramp impassable for launching, and it can also impede or damage the function of the boat dock rail and roller system. When this occurs, the Forest Service (YCWA's concessionaire for the non-marina facilities) removes the boat dock. YCWA has attempted to stabilize the slope in the past, but sediment buildup on the boat ramp continues to occur periodically.

Whitewater Boating

Whitewater Boating in the Vicinity of the Project

Whitewater boating opportunities associated with the west slope of the Sierra Nevada Mountain Range include all of the major drainages to the north and south of the project. The Feather River drainage to the north of the project has more than 11 class III to V+ whitewater boating runs and steep creek boating opportunities. South of the project, the American and Rubicon River drainages have at least 20 whitewater boating runs, most of which are rated class IV and V and provide high quality whitewater recreation opportunities in the spring.

Whitewater Boating in Yuba River Upstream of New Bullards Bar Reservoir

The North Yuba River above New Bullards Bar Reservoir from Indian Valley to New Bullards Bar Reservoir (a non-project reach) provides class IV whitewater boating opportunities. Whitewater boaters can take out at the upstream end of New Bullards Bar Reservoir or they can paddle or be towed to one of the boat ramps. Whitewater boating in this reach typically occurs from April through July. Currently, three commercial outfitters operate trips on this reach, and the number of trips per year depends on flow levels. For example, during a low water year, each outfitter may book 5 trips per year, whereas during a high water year, each outfitter may book up to 35 trips per year. The primary type of whitewater boating on this reach is rafting, with flows estimated to support various raft sizes at 1,000 cfs or higher for 14-foot rafts, and 700 to 1,000 cfs for 12 foot rafts. Kayaking is less common because boaters have a long paddle across the

reservoir to reach the take-out. Private and commercial outfitters with large numbers of users can share the cost for a boat to tow kayaks across the reservoir. However, kayaking typically occurs in smaller group sizes that require a higher cost per person for being towed across the reservoir, which decreases the appeal of this reach to kayakers.

Currently, boaters can be towed to take-out locations at either Dark Day Boat Launch or Cottage Creek Boat Launch. Cottage Creek Boat Launch is not as desirable because it is 2 miles beyond Dark Day Boat Launch.

YCWA investigated four known whitewater boating reaches associated with the project: Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge (7.5 miles); Middle Yuba and Yuba River from Highway 49 Bridge to Englebright Reservoir (take-out is at Rice's Crossing Road) (non-project reservoir) (12 miles); North Yuba River from New Bullards Bar Dam to the confluence with the Middle Yuba River (2.3 miles); and Oregon Creek from Log Cabin Diversion Dam to its confluence with Middle Yuba River (4.1 miles) (figure 3-49).

The Middle Yuba River from Our House Diversion Dam to the Highway 49 Bridge has a boatable flow range from 360 cfs to 3,000 cfs, with optimal flows between 500 and 2,500 cfs. The reach has a difficulty classification of III or higher and could be boated in kayaks (inflatable and hard shell), as well as rafts, depending on the flow. YCWA indicates a local demand exists for this reach, most likely in April and May, which would provide high quality boating that is comparatively better than Chamberlain Falls, a commonly boated run on the North Fork of the American River.

The primary constraint to boating from Our House Diversion Dam to the Highway 49 Bridge is the lack of accurate flow information. Boaters currently estimate flows based on the gage at Our House Diversion Dam, which does not account for contributing flows from other tributaries. Public vehicular use is not allowed past the gate on Our House Diversion Dam Spur Road, located about 900 feet from the dam, so boaters must walk several hundred yards with their boats to the river. Although the take-out at Oregon Creek Day Use Area has developed recreation facilities (non-project, Forest Service operated), the restrooms and parking are not available to boaters because the facility does not open until the summer recreation season begins, which is later than when boating would occur.

YCWA identified circumstances that challenge and constrain whitewater boating opportunities in the Yuba River from Highway 49 Bridge downstream to Englebright Reservoir. These circumstances include the occurrence of flashy spill flows of short duration that do not allow boaters to anticipate when suitable conditions exist because the lower flows of the hydrography are typically diverted out of the river through the Lohman Ridge Diversion Tunnel. Also, accretion flow when New Bullards Bar Reservoir is spilling during the spring can create flows that are too high for whitewater boating downstream of the confluence (although flows upstream of the confluence would be in a suitable boating range).

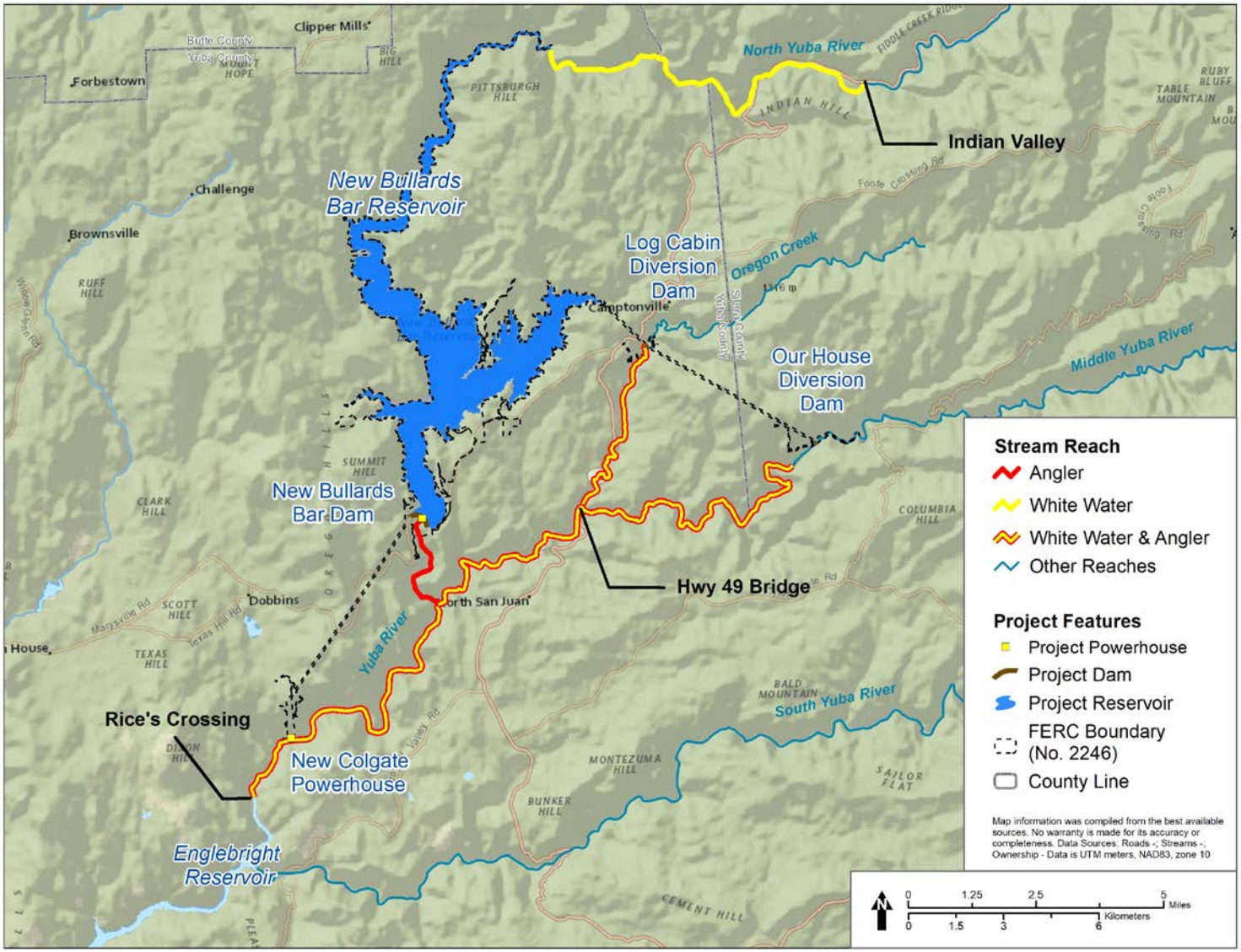

Figure 3-49. Reaches with potential whitewater boating opportunities (Source: YCWA, 2012j, as modified by staff).

The 2.4-mile reach between New Bullards Bar Dam and the confluence with the Middle Yuba River has a gradient of 135 feet per mile and provides class V to V+ whitewater boating opportunities. The range of boatable flows is from 500 to 1,000 cfs with an optimum range of 520 to 790 cfs. Although this is a viable and quality whitewater opportunity, the existing level of use is low use because real-time flow information is not provided, flashy spill conditions create brief opportunities (i.e., flow rapidly ramps and recedes through the boatable range), run difficulty (V/V+), and public vehicular access to the put-in downstream of the dam is not allowed.

YCWA determined the Oregon Creek reach does not provide significant whitewater boating potential due to its low gradient, thick riparian growth in the channel, low flow, and lack of boating demand for this type of opportunity.

3.3.5.2 Environmental Effects

This section includes a description of the anticipated effects of YCWA's proposed new facilities and environmental measures on recreation resources. The section is divided into the following areas: (1) effects of construction-related activities and (2) effects of continued project operation and maintenance.

Effects of Construction-related Activities

YCWA proposes to construct several facilities, including New Colgate Powerhouse tailwater depression system, the New Bullards Bar Dam auxiliary flood control outlet, modifications to Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets, modification to the gates at Lohman Ridge Diversion Tunnel, and the construction of various recreation facilities. This section provides a general description of the effects of the construction of these facilities on recreation resources.

New Bullards Bar Dam Auxiliary Flood Control Outlet

YCWA proposes to construct the New Bullards Bar Dam auxiliary flood control outlet. During construction, the Dam Overlook Observation Site would be used as a laydown and disposal area during the field construction period for the auxiliary flood control outlet and would be closed to recreation use for the full duration of the field construction period (no more than 2 years).

Our Analysis

The project would have a short-term and local effect on recreation resources by closing the Dam Overlook Observation Site for up to 2 years. As such, the effect on recreation access and use of the Dam Overlook recreation facility would be noticeable but short-term. The Dam Overlook facility generally receives low levels of use (i.e., 580 RDs and less than 5 percent parking area occupancy annually) and the nearby day use facility (i.e., Sunset Vista Observation Site) has adequate capacity and similar opportunities to accommodate the displaced users during this time period. In addition, YCWA's proposed Recreation Facilities Plan (RR1) takes this work into account and has

scheduled the major rehabilitation and improvements at the Dam Overlook Observation Site to occur 2 years after completing modifications to New Bullards Bar auxiliary flood control outlet.

In addition to the effects at the Dam Overlook facility, construction of the New Bullards Bar Dam auxiliary flood control outlet would have a short-term, temporary, adverse effect on recreation resources on other nearby project recreation facilities (e.g., Sunset Vista Observation Site, Schoolhouse Campground, Hornswoggle Group Campground, and Dark Day complex). Construction traffic could affect use at these facilities that are accessed by vehicle via Marysville Road where the work would occur. YCWA would complete construction work with temporary disruptions of normal traffic patterns along Marysville Road when moving heavy construction equipment (e.g., excavators, haul trucks, concrete trucks, and cranes). Some short duration (i.e., 5- to 15-minute) road closures may be required when setting up or unloading large equipment.

Implementing YCWA's proposed ecological group meetings (GEN1, Forest Service 4(e) condition 2) and Recreation Facilities Plan (RR1) would minimize and mitigate construction-related effects on recreation resources. YCWA's proposed measure GEN1 would mitigate some of the effects by coordinating the proposed work with the Forest Service to minimize disruptions during peak recreation use periods (i.e., weekends and holidays in the peak use season). YCWA's proposed measure RR1 includes annual coordination meetings and facility inspections with the Forest Service that would mitigate potential effects on recreation related to construction activities. Finally, YCWA would obtain all necessary permits and approvals for the work and would adhere to all permit terms and conditions, which is also expected to partially mitigate any aesthetic effects.

New Colgate Powerhouse Tailwater Depression System

The construction period for the New Colgate Powerhouse tailwater depression system is expected to last approximately 5 months, and all staging and laydown areas would be within the fenced powerhouse area. Parking and primary access for recreational use is along the shoulder of Lake Francis Road just outside the fenced powerhouse area. Access to the parking lot and parking capacity would remain open and available during construction activities.

Our Analysis

Construction of the New Colgate Powerhouse tailwater depression system would have a short-term, minor, adverse effect on recreation resources along the Yuba River near New Colgate Powerhouse by creating loud and busy construction activities near a recreation site. Primary recreational use in the area is angling accompanied by a low level (less than 100 RDs) of whitewater use. This site is used primarily as an access point to the river rather than a destination for recreational use. Typically, anglers will disperse from the access point at Lake Francis Road to recreate farther upstream or downstream of New Colgate Powerhouse. Whitewater boaters typically use this site as a take-out during the winter/spring months when flows are in the boatable range. Boaters only use the site

as a transition point where they remove boats from the river and typically leave the site soon after.

Depending on the final construction schedule, noise, vehicular traffic, and the presence of construction staff could affect the recreation access and experience adjacent to the New Colgate Powerhouse. The increase in noise, vehicular traffic, and presence of additional staff during construction is expected to be minimal, and similar to what occurs during annual outages that currently occur. Visitors would not be displaced from this point of access, and short, minimal disturbances would be similar to existing conditions.

Implementing YCWA's proposed ecological group meetings (GEN1, Forest Service 4(e) condition 2) and the Recreation Facilities Plan (RR1) would minimize and mitigate effects of construction activities on recreation resources. YCWA's proposed measure GEN1 would mitigate some of the effects by coordinating the proposed work with agencies and recreation groups that use this site (e.g., American Whitewater and angling groups) to minimize construction-related traffic effects. However, stakeholders would also be able to comment on the plan prior to Commission approval, so implementing the ecological group meetings may add little benefit. In addition, YCWA's proposal includes a measure (RR1) to improve recreation access and use at this area by constructing a trail from the parking area to the river's edge after construction of this project in license year 2. Finally, YCWA would obtain all necessary permits and approvals for the work and would adhere to all permit terms and conditions, which is also expected to partially mitigate any aesthetic effects.

Modifications to the Fish Release Outlets at Our House Diversion Dam and Log Cabin Diversion Dam

YCWA proposes to construct outlets at the diversion dams to meet proposed new minimum flows below the diversion dams.

Our Analysis

Modifications to the fish release outlets would have short-term, minor, effects on recreation resources at Our House Diversion Dam where, depending on the final construction schedule, noise, vehicular traffic, and the presence of construction staff could affect recreation access and experience. Construction equipment and staff could have short-term, temporary effects of reduced recreation access at the site; however, this work would be scheduled for late summer during the lowest period of use so few visitors, if any, would be affected. The peak recreational use periods occur in winter, spring, and early summer when whitewater boating and angling are most common. However, in the late summer, when fishing and gold panning are popular, these recreational uses could be affected, particularly downstream of the diversion dam if construction activities and equipment are present and prevent recreation access to the river.

During construction, visitors may need to travel farther downstream to find suitable conditions for their activities; construction noise would diminish farther away from the dam. Upstream of the impoundment, recreation access would not be affected by

construction; however, noise may be audible. Because the parking area is about 0.2 mile east of the dam and areas of recreational use are even farther east, any noise would be minimal, if at all audible. Recreational river boating would not be affected because flows are not within the boatable range during late summer months when the construction would occur.

Implementation of YCWA's proposed measure ecological group meetings (GEN1, Forest Service 4(e) condition 2) and the Recreation Facilities Plan (RR1) would minimize and mitigate effects on recreation resources. YCWA's proposed measure GEN1 would mitigate some of the effects by coordinating the proposed work with agencies and recreation groups that use this site (e.g., American Whitewater and angling groups) to minimize construction-related traffic impacts. YCWA's proposed measure RR1 includes annual coordination meetings and facility inspections with the Forest Service that would mitigate potential effects. Finally, YCWA would obtain all necessary permits and approvals for the work, and would adhere to all permit terms and conditions, which is also expected to partially mitigate any aesthetic effects.

Because recreational use is uncommon at Log Cabin Diversion Dam and the site does not have developed recreation facilities, construction would have no measurable effect on recreation use at this location.

Recreation Facilities Rehabilitation and Enhancements

Construction of recreation facilities has the potential to affect the availability of recreation facilities and opportunities to the public. As part of the proposed Recreation Facilities Plan (RR1), YCWA would minimize these effects during construction by: (1) undertaking construction activities during periods outside the facilities' peak recreation season, where possible (e.g., swim beaches and campgrounds); and (2) undertaking construction activities in only a portion of a facility while the remainder of the facility remains open to the public (e.g., campgrounds and picnic areas).

Our Analysis

YCWA's proposal to enhance recreation facilities would have short-term, minor effects on recreational use during construction. YCWA's proposal to mitigate these effects would allow visitors continued access to all of the types of recreation facilities and opportunities normally available at each recreation area. Construction activities may have short-term effects on total capacity at some sites. At boat launches, YCWA would schedule construction during the non-peak recreation season to minimize the number of boaters who would not be able to access the reservoir. During all recreation construction work, YCWA would take necessary measures to minimize noise and presence of construction equipment and staff. In addition, YCWA would make visitors aware of planned construction work by posting notices of upcoming planned work on kiosks and at entrance gates.

Effects of Proposed Project Operation and Maintenance

The following section describes the effects of YCWA's proposed measures, agency preliminary terms and conditions, and recommendations from agencies and other entities that are intended to address recreation-related project effects. We also analyze the effects of measures that are intended to address project effects on other resources but may also affect recreation resources.

Recreation Facilities and Access

Recreation Facilities Plan—Project recreation facilities need to accommodate existing and projected visitor use, allow boating access to project reservoirs and rivers, provide for public safety, and protect natural and cultural resources. To address the project effects identified in the results of the relicensing studies and enhance recreation resources at the project, YCWA proposes to implement a Recreation Facilities Plan (RR1) containing measures that would be developed over the license term. The plan provides for:

- rehabilitating and expanding capacity at existing campgrounds, day use areas, parking areas, and boat launches;
- constructing new recreation facilities;
- operating and maintaining project recreation facilities;
- monitoring and reporting project recreation use and visitor preferences through the license term;
- annually consulting with the Forest Service; and
- periodically reviewing the plan for adequacy.

The plan was developed in consultation with state and federal agencies and representatives of recreation interests. Forest Service 4(e) condition 46, Recreation Facilities Plan, would require implementation of YCWA's plan for those measures located on NFS land. In 10(a) recommendation 16, the Forest Service recommends implementing the measures in the plan that are not located on NFS land. The plan includes recreational elements such as facilities, visitor information, access, and monitoring. We provide separate analyses of these plan elements.

Our Analysis

Most project recreation facilities are in good condition; however, some are in fair or poor condition. The water system serving most of the recreation facilities is beyond its useful service life, and none of the project facilities fully comply with accessibility requirements. YCWA proposes (RR1) to rehabilitate or improve all project facilities within about 10 years of license issuance. This time frame adequately considers the number of facilities, the time needed for permitting and design, and the need to stagger construction activities to minimize effects on facility availability. Water system replacement is also scheduled early during the license term, which would ensure this

amenity would continue to be available at the recreation facilities. YCWA would also be responsible for all heavy maintenance, including addressing deferred maintenance needs and complying with accessibility requirements, at project recreation facilities through the license term, thereby improving facility condition and achieving accessibility.

Visitor survey responses indicate better recreation facility maintenance is necessary. YCWA's proposed measure should remedy this situation by clearly defining YCWA's roles and responsibilities for accomplishing operation and maintenance by using its own staff or contractors or through an agreement with the Forest Service. Under the latter, YCWA would still be responsible for expenses related to operation and maintenance. Under either scenario, facility user fees would be used to offset operation and maintenance expenses, as allowed under Commission regulations. Having this funding source directed to the project recreation facilities would improve their appearance, decrease instances of deferred maintenance, and enable operators to make repairs as soon as possible, resulting in overall improved user satisfaction and public safety.

Condition assessments show trails lack sufficient maintenance for public safety and resource protection. Accomplishing heavy trail maintenance, as proposed, for Bullards Bar and Schoolhouse Trails would correct the existing deficiencies. For new trails, performing heavy maintenance in the future, as proposed, would minimize potential effects related to safety and resource protection during the license term.

The types of project recreation facilities that would be provided by implementing the plan would accommodate a spectrum of opportunities expected in the future. The proposed facilities provide for family, group, tent, boat-in, and RV camping; boat launches providing reservoir access; and trails and day use areas enabling shoreline use.

Providing recreation facilities with sufficient capacity for future recreational use is necessary to ensure adequate and safe access to project lands and waters. Occupancy at most campgrounds on peak weekends is more than 85 percent and will likely reach 100 percent by 2020. The proposed new campgrounds at Kelly Ridge and Shadow Ridge would add about 45 campsites at the project. Although seven of the campsites would replace capacity removed when Frenchy Point Boat-in Campground is decommissioned, YCWA's proposal would increase overnight capacity by about 35 percent and accommodate projected demand.

Day use areas appear to have sufficient capacity for existing use, but survey responses and projected use indicate a need to expand capacity, develop additional shoreline access, and improve facilities. YCWA's proposal would meet these needs by constructing a new day use area at Cottage Creek, adding 20 parking spaces at the Dark Day complex, and increasing Moran Road Boating Site parking capacity from five to eight parking spaces. Other proposed measures would improve visitor use and expand capacity by relocating existing picnic sites closer to the shoreline; increasing shoreline access by developing shoreline trails; and applying for a county ordinance to establish a non-motorized water surface zone to minimize conflicts between shoreline users and motorized boaters in a popular shoreline use area. YCWA's proposed shoreline loop trail

around the peninsula where the new Shadow Ridge Campground would be developed would serve to meet an identified need for additional non-motorized trails at the project.

Occupancy at the three boat launch parking areas on peak weekends ranges from about 30 to 74 percent and is expected to reach about 35 to 87 percent by 2020. Although existing capacity appears sufficient to meet projected peak season weekend use, YCWA's proposal to increase Cottage Creek and Dark Day parking capacity would accommodate occasionally high peak season demand on some weekends and holidays.

Based on the detailed descriptions of facility development, the proposed campground amenities include flush restrooms and showers that reflect the level of development that seems to exceed the designated ROS of Rural. Recreation facilities within this ROS classification should correlate to Development Scale 4 parameters that state that development may provide some facilities designed strictly for comfort and convenience of users and luxury facilities are not provided (Forest Service, 2015). Although these amenities appear more consistent with the level of development for a facility on NFS land with an Urban ROS classification—where facilities are mostly designed for comfort and convenience of users, usually include flush toilets, and may include showers, bathhouses, laundry facilities, and electrical hookups—providing these types of facilities would respond to visitor needs identified in the survey responses and is consistent with the Forest Service's preference to have these amenities provided.

Considering development would increase the RV campsite capacity, providing an RV sanitation station, as proposed, would reduce the potential for RV users to improperly dispose of waste. Under YCWA's plan, it would develop an amphitheater, recreation brochure, signs, and displays that would improve availability of information, education, and interpretation for project recreation visitors. Improving visitor education about project resources may decrease improper visitor use such as polluting and contributing to the spread of invasive species. Facility accessibility and current design requirements would be incorporated into facilities when they are designed for construction or rehabilitation to provide accessible facilities that accommodate RVs and equipment appropriate for the development. YCWA's proposal would improve access of recreation facilities to persons with disabilities.

Recognizing that almost all of the project recreation facilities are located on NFS land, the plan provides for sufficient opportunities for coordination with the Forest Service, including inspections, permitting, and annual coordination meetings through the license term. YCWA's well-defined roles and responsibilities relative to operating and maintaining project recreation facilities as identified in the plan would address existing facility deficiencies, including accessibility, and reliably and expeditiously resolve facility issues that emerge during the license term. This measure would redeem YCWA's responsibility to provide safe and adequate project recreation facilities to meet visitor needs.

Access at New Bullards Bar Dam—Most of the project land in the vicinity of the project dams is public land managed by the Forest Service or private land. Access to

project shoreline and reaches for recreational use is constrained by steep topography, private land ownership, and YCWA's restrictions on vehicular traffic necessary to provide for public safety and security near project infrastructure. YCWA's access road leads to the base of New Bullards Bar Dam, an access point to project lands and water; however, public vehicular access is not allowed on this road.

In 10(a) recommendation 17, the Forest Service recommends providing public vehicular access below New Bullards Bar Dam, constructing parking for five vehicles, developing a pedestrian trail leading to the gaging station, and, if necessary, installing a security gate and fencing to allow access to the reach while providing security and public safety near project infrastructure. The Water Board (preliminary 401 condition 22), U.S. Department of the Interior, National Park Service (National Park Service) (10(a) recommendation 14), FWN (recommendation XIII), and California DFW (10(j) recommendation 2.22) include similar recommendations to provide public access and the amenities as described in the Forest Service recommendation.

YCWA did not adopt the agency and FWN measures for providing public vehicular access below New Bullards Bar Dam, citing that: (1) difficult access for recreational use would exist irrespective of the project; (2) whitewater releases have not been recommended by YCWA or any other entity for this reach; (3) the existing steep, narrow access road presents public safety concerns; and (4) the need to maintain security at project infrastructure. YCWA also filed a letter from California DWR, Division of Dam Safety containing the agency's concerns about allowing public access below the dam (letter from C. Aikens, General Manager, YCWA, Yuba City, California, to K.D. Bose, Secretary, FERC, Washington D.C., dated December 20, 2018, and filed December 19, 2018). These concerns include unauthorized access, vandalism, potential impacts on outlet and spillway operations, public safety during high and sudden outlet spillway releases; effects of traffic and parking on day-to-day project maintenance and monitoring activities; and public safety during road construction activities.

Our Analysis

The ease of public access to the gaging station would be greatly increased by allowing vehicle use on the access road, and public recreational use of project lands and waters is an important project purpose. However, providing this public access at hydroelectric projects must be assessed on a site-specific basis and consider public safety and project security.

The need to improve access is valid considering the reach is suitable for class V to V+ whitewater boating and YCWA's proposed measure to control spills (AR4) would provide 3-day boating opportunities about once every 5 years (see analysis later in this section under *Control Project Spills at New Bullards Bar Dam*), which would supplement any other opportunities that may occur as a result of other resource measures or project operation. The level of difficulty combined with the infrequent occurrence of suitable whitewater boating flows would likely result in few boaters taking advantage of public

access to the river. Although vehicular access would make it easier to get to the river, whitewater boating study participants said hiking down the road for access was a manageable alternative compared to hiking down canyon slopes to reach the river. Similarly, anglers would find it easier to access the river, but the angling quality for the overall reach would likely remain low because the steep canyon walls and predominance of private land along the river limit access for anglers up and down the shoreline. Consequently, allowing public vehicular access below New Bullards Bar Dam would likely improve access for only few visitors.

As YCWA states, upgrading the road would be challenging because of the steep and unstable topography, and this could be an expensive measure to implement. Specifically, the bench-cut road is currently only wide enough for one-way traffic; constructing turnouts would require extensive modification, and it would be difficult to maintain their stability on the steep slope. Other necessary actions would include installing guard rails, removing snow, ensuring timely road repairs, clearing rocks and landslides, and accomplishing similar maintenance activities necessary to meet conditions for providing public vehicular access.

Public safety concerns at the river should also be taken into account when considering if it is appropriate to allow vehicular access on the project access road below the dam. Rapid and unexpected spill flows create unsafe conditions for river use immediately below the dam. Allowing public vehicular use of the access road would encourage recreational use in this area, including in the river channel, which would increase the potential for visitors to be exposed to unsafe conditions during spill events. Irrespective of spill events, the Yuba County Sheriff Department states it is also concerned that increasing public access below New Bullards Bar Dam for recreational whitewater boating will increase the costs associated with search and rescue efforts. We also note that spill flows enter the river directly across from the access road (see figure 2-3), and the associated spray can impair visibility on the road.

A third consideration is the concern for maintaining security at the project infrastructure. Important project infrastructure is located at the base of the dam, and encouraging public use in this area would increase the potential for vandalism and trespassing.

Access at Our House Diversion Dam—As part of the proposed Recreation Facilities Plan (RR1), YCWA would improve the parking area near Our House Diversion Dam by providing an information kiosk, temporary restroom, pedestrian trail, and a wheeled cart for boaters to transport their equipment to the river.

Comments from the Forest Service, FWN, and California DFW indicate they support this level of proposed development because of YCWA's security concerns for project infrastructure.

Our Analysis

Improving access to the river would accommodate expected increased recreational use resulting from proposed scheduled whitewater boating releases in the reach (RR3) that would be within the range of boatable flows. The level of effort necessary to traverse the 0.25-mile hike to reach the put-in would be typical of boaters' experiences on other boating runs; this would not be an unreasonable distance, especially if, as YCWA proposes, a cart was provided. The temporary restroom would minimize potential for pollution, and a hardened trail would reduce the area potentially subject to recurrent foot traffic, which would reduce potential for soil compaction, erosion, and vegetation damage. The proposed measure would provide sufficient access for recreational use.

As seen at other remote FERC-licensed recreation facilities in the region, the isolation of the site increases the potential for vandalism. The plan adequately describes the process for evaluating alternatives and conditions under which YCWA would not be required to continue providing site amenities if vandalism was recurrent. This approach is a reasonable attempt to provide facilities to meet visitor needs and protect resources while recognizing it would not be cost effective to require YCWA to constantly replace vandalized amenities.

Access for Other Whitewater Boating Opportunities—In addition to the reaches immediately downstream of New Bullards Bar Dam and Our House Diversion Dam, whitewater boating opportunities are available upstream of New Bullards Bar Reservoir and downstream of the confluence of Middle and North Yuba Rivers. As part of the proposed Recreation Facilities Plan (RR1), YCWA would improve whitewater boating access at the New Colgate Powerhouse (take-out downstream of the confluence) by constructing a river access trail from the existing parking area and arranging, with the private marina operator, to provide a shuttle service across New Bullards Bar Reservoir (take-out for boating upstream of New Bullards Bar Reservoir).

Forest Service and FWN comments support YCWA's proposed measure to improve access at New Colgate Powerhouse (on YCWA-owned land). BLM's 10(a) recommendations 11 through 13 would require YCWA to provide whitewater boating improvements at Daguerre Point Dam and Hammon Grove and develop a plan to provide and maintain signs related to recreation access on BLM-managed lands between Englebright and Daguerre Point Dams. FWN also recommends requiring YCWA to demonstrate that funding provided to the Forest Service in an off-license agreement would enable the agency to operate Oregon Creek Day Use Area during the boating season from October 1 through June 30.

YCWA did not adopt the BLM recommendations related to improvements on Yuba River downstream of Englebright Reservoir in the proposed Recreation Facilities Plan because these locations are outside the project boundary and the associated recreational use would exist irrespective of the project. YCWA did not adopt FWN's funding recommendation because the day use area is a publicly owned facility managed

by the Forest Service that is primarily used for non-project related recreation, and whitewater boating in the reach would occur irrespective of project operation.

Our Analysis

Results of the Recreation Flow Study indicate the preferred take-out location below the confluence of the Middle and North Yuba Rivers is at New Colgate Powerhouse. However, other than a parking area, no facilities are currently available to accommodate recreational use at this location. YCWA's proposed measure would accommodate recreational use at this location as well as the expected increased use resulting from proposed whitewater flows provided below Our House Diversion Dam (RR3) and improved flow information (RR2). Providing a hardened trail would reduce the area potentially subject to recurrent foot traffic, which would reduce soil compaction, erosion, and vegetation damage.

Whitewater boaters' experience is affected at New Bullards Bar Reservoir where whitewater boaters have to paddle the length of the reservoir—more than 10 miles—to reach the take-out on the reservoir shoreline. YCWA's proposed fee-based shuttle may reduce the level of effort to complete this run and enhance recreational use, but whitewater boating use of the reach would still probably be limited because of the estimated 2-hour travel time by shuttle to the take-out.

In addition to providing access for non-project related day use recreation activities, Oregon Creek Day Use Area is used as a take-out for boating the reach downstream of Our House Diversion Dam and as a put-in for boating downstream to New Colgate Powerhouse. Because the Forest Service only operates this facility during the peak use period and boating flows occur outside this period, this facility is not available to boaters. Scheduled boating releases (RR3) and improved flow information (RR2) would increase boating use of this reach; therefore, having the Oregon Creek Day Use Area amenities available during boating season should adequately support this use. It would be appropriate for YCWA to support a commensurate share of the operation and maintenance cost of this facility, particularly because the use would not likely overlap the period when non-project uses typically occur. Ensuring adequate amenities are provided and available for use at the take-out would accommodate whitewater boating needs and minimize potential environmental effects caused by improper sanitation and parking off hardened surfaces that would occur if the facility was not open during the boating use period. Funding provided by YCWA under an off-license agreement would adequately support the commensurate share of project use of this day use area, which is mainly used for non-project recreation.

Improvements for access at Daguerre Point Dam and Hammon Grove, included in BLM's 10(a) recommendations 11 and 12, are more than 10 miles downstream of the project, and the project does not affect recreational use of these areas. Similarly, the area associated with BLM's recommended sign plan (recommendation 13) is located at a

sufficient distance from the project such that this measure would not address any project effect.

Whitewater Boating Use and Flow Information

The project affects whitewater boating opportunities on the reaches downstream of New Bullards Bar Dam and Our House Diversion Dam because under current operations flows are diverted from the reaches and minimum flow releases do not provide sufficient flow for whitewater boating. Also, other constraints, such as lack of available flow information, may discourage boaters from taking advantage of existing opportunities when flows are within the boatable range.

YCWA proposes providing flow downstream of Our House Diversion Dam within the suitable boating range on up to 8 days a year, depending on the type of water year (RR3). Flows would be provided on weekend days between October 1 and March 31 and may be the result of natural conditions or project operation.

Under YCWA's proposed measure RR3, YCWA would provide weekend boating days from October 1 and March 31 between 600 cfs and 2,000 cfs, as measured at the USGS gage 11408880, according to the schedule provided in table 3-64.

Table 3-64. Proposed project whitewater boating schedule below Our House Diversion Dam (Source: YCWA, 2017a).

Water Year Type as Defined in YCWA's Proposed Measure WR2			**Number of Weekend Whitewater Boating Days from October 1–March 31**
California DWR's Full Natural Flow at Smartsville for the Full Water Year that Ended on September 30	**Bulletin 120 February Forecast**	**Bulletin 120 March Forecast**	
Wet, above normal, below normal or dry	Any water year type	Wet	8
Wet, above normal, below normal or dry	Any water year type	Above normal	6
Wet, above normal, below normal or dry	Any water year type	Below normal, dry, or critically dry	4
Critically dry	Wet or above normal	Any water year type	2
Critically dry	Below normal, dry, or critically dry	Any water year type	0

Forest Service 4(e) condition 48 is consistent with this proposal, and FWN recommends including YCWA's proposed measure in a new license. The Water Board indicates it would include a requirement (preliminary 401 condition 21) for YCWA to develop a plan in consultation with others to specify scheduling, flow, duration, and method of public notification of flows for the reach downstream of Our House Diversion Dam.

Additionally, YCWA proposes, and Forest Service 4(e) condition 47 and 10(a) recommendation 18 are consistent with providing publicly available real-time flow information from the following gages (RR2):

- North Yuba River upstream and downstream of New Bullards Bar Reservoir;
- Middle Yuba River downstream of Our House Diversion Dam;
- Oregon Creek downstream of Log Cabin Diversion Dam; and
- Yuba River at Smartsville and Marysville.

YCWA also proposes to provide monthly flow forecasts on a publicly available website for:

- North Yuba River downstream of New Bullards Bar Reservoir;
- Middle Yuba River downstream of Our House Diversion Dam;
- Oregon Creek downstream of Log Cabin Diversion Dam; and
- Yuba River at Smartsville.

BLM, the National Park Service, and FWN support YCWA's proposal relative to providing recreation flow information. FWN recommends that YCWA be required to publicly report short- and long-term forecast flows and flow ramping rates on the lower Yuba River (downstream of Englebright Reservoir) and the Middle Yuba River downstream of Our House Diversion Dam. The Forest Service recommends (10(a) recommendation 18) providing public flow information from gages on the North Yuba River downstream of New Bullards Bar Dam and the Yuba River at Smartsville and Marysville.

Our Analysis

YCWA's proposal to provide flows in the boatable range would address the project's effect on whitewater boating opportunities by increasing the number of available boatable days. If flows within the boatable range were present, the reach would provide high quality whitewater boating opportunities because: (1) the reach has a class IV difficulty so it would be available to more than just expert boaters (i.e., more boaters could use the reach); (2) mostly paved roads provide good shuttle access; (3) study results indicate a demand for this opportunity; and (4) snow does not regularly preclude access to the put-in in winter and spring. The proposed measure appropriately considers the quantity

and duration of flow needed for optimal boating conditions and water year type; schedules the flows to occur during a time of year consistent with the normal hydrograph and on weekends during the period of greatest demand; and allows natural events to contribute to meeting the required number of days when flows would be provided.

The Water Board's requirement lacks sufficient detail to analyze its effects but developing a post-license plan in consultation with the same entities that support YCWA's proposed measure would likely be duplicative of YCWA's proposal because it would have the same content and the same effects as YCWA's proposed measure. The measure would require additional cost for consultation and plan development without measureable benefit for boating opportunities.

Participants in YCWA's Recreation Flow Study said the lack of reliable and publicly available flow information constrains their ability to boat various reaches downstream of the project. Providing real-time and forecast flow information to the public would ease this constraint by improving the certainty and predictability of flows that boaters, and other river-based recreationists, need to determine when suitable conditions exist. It would also be consistent with the current trend of providing real-time and forecast flow information at an increasing number of gaging stations located on California streams and rivers. Gage and forecast information would address project effects if provided from the North Yuba River downstream of New Bullards Bar Reservoir and the Middle Yuba River downstream of Our House Diversions Dam. Information provided on the lower Yuba River and the North Yuba River upstream of New Bullards Bar Reservoir may benefit non-project recreation use in these sections of the river. However, because the project does not influence flows in these reaches, there is no project nexus for requiring YCWA to provide this information. Although YCWA's proposed measure does not contain a provision to provide forecast and ramping rate information, these aspects of flow information, as FWN recommends, would augment the level of predictability and certainty for determining availability of suitable conditions for river-based recreation. Recognizing short- and long-term forecasting can be difficult and beyond a licensee's control; any such requirement to report forecast information would be effective only if it includes a stipulation that forecast information would represent expected, rather than guaranteed, flows or conditions that would be provided in the future. Accordingly, providing publicly available forecasts of flows in (1) the Middle Yuba River immediately downstream of Our House Diversion Dam, (2) Oregon Creek immediately downstream of Log Cabin Diversion, Dam, (3) the North Yuba River immediately downstream of New Bullards Bar Dam and spillway, and (4) the Yuba River at Smartsville would increase the amount of publicly available flow information while also making users aware of the limitations and uncertainty associated with the forecasts. Because boaters use the increasingly available points of and types of gage and flow information, this measure would likely increase boating use on Middle, North, and Yuba Rivers. Providing flow and ramping rate information would also improve safety for other river-based activities.

Fish Stocking

As discussed in section 3.3.5.1, in the subsection *New Bullards Bar Recreation Area*, New Bullards Bar Reservoir offers anglers both shoreline and boat-based fishing opportunities with varied settings ranging from deeper, larger pools near the dam to the sinuous arms at the upstream ends of the reservoir. Additionally, YCWA estimates recreational use to increase by approximately 50 percent by 2050 (YCWA, 2017a; see table 3-64). YCWA proposes to implement its New Bullards Bar Reservoir Fish Stocking Plan (AR6) that describes the fish stocking process and procedures, establishes stocking targets, and describes creel surveys. Specifically, YCWA's plan includes a provision to begin stocking 65,000 fingerling kokanee and 3,000 catchable rainbow trout in New Bullards Bar Reservoir in the first full calendar year after the issuance of any license for the project, and annually thereafter. YCWA notes that these stocking amounts are average annual targets that may fluctuate from year to year, and these averages would be measured on a 5-year running average to ensure consistent stocking over the term of a new license. YCWA would contract with either California DFW or one or more state-registered private hatcheries to raise and plant the average target number and weight of fish each year. YCWA would also conduct initial creel surveys on kokanee and rainbow trout in the reservoir from June 1 through September 30 in the first full calendar year after the issuance of any license, and for the next two consecutive years. In addition, YCWA would conduct creel surveys in each year prior to filing a required Form 80 with the Commission. YCWA would file annual reports with the Commission that document the New Bullards Bar Reservoir fish stocking in that calendar year, any creel survey data collected by YCWA, and any recommended changes to the plan.

The Forest Service (10(a) recommendation 19), California DFW (10(j) recommendation 2.21), and FWN support YCWA's proposed New Bullards Bar Reservoir Fish Stocking Plan as described above. Water Board (preliminary 401 condition 20) specifies that it would likely require YCWA to develop and implement a plan to supplement the fishery at New Bullards Bar Reservoir, which may include annual stocking of kokanee and rainbow trout, hatchery restrictions to maintain genetic integrity, and a monitoring component to measure effectiveness. FWS supports YCWA's plan in concept but suggests there would be greater conservation value in stocking New Bullards Bar Reservoir with hatchery spring-run Chinook salmon.

Our Analysis

New Bullards Bar Reservoir has a long history of fish stocking activities by California DFW dating back to 1959. Salmonid species have been the primary fishes planted in the reservoir over the years that have included rainbow trout, kokanee, brook trout, and cutthroat trout. YCWA's proposed New Bullards Bar Reservoir Fish Stocking Plan would help meet the projected increased demand on the recreational reservoir fishery and thereby protect the reservoir fish populations. YCWA's plan would also include consultation with California DFW and the Forest Service to review and update the plans and annual reports to these agencies detailing annual stocking amounts, creel

survey data, and expected stocking amounts for the next year. These provisions would help guide the management of the reservoir fishery over time.

FWS's recommendation for YCWA to stock hatchery spring-run Chinook salmon in New Bullards Bar Reservoir as part of its fish stocking plan is based on the premise that it would have greater conservation value than stocking rainbow and kokanee trout alone. However, New Bullards Bar Reservoir has been historically stocked with rainbow trout, kokanee, brook trout, and cutthroat trout consistent with the State's management goals for the reservoir (California DFW, 2008), and stocking of these species has already resulted in a popular recreational fishery. Therefore, no clear additional benefit to the recreational fishery would occur as a result of including hatchery spring-run Chinook salmon to the list of stocked species.

ESA Consultation for the Recreation Facilities Plan Measures

YCWA would implement several measures contained in the proposed Recreation Facilities Plan (RR1) that may require agency consultation or review. FWS preliminary 10(j) recommendation 8 would require YCWA to implement a sensitive amphibians management plan that contains specific site design considerations for the proposed West Shoreline Trail.

Our Analysis

Section 3.2.3 of the proposed Recreation Facilities Plan, *Avoidance, Protection, and Minimizing Affects* [sic] *to Sensitive Resource Areas*, provides sufficient procedures to ensure agency consultation would occur during the site design of the trail and other recreation facilities. Therefore, FWS preliminary 10(j) recommendation 8 would be duplicative of YCWA's proposed measure. In addition, all necessary details about a resource should be included in a plan correlated to that particular resource. Accordingly, presenting recreation information in the plan for recreation facilities, rather than in a plan for amphibians, would ensure compliant facility design and development.

Streamflow and Reservoir Level Compliance Monitoring Plan

Project operation fluctuates reservoir levels and modifies the quantity and duration of flows in reaches below project dams, which can affect recreation activities such as whitewater boating, reservoir boating, swimming, and angling. YCWA would implement proposed measure RR2, which identifies gages that would be used to provide streamflow and reservoir elevation data to the public and provide monthly flow forecasts.

Forest Service 4(e) condition 36 is consistent with YCWA's proposed measure; California DFW (10(j) recommendation 2.14), FWS, and FWN support the measure.

Our Analysis

Currently, project visitors do not know if conditions are suitable for their desired activities until they travel to project reservoirs and downstream reaches. Providing real time information to the public for locations important for recreation use, as YCWA

proposes, would benefit visitors in terms of trip planning and allowing them to have an experience that meets their expectation.

Periodically Close Lohman Ridge Diversion Tunnel

The project diverts water to New Bullards Bar Reservoir from the Middle Yuba River via the Lohman Ridge Diversion Tunnel in wet water year types. The diverted water contributes to the water level in New Bullards Bar Reservoir and reduces the amount water available downstream of Our House Diversion Dam. The ability to manage flows downstream of Our House Diversion Dam for achieving various resource objectives (e.g., channel maintenance) is constrained by the small storage provided by the diversion dam.

To provide conditions for meeting resource objectives, YCWA proposes to decrease water diversion by periodically closing the tunnel in wet water years (AR11).

Recommendations and conditions provided by California DFW, FWS, and FWN support YCWA's proposed measure content but also include provisions to close the tunnel in above normal water years.

Our Analysis

New Bullards Bar Dam spill events occur regularly and are unpredictable, particularly in wet and above normal water year types (see figure 3-1). Provided the reservoir is not drawn down due to a previous low water year or operational need, water diverted from Middle Yuba River to New Bullards Bar Reservoir in these water year types would likely spill and not contribute to higher reservoir levels. If the tunnel were closed in wet and above normal water year types, reservoir levels would likely remain unchanged because of high inflow to the reservoir from North Yuba River and undiverted water would continue to flow downstream of Our House Diversion Dam providing water supply to meet various resource objectives, including flows suitable for whitewater boating. Whereas YCWA's proposal and Forest Service 4(e) condition 35 would likely increase the number of days when the level of flow is within the boatable range in wet water year types, the California DFW, FWS, and FWN recommendation would have the same effect in above normal as well as wet water year types.

Minimum Streamflows below New Bullards Bar Dam

YCWA's proposed measure AR10 would increase minimum flows below New Bullards Bar Dam. The Forest Service, FWS, BLM, and California DFW all recommend that YCWA maintain the higher minimum flows downstream of New Bullards Bar Dam. Increased minimum flows have the potential to increase fish populations downstream of the dam, which could enhance angling; however, maintaining higher minimum flows could reduce water levels in New Bullards Bar Reservoir. YCWA indicates that it did not adopt the agency's recommended flows because implementing these flow requirements would reduce boating access and campground use around New Bullards Bar Reservoir and increase crowding on the reservoir.

Our Analysis

The rationale for the proposed and recommended increases in minimum flow is to improve fish habitat downstream of New Bullards Bar Reservoir. We analyze these measures in section 3.3.2, *Aquatic Resources*, but the range of increased minimum flows contained in the proposed and recommended measures would provide varying levels of improved fish habitat and, over time, probably increase the number of fish downstream of New Bullards Bar Dam. Allowing vehicle access near the gaging station (see discussion above in the section *Access at New Bullards Bar Dam*) may slightly improve access for angling near the dam, but the angling quality for the overall reach would probably remain low because the steep canyon walls and predominance of private land[116] limit access up and down the river shoreline for angling.

With regard to reservoir level, the higher minimum flows recommended by the agencies would lower the water surface elevation in New Bullards Bar Reservoir at about the same rate over time as YCWA's proposed minimum flows (AR10) (figures 3-50 to 3-54). Lower reservoir elevations would reduce the number of days when boat launches are functional, reducing the level of boating access to the reservoir for activities such as angling and watersports, and limiting public access to marina facilities and services. The agency flow recommendation would result in the level of New Bullards Bar Reservoir being lower than the end of the Cottage Creek Boat Launch (i.e., visitors could not launch boats) during most of the peak recreation season in critically dry water years, and in September of dry water years. YCWA's flow proposal would have this effect only in critically dry water years in August and September. The Dark Day Boat Launch, functional to an elevation of 1,758 feet, would be available through the peak season under all flow scenarios; however, most of the boating access is accommodated at Cottage Creek Boat Launch and its existing capacity would not accommodate displaced use from Cottage Creek Boat Launch.

[116] FWN and California DFW indicate additional public access to the reach may be provided in the future on Bear Yuba Land Trust lands.

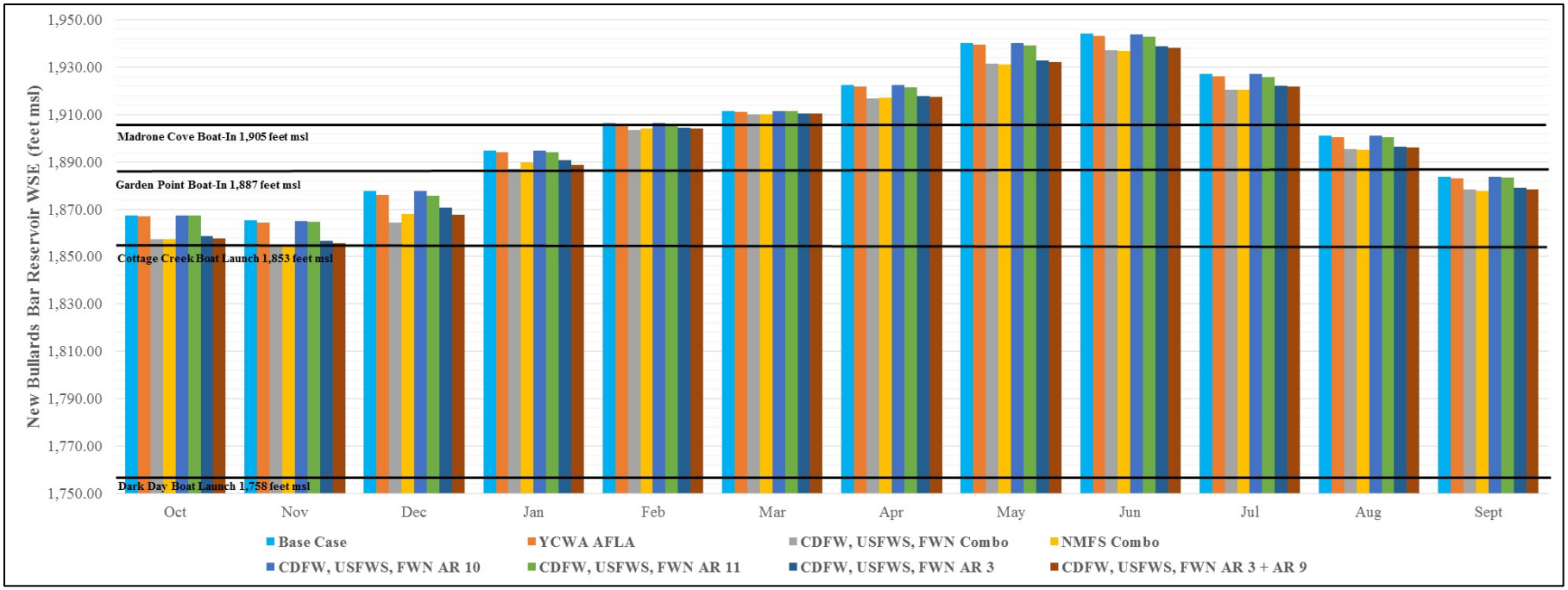

Figure 3-50. Boat launch elevations at New Bullards Bar reservoir and average monthly water surface elevation for flow scenarios in wet water year type (Source: YCWA, 2017c, as modified by staff).

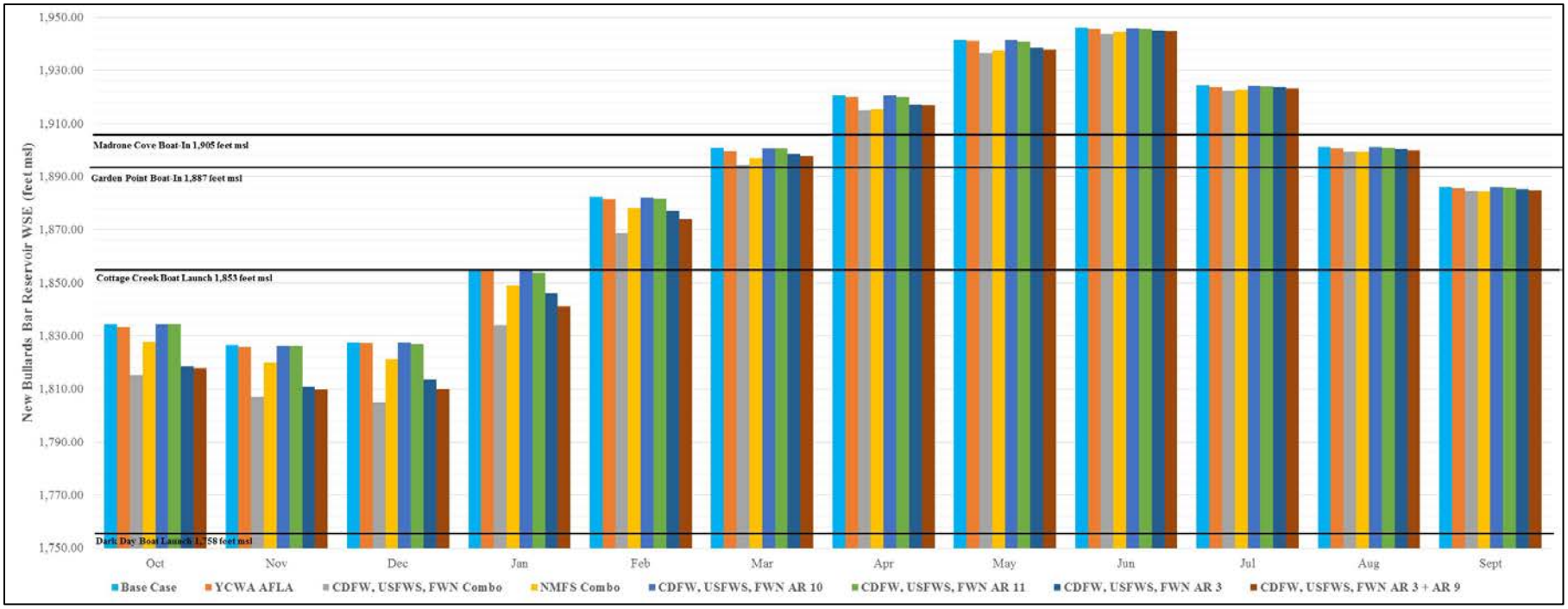

Figure 3-51. Boat launch elevations at New Bullards Bar reservoir and average monthly water surface elevation for flow scenarios in above normal water year type (Source: YCWA, 2017c, as modified by staff).

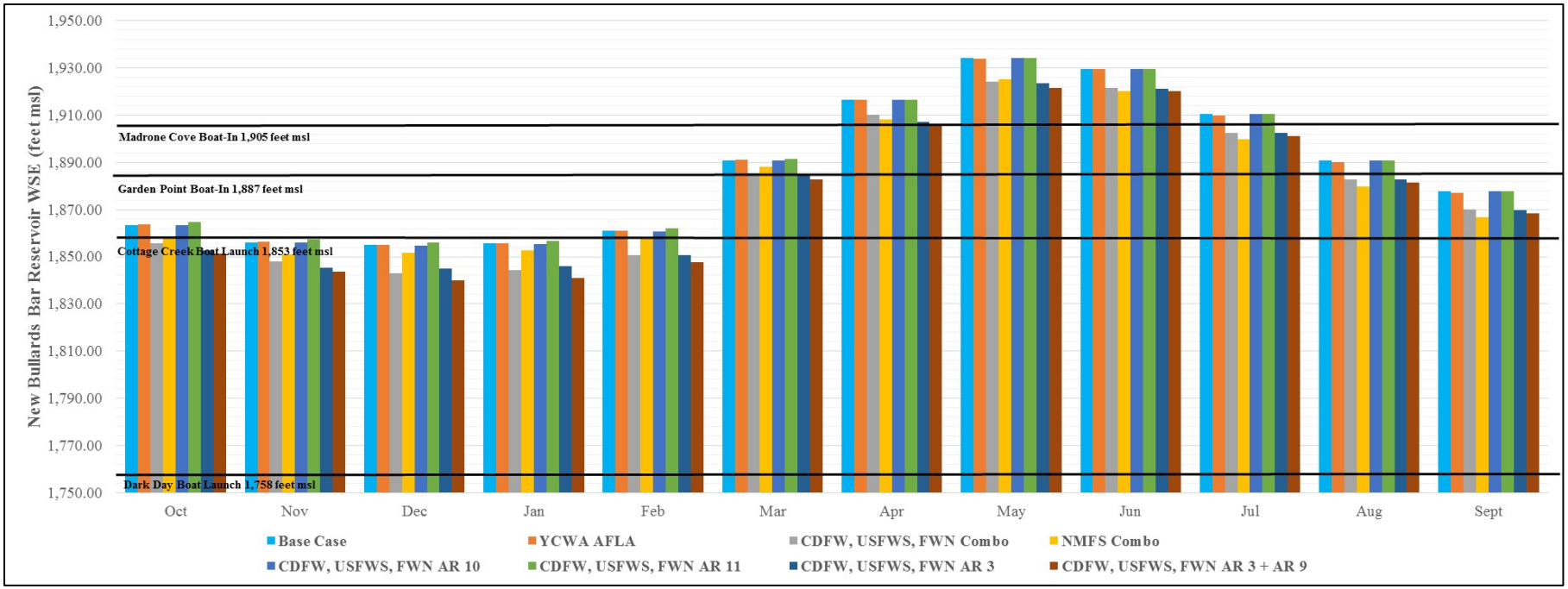

Figure 3-52. Boat launch elevations at New Bullards Bar reservoir and average monthly water surface elevation for flow scenarios in below normal water year type (Source: YCWA, 2017c, as modified by staff).

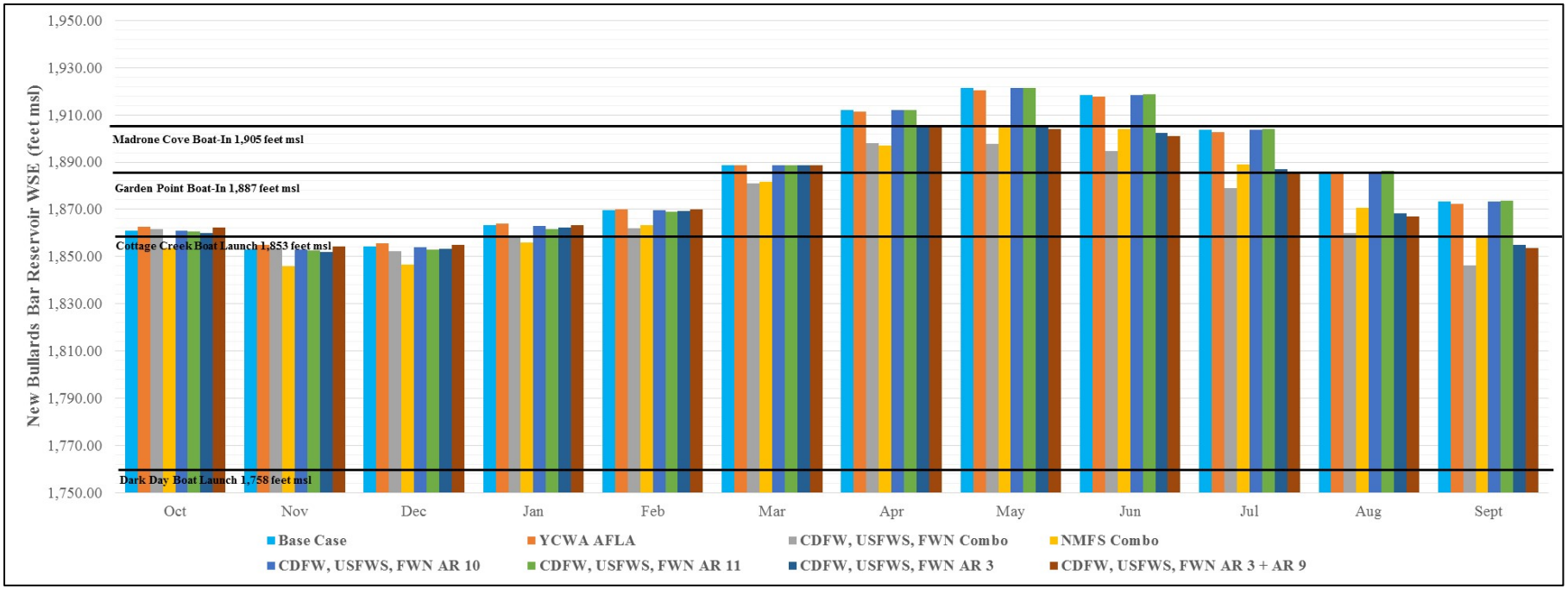

Figure 3-53. Boat launch elevations at New Bullards Bar reservoir and average monthly water surface elevation for flow scenarios in dry water year type (Source: YCWA, 2017c, as modified by staff).

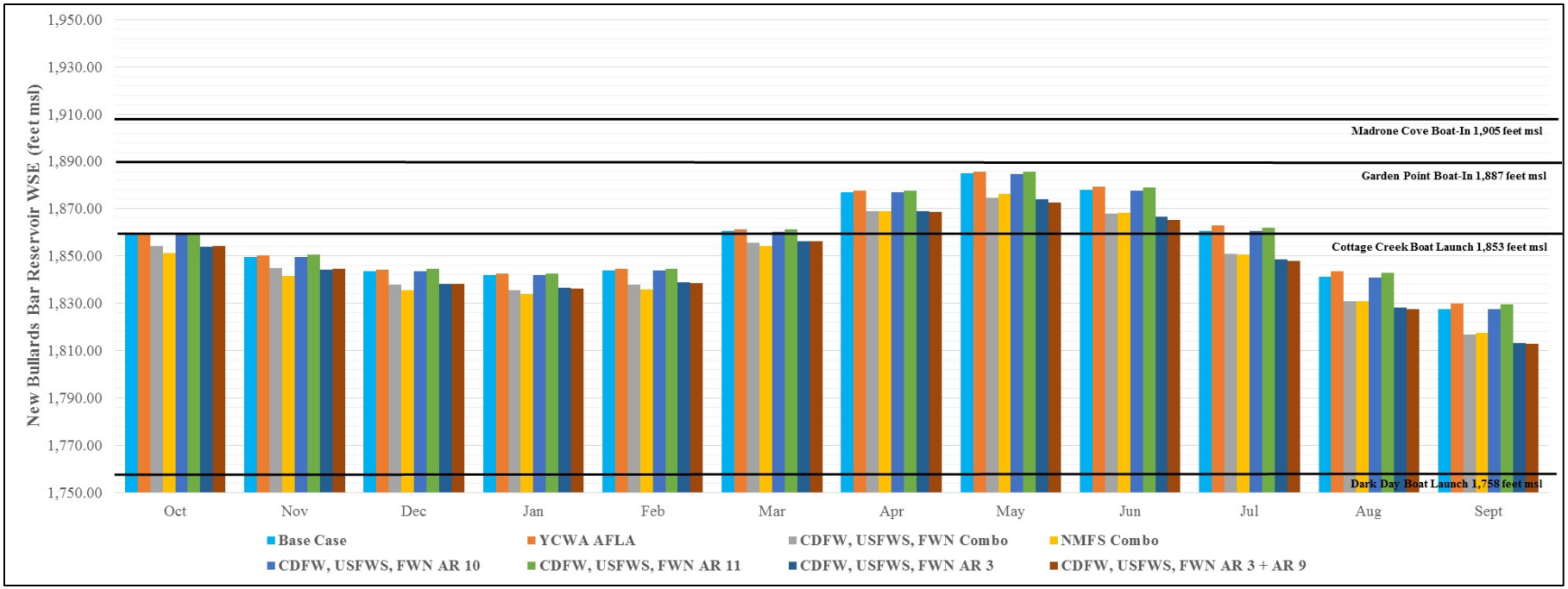

Figure 3-54. Boat launch elevations at New Bullards Bar reservoir and average monthly water surface elevation for flow scenarios in critically dry water year type (Source: YCWA, 2017c, as modified by staff).

Lower reservoir levels also create a smaller water surface area for boating use. The water surface area available through the peak season would be smaller under either YCWA's proposed flows or the agency-recommended flows than what currently exists. According to YCWA's modeling results, the agencies' recommended higher minimum flows downstream of New Bullards Bar Dam would not lower the water surface elevation in New Bullards Bar Reservoir at a faster rate over time than the minimum flows proposed by YCWA. However, as shown in tables 3-32 and 3-33, the Water Board's range of recommended flows is up to about 8 times higher than those recommended by the Forest Service, FWS, BLM, and California DFW, and up to 60 times higher than those proposed by YCWA. Consequently, the upper range of flows recommended by the Water Board would have the greatest effect on New Bullards Bar Reservoir elevation compared to all other alternative flow regimes.

Control Project Spills at New Bullards Bar Dam

Suitable flows for whitewater boating in the reach downstream of New Bullards Bar Dam only occur during spill events, but, under current operations, flows rapidly fluctuate over a short period, which does not allow boaters to anticipate when suitable conditions exist for boating. YCWA proposes (AR4) during each spill event to reduce flows and achieve minimum flows at a rate of approximately 250 cfs per day, beginning when flows reach 2,000 cfs and ending when the minimum required flow is achieved.

Forest Service 10(a) recommendation 3 and California DFW recommendation 2.11 are consistent with YCWA's proposed measure. FWS 10(j) recommendation 12 is similar to YCWA's proposed measure except that spill control would only be implemented until flow no longer passed over the spillway and flow would only be controlled using the spillway gates.

YCWA did not adopt FWS's recommendation because it states that it would not be as protective of resources and would not achieve the temperature conditions FWS seeks to attain with its recommendation.

Our Analysis

Flows with lower amplitudes and longer duration than what currently exist would increase whitewater boating opportunities in the reach. YCWA's proposal would provide a minimum of 3 consecutive days when flows would be suitable for boating each time spill events of 2,000 cfs or more occur between May 1 and July 31 (i.e., 1 day at each ramped flow within the boatable range—1,000, 750, and 500 cfs). Based on the historical record of spill events and YCWA's proposal to increase releases when significant storms are forecast, 3-day boating opportunities could be expected. It is not possible to estimate the expected frequency of these opportunities because measure implementation is complex, including a provision related to releases in an adjacent watershed (i.e., Oroville Dam [non-project]). Regardless, considering that flashy spill flows do not currently provide predictably suitable flows for whitewater boating, this

measure would increase available whitewater opportunities in the reach. YCWA's proposed measure would provide for a continuous downramp to transition the flow from spill to minimum flow requirement, whereas FWS recommends curtailing control when flow over the spillway ceases. Accordingly, flows would be in the suitable flow range for whitewater boating for a longer period of time under YCWA's proposal than if the project were operated using FWS's recommended approach for controlling spill. YCWA's proposed measure would provide a greater benefit for whitewater boating than FWS's recommendation.

Large Woody Material and Sediment Enhancement and Management Plan for the North Yuba River

The Forest Service, FWS, BLM, California DFW, the Water Board, and FWN all recommend developing and implementing a plan for placing sediment and LWM in the reach downstream of New Bullards Bar Dam for the purpose of enhancing fish habitat. The agency and FWN recommendations are similar, but most of the recommendations are consistent with Forest Service 10(a) recommendation 5, which would entail placing 143 pieces (minimum of 25 feet in length and 12 inches in diameter) in the river, with 129 pieces placed in piles downstream of the spillway and 14 pieces anchored or buried at two sites.

YCWA does not propose a similar measure and did not adopt this recommendation because it believes it would provide minimal benefit that would not be commensurate with the implementation cost.

Our Analysis

The rationale for the recommended measure is to improve fish habitat; we analyze this measure in section 3.3.2, *Aquatic Resources*. If supplementing sediment and LWM in the reach improves fish habitat, as the agencies and FWN suggest, there may be more fish in the reach. However, the angling quality for the overall reach would probably remain low because the steep canyon walls and predominance of private land limit access up and down the river shoreline for angling.

The agencies' recommendation would require planning the locations for anchoring LWM in consultation with others, including interested whitewater boating parties; it is unlikely that these pieces of anchored LWM would create boating hazards. However, unanchored LWM placed at the bottom of the spillway to be mobilized by spill events could increase the likelihood of boaters encountering boating hazards in the reach.

Houseboat Use on New Bullards Bar Reservoir

Houseboating is popular on New Bullards Bar Reservoir, and the reservoir has an established carrying capacity of 420 BAOT. Increasing the number of houseboats allowed on the reservoir has the potential to affect crowding and boater safety and increase parking area occupancy. A county ordinance prohibits operating houseboats over 60 feet in length or 15 feet in width on the reservoir. Emerald Cove Marina

recommends allowing up to 120 houseboats with a maximum size of 18 feet wide by 70 feet long on New Bullards Bar Reservoir. Several commenters disagree with increasing the number of houseboats allowed on the reservoir. YCWA did not adopt this measure.

Our Analysis

Increasing the number of houseboats allowed on the reservoir would allow more visitors to use the reservoir. However, allowing more houseboats on the reservoir would provide less space, on average, for each boat and would likely increase the visitors' sense of crowding. The existing carrying capacity was established considering these safety and visitor experience factors. Although licenses contain articles concerning how licensees are to manage non-project uses of project lands, such as reservoir boating use, revising the reservoir carrying capacity is more appropriately addressed outside the licensing proceeding through shoreline management plans that are developed in consultation with affected stakeholders. YCWA's proposed Recreation Facilities Plan includes an element that would likely fulfill this purpose. YCWA would monitor and report recreational use, including boating use on the reservoir through the license term. This plan element would provide sufficient opportunity to establish, review, and revise parameters for reservoir boating use. Accordingly, the number and size of boats allowed on the reservoir would be appropriately addressed through implementing YCWA's proposed Recreation Facilities Plan, as well as any revisions thereto, during the term of the license.

3.3.6 Land Use and Aesthetics

3.3.6.1 Affected Environment

This section describes existing conditions related to land use and aesthetic resources at and near the project.

Land Use

Land Ownership[117,118]

Land in the upper elevations of the project area (i.e., above 2,000 feet elevation, near Camptonville and New Bullards Bar Reservoir) consists of NFS land, timber

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[117] YCWA and the Forest Service consulted about landownership and determined that no NFS land is located in the North Yuba River channel downstream of New Bullards Bar Dam and from the North Yuba River and Middle Yuba River confluence downstream.

[118] Review of county assessor files and BLM land ownership maps show no federal land administered by BLM within the existing or proposed project boundaries.

company lands (e.g., Sierra Pacific Industries), and other private lands, such as YCWA-owned lands. Land around project facilities in the mid- to lower elevations along the North Yuba, Middle Yuba, and Yuba Rivers to Englebright Reservoir consists of public land managed by the Corps and the State of California and private land near urban areas. Table 3-65 summarizes land ownership in the existing project boundary listed by project development.

Table 3-65. Summary of land ownership within the existing project boundary by project development (Source: YCWA, 2017a).

						Total	
Project Development	**Federal (NFS land) (acres)**	**Federal (managed by Corps) (acres)**	**State of California (acres)**	**YCWA (acres)**	**Other Private (acres)**	**Area (acres)**	**Percent of Total Project Area**
New Colgate	4,416.7	0.0	0.0	3,148.1	209.9	7,774.7	99.5%
New Bullards Bar Minimum Flow	0.0	0.0	0.0	<0.1	0.0	<0.1	0.0%
Narrows 2	0.0	16.1	20.1	1.2	3.1	40.5	0.5%
Total	**4,167.7**	**16.1**	**20.1**	**3,149.3**	**213.0**	**7,815.2**	**100%**
Percent	**56.5%**	**0.2%**	**0.3%**	**40.3%**	**2.7%**	**100%**	

Table 3-66 shows that the majority of land in the project boundary is located in Yuba County.

Table 3-66. Acreage of land within the existing project boundary of each project development by county (Source: YCWA, 2017a).

				Total	
Project Development	**Yuba County (acres)**	**Sierra County (acres)**	**Nevada County (acres)**	**Area (acres)**	**Percent of Total Project Area**
New Colgate	7,645.3	97.8	31.6	7,774.7	99.5%
New Bullards Bar Minimum Flow	<0.1	0.0	0.0	<0.1	0.0%
Narrows 2	40.4	0.0	0.1	40.5	0.5%
Total	**7,685.7**	**97.8**	**31.7**	**7,815.2**	**100.0%**
Percent	**98.3%**	**1.3%**	**0.4%**	**100.0%**	

Land Use

Yuba County—Predominant land uses in Yuba County include agriculture, timber, extractive/industrial, commercial/research and development, park, public lands, military installations, and urban/communities. Yuba County regulates private land use in accordance with the 2030 Yuba County General Plan and County zoning ordinances. Table 3-67 lists the three zoned land uses applicable to land in the vicinity of the project: timberland preserve, agricultural/rural residential, and recreational. Unincorporated communities located in Yuba County near the project economically related to the project include Camptonville, Challenge, Dobbins, and Oregon House.

Table 3-67. Yuba County zoning ordinance land use categories in the project vicinity (Source: YCWA, 2017a).

Land Use Categories	Description
TPZ – Timberland Preserve Zone	Implements the Forest Taxation Reform Act (1976) and the California Timberland Productivity Act (1982).
A/RR – Agricultural/Rural Residential Zone	Preserves the rural character and amenities of lands best utilized for low-density residential development such as single-family residence, growing and harvesting agricultural crops or products, aquaculture, and game preserves.
RZ – Recreational Zone	Includes land containing natural or potential park and recreation features, identifies areas suitable for passive recreational activities, and identifies lake recreation areas to provide for use of these areas.

Nevada County—The predominant land uses in Nevada County include timber, agriculture, and urban/communities. Nevada County regulates private land use in accordance with the 1996 Nevada County General Plan (the Land Use section was updated in 2016) and county zoning ordinances. Nevada County land use on non-federal project lands is designated as Agricultural-30.

Sierra County—The predominant land uses in Sierra County include timber, agriculture, and urban/communities. Sierra County regulates private land use in accordance with the 2012 Sierra County General Plan and county zoning ordinances. Non-federal project lands in Sierra County are designated as Rural/Residential and Rural according to the Sierra County public land use map.

Federal Land Managed by the Forest Service—The Forest Service manages two national forests at and near the project: the TNF and PNF. These forests are managed in accordance with their respective Land and Resource Management Plans, as amended, which contain two levels of management standards and guidelines: forest-wide and area-specific. Forest-wide goals, objectives, standards, and guidelines apply to all NFS

land within the forest boundaries, and additional standards and guidelines apply to specific management areas of each forest. In addition, the Motorized Travel Management Plans for the TNF and PNF contain management direction and guidelines regarding maintenance of project roads on NFS land. The TNF specific management areas in the project vicinity are the Oregon, Forty-Niner, and Bullards Management Areas, administered by the Yuba River Ranger District. The PNF specific management area in the project vicinity is the Challenge Management Area, administered by the Feather River Ranger District.

Federal Land Administered by the Corps—The Corps operates Englebright Dam and administers the land adjacent to the reservoir. The primary purpose of the dam is to trap and contain sediment derived from extensive historical hydraulic mining operations in the Yuba River Watershed. Englebright Reservoir is about 9 miles long with a surface area of 815 acres. The dam does not include hydropower facilities and is not under the Commission's jurisdiction.

Corps Jurisdictional Wetlands—Wetlands that meet the criteria of "waters of the United States" are managed under the jurisdiction of the Corps and EPA pursuant to section 404 of the Clean Water Act. The definition developed by the Corps considers those areas which ". . . are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" as wetlands. Within the existing project boundary, approximately 60 acres of wetland/riparian habitat, 4,635 acres of open-water habitat, and more than 4 miles of linear drainages and perennial and ephemeral streams may qualify as jurisdictional wetlands under section 404.

Federal Emergency Management Agency Floodplains—A review of the Federal Emergency Management Agency flood maps for the project vicinity indicates that 3.5 acres near Narrows 2 Powerhouse are in the 100-year floodplain. The remaining area in the existing project boundary is either outside the 100- and 500-year floodplains or is not mapped by the Federal Emergency Management Agency.

Land Management Guidance

Land management guidance applicable to each project development is summarized below. The summary contains information regarding Land and Resource Management Plan standards and guidelines for lands administered by the Forest Service and land use designations for each county in which the project development is located. Forest-wide standards and guidelines apply to all NFS land within each national forest, whereas management area standards and guidelines apply to specific management areas within each national forest. With respect to county land designations, the county designates land within its boundaries to be used in ways that are consistent with the resources found in that area.

New Colgate Development—The New Colgate Development consists of the following: Our House and Log Cabin Diversion Dams and impoundments; Lohman Ridge and Camptonville Diversion Tunnels (both of which are below ground); New Bullards Bar Dam and Reservoir; New Colgate Power Tunnel; New Colgate Powerhouse; and some access roads to these facilities. The project lands encompass 7,815.2 acres, of which about 55 percent is NFS land and 45 percent is private land, the majority of which is owned by YCWA (see table 3-65 above).

Our House and Log Cabin Diversion Dams and impoundments are located primarily on NFS land managed by the TNF. The access roads in the existing project boundary to these two facilities are located on NFS and private land. The two diversion tunnels are located on NFS and private land. New Bullards Bar Reservoir is located on NFS land, managed by the TNF and PNF, and private land, much of which YCWA owns. New Bullards Bar Dam and access road are located almost entirely on private land owned by YCWA. The New Colgate Powerhouse is primarily located on land owned by YCWA. Table 3-68 summarizes, by project facility, the PNF and TNF management areas standards and guidelines as they apply to the New Colgate Development.

Table 3-68. Plumas National Forest and Tahoe National Forest management area standards and guidelines for New Colgate Development facilities (Source: YCWA, 2017a).

New Colgate Development Facilities	Standards and Guidelines
Challenge Management Area (PNF)	
New Bullards Bar Reservoir and New Colgate Power Tunnel	**Recreation:** Rely on the TNF to administer the reservoir and its shoreline. Maintain the Burnt Bridge Campground[a]; employ Rx-6. Maintain the Skinner Trail. Ensure adequate access to the Wambo Bar area through project permit requirements.
	Visual Resources: Apply Rx-10 and Rx-14 to the New Bullards Bar Reservoir and Marysville-La Porte Road.
	Wildlife: Provide suitable habitat for wintering band-tailed pigeons in timber compartments 306 and 307. Maintain or enhance deer winter range for the Mooretown and Downieville herds in TCs 301, 302, 303, and 343. Maintain or enhance deer summer range habitat and migration corridors for the Mooretown deer herd.
	Timber: Continue current designation of Challenge Experimental Forest; employ Rx-4.
	Water: Rehabilitate the Slate and Canyon Creek Watersheds to improve water quality sufficient for the beneficial uses in cooperation with California DFW and other landowners.
	Minerals and Materials: Recommend withdrawal from mineral entry: Slate Creek, from its junction with the North Yuba River, upstream 0.5 mile.

New Colgate Development Facilities	Standards and Guidelines
	Lands: Consider making NFS lands in T18N, R7E, section 28, 34 except winter deer range, available for exchange.
	Facilities: Reconstruct the Pike County lookout as a PNF microwave facility. Construct a PNF microwave facility at the Challenge Ranger Station.[b] Construct a crossing on Deadwood Creek in association with timber access. Study exchange of the Challenge District Office or other relocation of office to reduce forest-wide fixed cost. Develop and implement site improvements at the Challenge Work Center to support program activities.
Oregon Management Area (TNF)	
Our House Diversion Dam and impoundment, Log Cabin Diversion Dam and impoundment, Lohman Ridge Diversion Tunnel, and Camptonville Diversion Tunnel	**Recreation Opportunity Spectrum:** Roaded natural. Visual Quality Objective (VQO)—Partial retention for the immediate foreground along the Pliocene Ridge Road and middle ground of Highway 49, modification for the remainder of the area. Maximum modification will be allowed on a case-by-case basis in areas that have a modification or maximum modification initial VQO and have herein assigned the modification VQO.
	Transportation Management Policy: Forest-wide Standards and Guidelines apply.
	Off-Highway Vehicle Restrictions: Designated routes only, except closed in wildlife areas such as Plum Valley, Lohman Ridge, and Studhorse Canyon (November 1–May 1). This restriction can be amended if weather conditions are such that deer are not on the winter range.
	Forest-wide Standards and Guidelines: All apply.
Forty-Niner Management Area (TNF)	
Camptonville Diversion Tunnel and New Colgate Development Facilities	**Recreation Opportunity Spectrum:** Roaded natural except for a small portion of semi-primitive motorized in the Sierra Buttes area.
	Visual Quality Objective: Retention, however, partial retention will be allowed for developed recreation sites.
	Transportation Management Policy: Forest-wide Standards and Guidelines apply.
	Off-Highway Vehicle Restrictions: Designated routes only.
	Forest-wide Standards and Guidelines: All apply.

New Colgate Development Facilities	Standards and Guidelines
Bullards Management Area (TNF)	
New Bullards Bar Reservoir and Camptonville Diversion Tunnel	**Recreation Opportunity Spectrum:** Rural in developed sites, Roaded Natural in all other areas. **Visual Quality Objective:** Retention in foreground, as viewed from New Bullards Bar Reservoir and recreation sites. Partial retention for remainder of the area, including developed sites. **Transportation Management Policy:** All roads open. Forest-wide Standards and Guidelines apply. **Off-Highway Vehicle Restrictions:** Designated routes only. **Forest-wide Standards and Guidelines:** All apply.
Recreation facilities: Hornswoggle Group Campground, Schoolhouse Campground, Dark Day Campground, Garden Point Boat-in Campground, Madrone Boat-in Campground, Frenchy Point Boat-in Campground, Sunset Vista Observation Site, Dam Overlook Observation Site, Moran Day Use Area, Cottage Creek Boat Launch, Cottage Creek Overflow Campground, Dark Day Picnic Site, Dark Day Boat Launch, Schoolhouse Trail, Bullards Bar Trail, Emerald Cove Marina	**Recreation Opportunity Spectrum:** Rural in developed sites, Roaded Natural in all other areas. **Visual Quality Objective:** Retention in foreground, as viewed from New Bullards Bar Reservoir and recreation sites. Partial retention for remainder of the area, including developed sites. **Transportation Management Policy:** All roads open. Forest-wide Standards and Guidelines apply. **Off-Highway Vehicle Restrictions:** Designated routes only. **Forest-wide Standards and Guidelines:** All apply.

[a] The Burnt Bridge campground has been removed.

[b] The project does not use a Pike County lookout or Challenge Ranger Station for microwave communication.

Sierra County zoning designations applicable to Our House Diversion Dam and Lohman Ridge Diversion Tunnel are rural/residential and rural and rural/residential, respectively. Nevada County zoning designations on land around the New Colgate Powerhouse and Our House Diversion Dam are Agricultural-30 and Forest-40.

Table 3-69 provides a summary of the Yuba County General Plan Land Use Designations in and adjacent to the New Colgate Development.

Table 3-69. Yuba County land use designations for New Colgate Development facilities (Source: YCWA, 2017a).

New Colgate Development Facilities	Yuba County Land Use Designations
Lohman Ridge Diversion Tunnel	Agricultural/Rural Residential Zone 20 / Timberland Preserve
Log Cabin Diversion Dam	Agricultural/Rural Residential Zone 20 / Timberland Preserve
Camptonville Diversion Tunnel	Agricultural/Rural Residential Zone 20
New Bullards Bar Reservoir	Reservoir
New Bullards Bar Dam	Recreational Zone
New Bullards Bar Dam Spillway	Recreational Zone
New Colgate Powerhouse and Penstock	Recreational Zone, Agricultural/Rural Residential Zone 40, Timberland Preserve
New Colgate Powerhouse	Agricultural/Rural Residential Zone 40
New Colgate Switchyard	Agricultural/Rural Residential Zone 40
Madrone Cove Boat-in Campground	Agricultural/Rural Residential Zone 40
Frenchy Point Boat-in Campground	Agricultural/Rural Residential Zone 20
Garden Point Boat-in Campground	Recreational Zone
Dark Day Campground	Recreation Zone
Dark Day Boat Launch	Agricultural/Rural Residential Zone 20
Dark Day Picnic Site	Agricultural/Rural Residential Zone 20

New Colgate Development Facilities	Yuba County Land Use Designations
Hornswoggle Group Campground	Agricultural/Rural Residential Zone 20
Schoolhouse Campground	Agricultural/Rural Residential Zone 20
Sunset Vista Observation Site	Recreational Zone
Dam Overlook Observation Site	Recreational Zone
Moran Road Boating Site	Recreational Zone/Timberland Preserve
Cottage Creek Boat Launch	Recreational Zone
Cottage Creek Campground	Recreational Zone
Schoolhouse Trail	Recreational Zone
Bullards Bar Trail	Recreational Zone
Emerald Cove Marina	Recreational Zone

New Bullards Bar Minimum Flow Development—The New Bullards Bar Minimum Flow Development includes the New Bullards Bar Powerhouse, a below-ground penstock, and a powerhouse transformer. These facilities occupy about 0.1 acre of YCWA-owned land within the existing project boundary (see table 3-65); this parcel has a recreational land use designation (Yuba County).

Narrows 2 Development—The Narrows 2 Development is composed of the Narrows 2 Powerhouse, an aboveground penstock, a switchyard, and an access road. These facilities occupy about 40 acres within the existing project boundary, consisting of federal (Corps-administered), state (University of California Sierra Foothill Research and Extension Center), and private land (see table 3-65). Table 3-70 provides a summary of land management plans applicable to the Narrows 2 Development area. Land in the area of the Narrows 2 Powerhouse is designated as Agricultural-30 (Nevada County) and Recreational Zone (Yuba County).

Table 3-70. Land management plans for the Narrows 2 Development (Source: YCWA, 2017a).

Development	Land Manager	Management Plan
Narrows 2 Penstock	Corps	Yuba River, California. Master Plan, Design Memorandum No. 4 (Corps' Harry L. Englebright Reservoir)
Narrows 2 Powerhouse	Corps	Yuba River, California. Master Plan, Design Memorandum No. 4 (Corps' Harry L. Englebright Reservoir)
Narrows 2 Switchyard	Corps	Yuba River, California. Master Plan, Design Memorandum No. 4 (Corps' Harry L. Englebright Reservoir)
Appurtenant project facilities and features, including access roads, within the project boundary	University of California Sierra Foothill Research and Extension Center	University of California, Agriculture & Natural Resources 1994 Strategic Plan. Sierra Foothill Research and Extension Center.
	PG&E	Pacific Forest and Watershed Lands Stewardship Council Final Land Conservation Plan (November 2007)

Project-Related Land Use Permits and Easements

Land use permits and easements obtained by YCWA for the normal project operation and maintenance are listed below.[119]

- **1965 Memorandum of Understanding between YCWA and the Forest Service regarding Conduct of Work during Construction and Subsequent Operations of the Project.** This agreement stipulates the understanding, at that time, by YCWA and the Forest Service regarding roles and responsibilities during construction and operations of the project. The memorandum of understanding was amended at least twice, once in June 1966 and once in August 1966.

[119] Copies of each of these can be viewed on YCWA's relicensing website: www.ycwa-relicensing.com.

- **1966 Agreement between YCWA and United States California Debris Commission for Use of Englebright Reservoir**. Under this agreement, YCWA has the right to construct and maintain project facilities, including the Narrows 2 intake, and store and release water from Englebright Reservoir and pays the United States $100,000 annually. The agreement expires concurrent with the project license and can be extended by mutual agreement.
- **1966 Agreement between YCWA and the California DWR for Grants under the Davis Grunsky Act**. Among other provisions, this agreement provided funds to YCWA for the construction of various recreation facilities surrounding New Bullards Bar Reservoir. The agreement was amended at least twice, once in 1973 and once in 2003. The agreement expired on December 31, 2014.
- **1968 Agreement between YCWA and the Forest Service for Recreation on NFS Land**. Under this agreement, YCWA constructed recreation facilities on NFS land surrounding New Bullards Bar Reservoir. Subsequent to their construction, YCWA gave title to the Forest Service, which agreed to maintain, operate, and replace the facilities at its expense. If the Forest Service found it had inadequate funding to operate and maintain the facilities, it would issue a special use permit to YCWA for facility operation and maintenance, and YCWA would retain the fees and charges obtained for use of the facilities, and the Forest Service would not require YCWA to improve the facilities.
- **1975 Easement from Corps to YCWA for Use of Narrows 2 Powerhouse Access Road (Easement No. DACW05-2-75-715)**. This easement was issued on November 17, 1975, and gives YCWA the right to construct, maintain, and use the access road for the Narrows 2 Powerhouse. The easement expired on August 13, 2017.
- **1975 Easement from Corps to YCWA for Narrows 2 Powerhouse (Easement No. DACW05-2-75-716)**. This easement was issued on November 17, 1975, and gives YCWA a right-of-way for the construction, operation, and maintenance of the Narrows 2 Powerhouse, intake works, and tunnel. The easement expired on August 14, 2017.
- **1984 Amendment 1 to Special Use Permit between YCWA and the Forest Service – Operation and Maintenance of Garden Point, Frenchy Point, and Madrone Campgrounds (total of 40 units).** This Special Use Permit was issued pursuant to the above 1968 agreement between YCWA and the Forest Service for recreation on NFS land and for the three campgrounds described above. The permit does not have a termination date.
- **1987 Amendment 2 to Special Use Permit between YCWA and the Forest Service – Waterless Toilets (total of 8)**. This Special Use Permit was issued pursuant to the above 1968 agreement between YCWA and the Forest Service

for recreation facilities on NFS land and for the eight Shasta waterless toilets. The permit does not have a termination date.

- **1990 Collection Agreement between YCWA and the Forest Service for Recreation Facilities**. This collection agreement was issued pursuant to the above 1968 agreement between YCWA and the Forest Service and amended the arrangement described in the 1968 agreement. It describes the process by which the Forest Service, as YCWA's recreation concessionaire, provides staff and services to maintain and operate the New Bullards Bar Recreation Area and YCWA reimburses the Forest Service for operation and maintenance. The collection agreement does not have a termination date.
- **1991 Amendment 3 to Special Use Permit between YCWA and the Forest Service—Addition of Hornswoggle Group, Schoolhouse and Dark Day Campgrounds.** This Special Use Permit was issued pursuant to the above 1968 agreement between YCWA and the Forest Service for the addition of Hornswoggle Group, Schoolhouse, and Dark Day Campgrounds. The permit does not have a termination date.
- **2005 Right-of-Way from the Corps to YCWA for Narrows 2 Powerhouse Full Bypass (Right-of-Way Entry No. DACW05-9-06-510)**. This right-of-entry was issued on December 27, 2005, and authorized YCWA to construct the Narrows 2 Bypass Project. The document states that it will terminate upon the effective date of the formal easement for this project.
- **Annual Operating Agreements between YCWA and Yuba County Sheriff's Department for Law Enforcement Services**. Under these agreements, YCWA annually funds the Yuba County Sheriff's Department for law enforcement services at New Bullards Bar Reservoir.

YCWA's Vehicular Access Routes to Project Facilities

YCWA obtains vehicular access to the project over federal and State of California, county, and private roads. YCWA's use of these roads consists of light and heavy vehicles at varying frequencies. In 2012 and 2013, YCWA conducted a field inventory and assessment of 11.9 miles of roads, and 0.33 mile of trails, used almost exclusively by YCWA to access project facilities. YCWA also assessed the condition of 4.27 miles of roads related to project recreation. The condition of each road segment was ranked as "good," "moderate," or "poor." Table 3-71 provides details about the roads and trails YCWA inventoried.

Table 3-71. Inventoried roads and trails information related to the project (Source: YCWA, 2017a).

Road Name	Project Road under Existing License	Public Vehicular Access Prohibited	Length		Road Maintenance Objective		Ave. Road Width (feet)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
			Total (miles)	On NFS Land (miles)	Maint. Level[b]	Frequency of YCWA Use					
Our House Diversion Dam Road (TNF Rd 0180-Our House)	Yes	Ridge Road gate typically unlocked	1.93	0.87 (Forest Service)	3 / 4	Daily	16	Asphalt, Gravel, Native Rock	Poor	Pavement is good, but diversion potential, erosion, signage, and AASHTO compliance issues	High
Our House Diversion Dam Spur	Yes	Gate is locked 500 feet from dam	0.03	0.03 (Forest Service)	3	Periodic	12	Gravel	Good	None	Low
Log Cabin Diversion Dam Road	Yes	Gate is locked at Highway 49 intersection	1.37	0.86 (Forest Service)	3 (upper) 4 (lower)	Daily	22	Asphalt, Native Soil	Good	Landslides, asphalt, signage, and AASHTO compliance issues	Low
Garden Valley Road (TNF Rd 0125-013)	No	Forest Service gate near intersection with TNF Rd 0125-013-02	2.53	2.53 (Forest Service)	2	Infrequent	20	Gravel, native soil	Good	None	Low

Road Name	Project Road under Existing License	Public Vehicular Access Prohibited	Length		Road Maintenance Objective		Ave. Road Width (feet)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
			Total (miles)	On NFS Land (miles)	Maint. Level[b]	Frequency of YCWA Use					
New Bullards Bar Dam Road	Yes	YCWA gate at highway	1.09	--	N/A	Daily	28	Asphalt	Good	Diversion potential, landslides, signage, and AASHTO compliance issues	High (land-slides)
New Bullards Bar Dam Spur	Yes	YCWA gate at highway	0.11	--	N/A	Infrequent	30	Asphalt	Good	None	Low
New Bullards Bar Dam Compliance Gage Trail	No	YCWA gate at highway	0.12	--	N/A	Weekly	10	Native rock	Good	Erosion	Moderate
Colgate Tunnel Lane	No	Private landowner gate at road; gate at YCWA property line	0.72	--	N/A	Weekly	11	Gravel	Poor	Erosion, landslides, and diversion potential	High
Colgate Tunnel Muck	No	Accessed by Colgate Tunnel Lane (gated)	0.85	--	N/A	Infrequent	14	Gravel, Native Soil	Poor	Erosion, landslides, and diversion potential	High

Road Name	Project Road under Existing License	Public Vehicular Access Prohibited	Length		Road Maintenance Objective		Ave. Road Width (feet)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
			Total (miles)	On NFS Land (miles)	Maint. Level[b]	Frequency of YCWA Use					
Colgate Haul	No	Private landowner gate at road; gate at YCWA property line	0.23	--	N/A	Two trips weekly	20	Gravel	Poor	Erosion, landslides, and diversion potential	High
New Colgate Tunnel Penstock	No	Accessed by Colgate Tunnel Lane (gated)	0.15	--	N/A	Infrequent	50	Gravel	Poor	None	Low
Penstock Access 1	No	YCWA gate at Lake Francis Road	0.23	--	N/A	Weekly	17	Gravel	Poor	Erosion	Moderate
Penstock Access 1 Spur	No	Accessed by Penstock Access 1 (gated)	0.04	--	N/A	Weekly	25	Gravel	Good	None	Low
Penstock Access 2	No	YCWA gate at Lake Francis Road	0.10	--	N/A	Weekly	18	Gravel	Good	None	Low

Road Name	Project Road under Existing License	Public Vehicular Access Prohibited	Length		Road Maintenance Objective		Ave. Road Width (feet)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
			Total (miles)	On NFS Land (miles)	Maint. Level[b]	Frequency of YCWA Use					
Penstock Access 3	No	YCWA gate at Lake Francis Road	0.10	--	N/A	Two trips per year	30	Gravel	Poor	Fill failure	Moderate
Penstock Access 4	No	YCWA gate at Lake Francis Road	0.15	--	N/A	Monthly	21	Native Soil	Poor	Diversion potential and erosion	High
Narrows 2 Access	No	YCWA gate at Scott Forbes Road	2.07	0.57 (Corps)	N/A	Three trips weekly	22	Asphalt	Good	Erosion, landslides, diversion potential, and AASHTO compliance issues	High
Narrows 2 Compliance Gage Trail	No	Accessed by Narrows 2 Power-house access road (gated)	0.21	0.03 (Corps)	N/A	Monthly	3	Native Rock	Poor	Landslides	Moderate (land-slides)
Narrows 2 Access Spur 1	No	Accessed by Narrows 2 Power-house access road (gated)	0.19	0.06 (Corps)	N/A	Three trips weekly	22	Gravel	Good	Erosion	Moderate

Road Name	Project Road under Existing License	Public Vehicular Access Prohibited	Length		Road Maintenance Objective		Ave. Road Width (feet)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
			Total (miles)	On NFS Land (miles)	Maint. Level[b]	Frequency of YCWA Use					
Dark Day Access Road (TNF Rd 0008-004)	No	Open year-round	0.23	0.23 (Forest Service)	4	Daily	25	Asphalt, Chip Seal	Good	Signage and AASHTO compliance issues.	Moderate
Dark Day Boat Launch Road (County Road 157)	Yes	Open year-round	0.28	0.28 (Forest Service)	5	Daily	75	Asphalt	Excellent	Diversion potential and one localized landslide	High (land-slide)
Dark Day Campground and Picnic Area Road (TNF Rd 0008-004)	Yes	Public access allowed from April 15 to October 15	0.44	0.44 (Forest Service)	5	Daily (4/15 to 10/15)	25	Asphalt	Excellent	Landslide	High (land-slide)
Schoolhouse Campground Loop Rd (TNF Rd 0008-005, 0008-005-001, 0008-005-002 and 0008-003)	Yes	Public access allowed from April 15 to October 15	0.97	0.97 (Forest Service)	4	Daily (4/15 to 10/15)	19	Asphalt	Excellent	Asphalt and AASHTO compliance issues	Low

Road Name	Project Road under Existing License	Public Vehicular Access Prohibited	Length		Road Maintenance Objective		Ave. Road Width (feet)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
			Total (miles)	On NFS Land (miles)	Maint. Level[b]	Frequency of YCWA Use					
Hornswoggle Group Campground Road (TNF Rd 0008-006)	Yes	Public access allowed from April 15 to October 15	0.33	0.33 (Forest Service)	4	Daily (4/15 to 10/15)	20	Asphalt	Good	None	Low
Moran Boat Launch Access Road	Yes	Open year-round	0.29	0.20 (Forest Service)	3	Daily (4/15 to 10/15)	15	Chip Seal, Gravel	Poor	Diversion potential and AASHTO compliance issues	Moderate
Sunset Vista Point Road (TNF Rd 0008-009)	Yes	No public use beyond the Sunset Vista parking area	0.12	0.12 (Forest Service)	4	Daily	24	Asphalt	Excellent	None	Low
Cottage Creek Campground Road[a]	Yes	Closed due to fire	0.14	0.12 (Forest Service)	5	Closed due to fire damage	17	Asphalt	Good	None	Low
Cottage Creek Campground Access Road	Yes	Open year-round	1.24	0.43 (Forest Service)	3	Daily	36	Asphalt	Poor to Good	Active landslides, erosion, and signage and AASHTO compliance issues	High

Road Name	Project Road under Existing License	Public Vehicular Access Prohibited	Length		Road Maintenance Objective		Ave. Road Width (feet)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
			Total (miles)	On NFS Land (miles)	Maint. Level[b]	Frequency of YCWA Use					
Cottage Creek Boat Launch Road	Yes	Gated year-round	0.15	--	N/A	Daily	25	Asphalt	Excellent	Signage and AASHTO compliance issues	Low
Cottage Creek Shoreline Access Spur	Yes	Open year-round	0.08	0.08 (Forest Service)	3	Infrequent	16	Asphalt	Good	Landslide	Low
Total Length – Roads			**16.17**								
Total Length – Trails			**0.33**								

Notes: AASHTO – American Association of State, Highway and Transportation Officials

[a] Yuba County has confirmed the road segment formerly referred to as County Road 169 (i.e., from Marysville Road to Cottage Creek Campground) is not a county road.

[b] National Forest Service classifies maintenance of NFS roads by five levels: 1, 2, 3, 4, and 5. Maintenance level 1 roads are closed to motor vehicle use. Maintenance level 2 roads are maintained for high-clearance vehicles. Maintenance level 3 roads are maintained for travel by a prudent driver in a standard passenger car, and user comfort and convenience are not considered priorities. Maintenance level 4 roads are maintained to provide a moderate degree of user comfort and convenience at moderate travel speeds for a passenger car, and most roads are double lane and aggregate surfaced. Maintenance level 5 roads are maintained to provide a high degree of user comfort and convenience, and are normally double lane, paved roads (Forest Service, 2012).

Project Boundary

The current project boundary encompasses most existing project recreation facilities, roads, and project infrastructure. YCWA reports several roads and trails that are not classified as project roads or trails under the existing license and a few short segments of the Bullards Bar Trail to the east of the Dark Day Boat Launch that are not within the project boundary. Although the existing project boundary includes buffers for operating and maintaining facilities and access, some of the existing buffers do not provide sufficient area to accommodate current operation and maintenance activities or may be inconsistent with Commission guidelines for project boundary around reservoirs. Conversely, the existing project boundary also includes lands that are not needed for operating and maintaining the project or support uses not primarily related to the project.

Wildland Fire

YCWA does not have a formal policy regarding fire prevention and suppression on public land. YCWA's staff is not trained in forest fire suppression and it notifies appropriate response agencies in the event of an emergency. Fire suppression systems and equipment are included in each project powerhouse and building. In addition, YCWA maintains a vegetation-free defense zone of about 40 feet around each aboveground project facility, excluding recreation facilities. The Forest Service, which maintains the New Bullards Bar Recreation Area facilities, controls vegetation in these areas to minimize the risk of recreation-related wildfires.

YCWA adheres to local, state and federal rules and regulations and BMPs to operate and maintain the project. Project staff are required to have axes, saws, and shovels when performing maintenance activities for suppressing small fires. If project work includes burning debris, YCWA obtains necessary permits and approvals from the appropriate agency, which may require YCWA to have specialized equipment on-site and only burn during specific times of the year.

Current wildfire risks are associated primarily with non-project related activities, such as avian collisions with non-project power lines, debris burning, and lightning. Other activities that tend to have a high risk factor for wildland fire ignition include recreation and vehicle use. Operating and maintaining project infrastructure may contribute to wildfire risk; however, YCWA reports no wildfires have resulted from project-related operation and maintenance activities.

Law Enforcement in the Project Area

Law enforcement is a specific responsibility identified in the 2009 Annual Operating Agreement for the New Bullards Bar Recreation Area for which YCWA annually reimburses the Forest Service through the Collection Agreement. In addition, YCWA funds local law enforcement for patrolling New Bullards Bar Reservoir during the recreation season.

Aesthetic Resources

The facilities and features of the project (section 2.1.1) are located in the northern Sierra Nevada Mountain Range within the subregion of flat ridge tops and steep valley zone. The dominant visual character for the New Bullards Bar Reservoir area is a continuous cover of mixed conifer forest along with a significant component of live oak, black oak, and madrone. Log Cabin Diversion Dam and Our House Diversion Dam are included in this area, but both are located in the lower parts of the steep valley walls. Project features potentially affecting aesthetic resources include the dams, spillways, storage tanks, gate controls, roads, marina, buildings, signs, lighting, trails, campgrounds, boat launches, and day use facilities. Visual contrast of project facilities is determined by comparing their appearance to the conditions as described above.

On NFS land, Land and Resource Management Plans, as amended, establish Visual Quality Objectives (VQOs) under Forest Standards and Guidelines and Management Area direction that require land management activities meet the designated VQO. The VQOs are defined in the two Forest Land and Resource Management Plans, as amended, and the pertinent VQOs are "Retention," "Partial Retention," and "Modification." The Retention VQO allows management activities that are not visually evident. The Partial Retention VQO allows management activities that remain visually subordinate to the characteristic landscape. The Modification VQO allows management that may visually dominate the original characteristic landscape, but activities altering the vegetative and land form must borrow from naturally established form, line, color, or texture, and at such a scale that the visual characteristics are those of natural occurrences within the surrounding area or character type. The VQOs and their definitions are primarily focused on forest land management activities, but they also apply to existing and proposed facilities. Table 3-68 above identifies the VQO Standards and Guidelines for the New Colgate Development facilities in the PNF and TNF management areas. We note that project facilities pre-date the establishment of Forest Service VQOs, so the designations considered the presence and visual effects of these facilities.

YCWA used a simplified version of the Forest Service Visual Management System to assess facilities located on private land (including land owned by YCWA) adjacent to NFS lands. The Yuba County General Plan has broad goals to maintain or enhance the visual quality of the lands within the county with an emphasis on a policy that states: "encourage the preservation and enhancement of the natural features of the County, including rivers and areas of scenic beauty, and native vegetation." The General Plan emphasizes protecting views from scenic highways and other important highways, specifically, Marysville Road and State Highway 49. Our House Diversion Dam and impoundment straddle the border between Sierra and Nevada Counties, and this is the only YCWA facility located in these two counties. Both counties list State Highway 49 as an emphasis for retaining the natural visual quality along the highway corridor. However, Our House Diversion Dam is located deep in the Middle Yuba River Canyon and is not visible from State Highway 49 because of intervening terrain.

YCWA determined that, overall, the dams, recreation facilities, and other project facilities tend to blend into the landscape from most viewpoints. However, New Bullards Bar Dam, Emerald Cove Marina, and the moored boats, including houseboats, present a strong visual contrast due to light colors, uniform textures, and geometric shapes that are visible in the foreground and near middle ground from Marysville Road, Sunset Vista Observation Site, Dam Overlook Observation Site, Cottage Creek Boat Launch, Emerald Cove Marina, and boats on the southern part of the reservoir. All of the facilities on or near NFS lands met assigned VQOs. At a distance of less than 1 mile, Dark Day Boat Launch begins to contrast with the surrounding landscape and exhibit strong visual contrast in the foreground when viewed from boats on New Bullards Bar Reservoir. This same condition applies to the appearance of Emerald Cove Marina (including moored houseboats), New Bullards Bar Dam, and Cottage Creek Boat Launch as viewed from boats on the reservoir, and from Marysville Road and Sunset Vista Observation Site. The moored rental houseboats and marina exhibit strong visual contrast because of the light, reflective colors of the house boats, their boxy and angular shapes, and the docks associated with the marina. Straight lines, geometric shapes, and large, uniform, smooth textured shapes associated with Cottage Creek Boat Launch and New Bullards Bar Dam also strongly contrast with the appearance of the landscape. Consequently, the facilities do not meet assigned VQOs. In addition, over the summer season, the New Bullards Bar Reservoir presents a strong visual contrast when bright red and orange unvegetated soil and white rocks around the rim of the reservoir are increasingly exposed to view as the reservoir is drawn down. This condition does not meet the assigned VQO.

3.3.6.2 Environmental Effects

Effects of Construction-related Activities

Effects related to land use and aesthetic resources from construction activities include leveling and grading or otherwise disturbing soil to create areas for staging equipment and materials, access, and borrow or disposal sites. In addition to the visually evident construction activity, traffic could impede public access and create noise.

Our Analysis

YCWA's proposal includes several plans that would address effects on land use and aesthetic resources, including an Erosion and Sediment Control Plan (GS1), Integrated Vegetation Management Plan (TR1), and Visual Resource Management Plan (VR1). These plans describe actions to ensure construction activities are developed in coordination with applicable agencies to properly control erosion, protect vegetation, and eliminate or minimize the appearance of disturbed landscapes and construction activities. Additionally, YCWA would also obtain all necessary permits and approvals for the work, which would provide the proper authorization for construction and contain specific requirements. Complying with all permit terms and conditions, such as seasonal or time of day restrictions and public notification, would eliminate or minimize effects on land use and aesthetic resources such as noise and dust and provide for public safety and

access. Additionally, the annual recreation coordination meeting required by the proposed Recreation Facilities Plan (RR1) would provide another opportunity for coordinating construction activities to eliminate or minimize any effects on public access and use.

Effects of Continued Project Operation and Maintenance

Project Boundary

Commission regulations require including only lands within the project boundary that are necessary to operate and maintain the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources (18 CFR 4.41[h][2]). YCWA proposes many project boundary changes to: (1) include lands necessary for current and future operation and maintenance and recreation development; (2) remove lands where there are no project-related uses necessary for operation and maintenance; and (3) reduce the shoreline buffer of project impoundments to 30 feet where project infrastructure and recreation facilities are not located along the shoreline. At New Bullards Bar Reservoir, the project boundary would encompass between 50 and 200 horizontal feet from the reservoir NMWSE except where slopes exceed 60 percent, in which case the boundary would encompass less than 50 horizontal feet. As such, the project boundary would provide shoreline access from the reservoir of at least 50 feet for all areas where slopes are unsafe. YCWA's proposed changes would remove 1,591.8 acres from within the project boundary. The majority would be NFS land (1,003.4 acres) and YCWA-owned land (569.3 acres) with the remainder consisting of lands managed by the Corps, State of California, and other private landowners.

Based on staff recommendations in the draft EIS, YCWA (July 30, 2018, comments on draft EIS) also proposes to modify the proposed project boundary to enclose the following parcels of project land: (1) lands adjacent to New Bullards Bar Dam necessary for operating and maintaining the proposed auxiliary flood control outlet, and (2) lands necessary for the construction of the proposed trail along the west shoreline of New Bullards Bar Reservoir between Cottage Creek Campground and Madrone Cove Boat-in Campground. These changes would add 183.9 acres of land, managed by the Forest Service, to the project boundary.

Our Analysis

YCWA proposes to include many new access roads and trails within the project boundary. The proposed project trails would provide sufficient access to stream gages and provide for recreational use. Similarly, existing and new project roads would provide access to project infrastructure and recreation facilities, including the water and sanitation systems, and provide for annual debris removal. The proposed project boundary would include all new project recreation facilities. Where these facility footprints are yet to be determined, YCWA would revise the project boundary after these facilities were constructed. The proposed widths and revisions to the project boundary after recreation

facility construction would provide adequate buffers for project operation and maintenance activities.

The proposed project boundary around the impoundments would follow a contour 30 feet above the NMWSE, except near project infrastructure and recreation facilities. At New Bullards Bar Reservoir, the project boundary would encompass land between 50 and 200 horizontal feet upslope from the NMWSE except where slopes exceed 60 percent, in which case the boundary would encompass less than 50 horizontal feet. Considering the preponderance of steep slopes at the project impoundments that limit shoreline use and that the boundary would extend around the recreation facilities located along the shoreline and project infrastructure, YCWA's proposed project boundary around the impoundment, in general, would provide sufficient shoreline access while being consistent with Commission guidelines that the project boundary should not extend more than 200 feet upslope from the NMWSE. However, comparing the proposed project boundary as shown on exhibit G maps and the proposed West Shoreline Trail alignment in the proposed Recreation Facilities Plan, it appears the proposed project boundary would remove at least some project lands where this trail would be constructed.

The proposed project boundary, as modified in YCWA's comments on the draft EIS, includes sufficient land for operating and maintaining the New Bullards Bar auxiliary flood control outlet. We note this proposed facility would require an access road, borrow sites, and disposal areas that appear to be located outside the proposed project boundary. YCWA would likely need to periodically use the access road after construction to perform maintenance at outlet works (e.g., remove vegetation, repairs). Similarly, borrow and disposal sites would likely require ongoing monitoring and treatment to address erosion and visual effects. Accordingly, including these areas within the project boundary would be necessary to comply with Commission regulations.

YCWA also proposes to remove lands from the project boundary where project facilities are not located and are not needed to operate and maintain the project. Table 3-72 presents our analysis of removing these areas from the project boundary. Removing some of the parcels, as proposed, would not be consistent with including lands necessary for project operation and maintenance within the project boundary.

Transportation System Management Plan

Roads and trails provide access necessary for operating and maintaining the project infrastructure as well as access for public recreation at developed recreation facilities and for dispersed recreation activities. Proper maintenance of roads and trails is necessary to provide for public safety and to protect natural and cultural resources. Most project roads are located on NFS land. YCWA proposes to manage the project roads and trails under the proposed Transportation System Management Plan (LU1). Forest Service 4(e) condition 51 specifies implementing the plan on NFS lands and recommends (10(a) recommendation 21) implementing the plan on non-NFS lands.

Table 3-72. Analysis of areas proposed for removal from the project boundary (Source: staff).

Area (ownership)	YCWA Rationale for Removal	Analysis
Land in the vicinity of Burnt Bridge Campground (NFS land)	Campground burned down; proposed boundary would encompass new development.	Removes lands that would not have project recreation facilities or be used for recreation activities and retains lands where proposed campground and access road would be located.
Land east of New Colgate Powerhouse (PG&E)	Lands only have facilities for PG&E's hydroproject; not needed for project operation and maintenance.	Removes a parcel containing the access road to YCWA's Yuba River Development Project headquarters and retains lands necessary for new recreation development.
Marysville Road near New Bullards Bar Dam Road (County)	Public road provides general access and is not a primary project road.	Removes a road that primarily serves non-project uses and is not consistent with Commission's guidance for a project road. Removes land potentially needed for disposal to construct the auxiliary flood control outlet.
Cottage Creek Campground access road north of 50-foot road buffer (NFS land/YCWA)	Lands not necessary for project operation and maintenance.	Removes lands that would not have project recreation facilities or be used for recreation activities and retains lands where proposed campground and access road would be located.
Area near administration site north of Sunset Vista Observation Site (NFS land)	Administrative site used by the Forest Service and not needed for project operation and maintenance.	Removes lands that would not have project recreation facilities and retains lands associated with water systems supporting project recreation facilities.
Land in the vicinity of Narrows 2 Powerhouse access road (Corps)	Lands do not include project facilities and are not needed for project operation and maintenance.	Removes lands with no project purpose and retains project access road and trail access to gaging station.

Our Analysis

The proposed Transportation System Management Plan would establish a forum for coordination of road maintenance activities between YCWA and the Forest Service and memorialize agreements and responsibilities for maintaining project roads, trails, and access to recreation sites. The plan content identifies the project roads (11.9 miles), trails (0.33 mile), and project recreation roads (4.27 miles) covered by the plan. It does not address use and maintenance of roads and trails that receive a preponderance of non-project use (e.g., general public access roads), although they receive some project-related use to access project infrastructure or recreation facilities. The plan: (1) describes rehabilitation actions to bring existing roads up to standards by the end of the fifth full calendar year after license issuance; (2) includes measures to protect sensitive resources; (3) defines applicable road and trail maintenance activities (including frequency) and standards for performing maintenance; and (4) specifies reporting and consultation requirements with the Forest Service for roads located on NFS land. The plan also addresses maintenance of project roads that are not located on NFS-managed lands and describes mapping and inventory YCWA will accomplish, sign placement and maintenance, pavement surface monitoring, and emergency repair procedures.

The scope of the plan contents, including periodic review and revision, addresses every aspect of road maintenance and provides for necessary consultation and approvals from the Forest Service. Implementing the plan, as YCWA proposes and the Forest Service specifies and recommends, would eliminate existing road and trail maintenance deficiencies within 5 years of license issuance, improve road and trail management, ensure safe public access to project lands and waters, provide for adequate protection of natural and environmental resources in the project area, and reflect YCWA's responsibility for maintaining project roads, trails, and recreation roads.

Wildland Fire

Project operation and maintenance, including recreational use, increase potential for wildland fire occurrence. YCWA proposes to implement the Fire Prevention and Response Plan (LU2), developed in consultation with Forest Service, FWS, California DFW, and FWN.

Forest Service 4(e) condition 53 specifies YCWA implement this plan. FWS's comments indicate that it conceptually agrees with this plan, but it recommends that emergency ESA consultation be addressed in the plan. YCWA did not adopt this measure because FWS did not provide sufficient detail. Additionally, YCWA believes the ESA and ESA Consultation Handbook provide sufficient direction for consultation during emergencies.

Our Analysis

Although none of the reported wildland fires to date are related to the project, the potential for project-related occurrences over the license term would continue. Additionally, all wildland fires, whether or not related to the project, threaten project

infrastructure. YCWA's proposed plan (LU2) provides measures regarding preventing, responding to, and reporting fires. The plan is based on applicable laws and regulations, describes the fire suppression equipment YCWA would be required to have in vehicles and at project facilities, identifies road and helicopter access points, includes investigation procedures, and identifies points of contact for agencies and YCWA. YCWA would periodically consult with the Forest Service, and the plan would be reviewed and revised, as necessary, in consultation with the appropriate agencies. Implementing the plan would minimize project-related wildland fires and, for any such occurrences near project facilities, YCWA's required suppression equipment and support would increase the likelihood of prompt control. Other measures such as pre-identified points of access and contacts would also likely facilitate wildland fire control. The reporting and consultation required by the plan would allow the plan to incorporate lessons learned and accommodate management changes over the license term. Implementing the plan would reduce the effects of wildland fire, which would protect YCWA's hydropower assets and the environmental resources on and adjacent to project lands.

FWS believes that emergency consultation under the ESA should be addressed in the plan but does not provide any specifics. In the event of a fire that could potentially affect a listed species or its habitat, the Commission would consult with FWS, as necessary, to expedite consultation. Therefore, including such provisions in the plan would be duplicative of established procedures. Incorporating these procedures, as FWS recommends, would not provide additional protection for these species.

Aesthetic Resources

Aesthetic effects related to continued project operation and maintenance could include visual appearance and colors of project infrastructure as well as disturbances caused by maintenance activities such as vegetation removal. YCWA proposes to implement a Visual Resource Management Plan (VR1), and Forest Service 4(e) condition 49 specifies YCWA implement this plan.

Our Analysis

YCWA could not identify mitigation measures that could be applied to project facilities to achieve designated VQOs, so the project would continue to be inconsistent with Forest Service visual objectives. Specific non-compliant elements include Emerald Cove Marina, New Bullards Bar Dam, and New Bullards Bar Reservoir shoreline. Dam structures often present high visual contrast and do not meet visual objectives because the engineering and safety requirements from the Commission strictly limit what can be done to a dam structure. Boats and docks introduce high color and form contrast to the reservoir, but these features are part of the usual recreational setting at the reservoir and are not unexpected views. Similarly, exposed shoreline that increases through the recreation season is a typical condition that recreation visitors expect to see at storage reservoirs in California.

The plan describes three mitigation measures YCWA would implement to lessen existing visual effects of features associated with the project: (1) painting or screening (e.g., fencing) the white fuel storage tanks at Emerald Cove Marina; (2) painting the flood gate controls and housings; and (3) removing vegetation at Sunset Vista Observation Site to maintain the view of the reservoir from picnic sites. Even though implementing these measures would not enable the VQOs to be met, visual resources would appear slightly better than what currently exists. Considering (1) the VQOs were established with these features in place; (2) engineering and safety requirements limit options for treatments to minimize visual effects; (3) YCWA consulted with the Forest Service to determine the feasible treatments; and (4) views of contrasting elements are typical of what visitors would expect, YCWA's plan presents a realistic approach to treat the existing elements to reduce their contrasting effects and improve the visitors' view of the reservoir. Further, the proposed Recreation Facilities Plan and Visual Resource Management Plan require development of a visual resource protection plan as well as consultation and approval from the Forest Service when designing or modifying facilities. These measures would ensure facility designs, including their colors, are developed that consider and minimize effects on visual resources to the satisfaction of the Forest Service, the primary land manager of and adjacent to project lands.

3.3.7 Cultural Resources

3.3.7.1 Affected Environment

Section 106

Section 106 of the NHPA[120] as amended and its implementing regulations (36 CFR 800) require the Commission to consider the effects of licensing a hydropower project on any historic properties and allow the Advisory Council on Historic Preservation (Advisory Council) an opportunity to comment if any adverse effects on historic properties are identified within a hydropower project 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. 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

[120] Section 106 of the NHPA of 1966, as amended, 54 U.S.C. § 306108, Pub. L. No. 113-287, 128 Stat. 3188 (2014). (The NHPA was recodified in Title 54 in December 2014.)

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). In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. However, properties that are less than 50 years old may be considered eligible under the National Register if they have achieved significance within the past 50 years and are of exceptional importance or if they are a contributing part of a National Register eligible district.

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

In December 2010, the Commission sent letters to nine federally recognized Native American tribes who were indigenous to the area in and around the project. Tribes who received letters from the Commission included the Shingle Springs Rancheria, Greenville Rancheria of Maidu Indians, Susanville Indian Rancheria, United Auburn Indian Community of the Auburn Rancheria of California, Enterprise Rancheria of Maidu Indians, Mooretown Rancheria, Mechoopda Indian Tribe of Chico Rancheria, Berry Creek Rancheria of Maidu Indians, and the Washoe Tribe of Nevada & California. These letters initiated government-to-government consultation regarding the relicensing of the project, and the Commission asked if the tribes were interested in participating in the licensing process and if they desired to meet with Commission staff to discuss the project. In a letter dated February 1, 2011 (filed February 28, 2011), the United Auburn Indian Community of the Auburn Rancheria responded that it would like to be an active participant in the relicensing process. Commission staff was able to discuss the project with a representative of the Susanville Indian Rancheria on February 28, 2011. Commission staff was unable to confirm if the remaining tribes desired to meet to discuss the project.

On January 4, 2011, the Commission designated YCWA as the Commission's non-federal representative for gathering information and carrying out consultation with regard 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. By letter to the California SHPO filed March 30, 2015, the Commission reaffirmed this delegation.

If existing or potential adverse effects have been identified on historic properties, an applicant must typically develop an HPMP to seek to avoid, reduce, or mitigate the effects. Potential effects that may be associated with a hydroelectric project include any project-related effects associated with operation and maintenance of the project after issuance of a new license. During development of the HPMP, the applicant would consult with the Commission, Advisory Council, California SHPO, Native American

tribes, and the Forest Service. In most cases, the HPMP would be implemented by execution of a PA that would be signed by the Commission, Advisory Council (if it chooses to participate), California SHPO, and other consulting parties.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by a proposed new license within a project's APE. The APE is determined in consultation with the California SHPO and is defined as "the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties," including TCPs (36 CFR 800.16[d]).

The APE for the project was initially defined to include all lands within the FERC project boundaries, with a buffer of 200 feet where YCWA activities have the potential to affect historic properties. Lands above the diversion and power tunnels were excluded from the APE because they would not be subject to project effects. On April 19, 2012, the California SHPO concurred with this definition of the APE. During field surveys, the APE was expanded to include the entirety of identified cultural resource sites that extended beyond the APE as previously defined. On February 5, 2013, the California SHPO concurred with the expanded APE. However, the APE was subsequently reduced to exclude the 200-foot buffer zone because of extremely steep terrain. The project APE currently encompasses about 5,897 acres of which approximately 4,674 acres are typically inundated by New Bullards Bar Reservoir. By letter filed April 28, 2014 (dated March 27, 2014), the California SHPO concurred with the definition of the revised APE.

Cultural History Overview

Archival research conducted as part of the relicensing efforts for the project provided background information relevant to understanding past lifeways, cultural sequences, and historic period developments within and adjacent to the project APE. Based on this gathered background information, a cultural context was prepared and is summarized below (as provided in Ramsey Ford et al., 2014; YCWA, 2014a, 2016). All specific references are as cited by YCWA (2016).

Evidence of Paleoindian period occupation during the late Pleistocene (15,000–10,000 years before present [B.P.]) is scant but has been identified throughout much of the Sierra Nevada. "Fluted" projectile points and other artifacts representing the Clovis culture (13,500–13,000 B.P) are not common, and no artifacts dating to this period have been identified in the immediate project area. However, early Paleoindian occupation in the region is evidenced by the identification of a fluted projectile point recovered from Lake Almanor, approximately 100 miles north of the project area.

The Holocene is marked by the retreat of Pleistocene glaciers and a warming and drying climatic trend. During the early Holocene (10,000–8,000 B.P.), mobile populations traversed the landscape of the Sierra Nevada hunting, gathering, and procuring toolstone from basalt and obsidian quarries. Archaeological evidence of

human occupation throughout California during the early Holocene is common. At this time, the Alder Hill basalt quarry near Truckee, located approximately 80 miles from the project area, was an important source for toolstone. Additionally, archaeological evidence of prolonged human use of the landscape is present in the western Sierra foothills of Calaveras County during this period. One site in this area, the Skyrocket site, appears to have been used for approximately 2,500 years. Sites dating to the middle Holocene (8,000–5,000 B.P.) are not as common in the Sierra Nevada, perhaps because of a drought period between 6,300 and 4,850 B.P. However, human use of the Skyrocket site in Calaveras County continued during this time.

A more moderate climate marks the onset of the Middle Archaic (5,000–1,500 B.P.). This time period is a represented by the first well-documented cultural complexes. The Windmiller culture of the Sacramento-San Joaquin Delta is represented by unique traits and an unusual mortuary practice. The Martis Complex is marked by a preference for locally procured basalt, distinctive stone tools (particularly large bifacially worked tools), and abundant lithic debris. Early and late Martis sites indicate that growing populations may have placed an emphasis on high elevation hunting and relied on a diverse subsistence base at middle and lower elevations. Archaeological sites associated with the Martis Complex are well-represented in the project area.

Studies undertaken for the proposed Bullards Bar and Auburn Dam Reservoirs indicate that the Martis Complex may reflect early Maiduan prehistory. A three-stage Bullards Bar cultural complex has been proposed. All three phases are represented by distinctive projectile point types. During the Bullards Bar I stage (2,450–1,950 B.P.), handstones and milling slabs are very common. Projectile point forms vary, but basalt was the primary tool stone. Basalt was also the primary tool stone associated with Bullards II (A.D. 1 to A.D. 1000), but chert, steatite, and other local materials were also used. Eastgate, Rose Springs, and Gunther Barbed projectile points dominate this stage. Bullards Bar III (500 B.P.to the historic period) is represented by Desert Side-notched projectile points (Type 1) and Type 2 triangular points. These three stages appear to follow a similar progression as the phases identified for the Martis Complex (Martis to Kings Beach phases) at Lake Tahoe and Lake Oroville (Mesilla to Sweetwater phases).

While archaeological sites of the Middle Archaic cannot yet be reliably attributed to modern ethnographic groups, sites of the north-central Sierra Nevada exhibit clear influences from both central California and the Great Basin. During the Late Archaic and Emergent periods (2,000 to 200 B.P.), an absence of a clear relation between archaeological complexes and the known material cultures of ethnographic Californian populations ends. In the western Sierra, important subsistence changes take place as the acorn clearly emerges as an important staple. This is marked by an increase in the abundance and use of bedrock mortars. The bow and arrow also appear as the weapon of choice, marked by an abrupt reduction in projectile point size and a significant increase in numbers of points in use. In the high Sierra, the Martis Complex gives way to the Kings Beach Complex. Use of the bow and arrow also appears in the Kings Beach Complex but

preferred materials for projectile points change from basalt to microcrystalline silicate materials.

The Emergent Period is distinguished by evidence of historically encountered ethnographic peoples. The majority of the project APE is located on lands attributed ethnographically to the Nisenan people, also referred to as the Southern Maidu or Valley Maidu. The Nisenan are speakers of a language that is part of the Penutian language family. Four principal linguistic divisions within Nisenan were proposed in the 1930s, but political units demonstrated minor dialectic differences. Minor differences between valley, hill, and mountain Nisenan dialects and divisions running east-west that approximate the course of major streams were identified. By 1999, five Nisenan dialects were proposed and classified as Northern Hill, North Central Hill or Nevada City Nisenan, Central Hill or Auburn Nisenan, Southern Hill, and Valley Nisenan.

Nisenan society was organized into small, politically independent tribes or tribelets. Each group consisted of one or more household groups and associated relatives living together in a village or community. A tribelet might contain two or more villages. While interactions between tribelets were common, each tribelet was independent and self-governing. Villages could contain as few 15 to 25, or as many as 500 people and were generally located on high ground between rivers. Dome-shaped dwellings consisted of a pole frame structure covered with bark or brush with a central hearth. Larger dance houses were also constructed. Nisenan subsistence was varied, and few resources were avoided. Several varieties of acorn were gathered in the fall and stored in granaries for later use, but hunting and gathering occurred year-round. Hunting was accomplished individually but also communally by driving game into enclosed areas and by setting brush fires. Deer, elk, antelope, bear, wildcats, rabbits, and a variety of other mammals were procured. Fish were taken using different methods, including hook and lines and natural poisons that would stun fish and enable them to be easily collected. Gathering plant resources was a family activity and included harvesting of nuts, seeds, roots, tubers, bulbs, berries, grapes, and other vegetal foods in addition to acorns.

Although early Spanish explorers initiated contact with coastal indigenous populations during the mid-sixteenth century, it was not until the arrival of Spanish missionaries in 1769 and the establishment of Spanish missions in the early nineteenth century that changes to native lifeways became fully apparent. In 1808, Gabriel Moraga identified numerous Nisenan villages along the Cosumnes, American, and Feather Rivers during explorations for potential mission sites. Fray Narcisco Duran also reported many villages along the Sacramento River in 1817. The missionaries' colonizing efforts greatly affected the demography, social life, and culture of the indigenous people, and some Nisenan were likely forced into the Spanish mission system. During the early nineteenth century, European trappers, explorers, and other travelers also encountered the Nisenan living within their traditional territories. However, by the middle of the nineteenth century, introduced diseases such as smallpox and malaria are estimated to have decimated as much as 75 percent of the Valley Nisenan population.

The discovery of gold at Sutter's Mill in 1848 initiated widespread Euro-American migration into the region. Food, shelter, and infrastructure were needed to support the thousands of miners who traveled to the area, and violent clashes between miners and indigenous populations were common. By the end of 1849, many of the drainages and streams that the Nisenan relied on for subsistence were polluted, and hunting and gathering lands were no longer accessible to them. As a result, many Nisenan were forced to abandon their traditional lifeways and seek work in other pursuits such as logging, ranching, and agricultural industries.

The initiation of the gold boom resulted in the establishment of an extensive network of roads, ferries, and other transportation systems in the northern Sierra Nevada. Mule trains carried supplies and passengers from Marysville to remote mining regions. As early as 1850, a series of bridges was constructed at Bullards Bar, most of which were washed away during winter storms. A toll bridge was built in 1875 and remained in place until the original Bullards Bar Dam and associated bridge were constructed in 1924. Following the decline of the gold mining boom in the 1850s, settlers turned to other economic endeavors. By the 1860s, logging, ranching, and some crop production were the primary pursuits in the vicinity of the project, with a number of ranches located in the area currently inundated by the New Bullards Bar Reservoir.

In September 1897, Eugene J. de Sabla, Jr., John Martin, and R.R. Colgate incorporated the Yuba Power Company for the primary purpose of constructing a power plant on the Yuba River. By April 1898, the plant was in operation with two generators that provided electricity to mines and agricultural fields in the Smartsville area. A ditch system diverted water from the North Fork of the Yuba River to Browns Valley. In 1899, the Yuba Power Company was reorganized as the Yuba Electric Power Company, and a new power plant was constructed that same year farther upstream from the Yuba plant. The new plant was called the Colgate Powerhouse after Romulus Riggs Colgate, and it included approximately 10 miles of wooden flumes, trestles, and pipes that carried water from the Browns Valley Irrigation District to the powerhouse. Additional water was transported to the powerhouse via a wood stave pipe flume from Lake Francis, a reservoir on nearby Dobbins Creek. In 1946, the Colgate Powerhouse was shut down after it suffered major fire damage. In 1949, the plant was reconstructed at a location 600 feet downstream from the original plant location. The new, larger plant transported power to Sacramento via a 61-mile-long transmission line. From here, it joined a network of other transmission lines that ultimately supplied power to Oakland and San Francisco.

Construction of the Old Bullards Bar Dam (currently inundated by the New Bullards Bar Dam) began in 1922 and was completed in 1924. The dam was originally constructed for local hydraulic mining interests. The dam replaced a 40-foot-tall earthen dam and included a powerhouse with a 6,000-horsepower capacity. PG&E purchased the dam and powerhouse in 1928. In 1957, the Yuba County Council approved the construction of a new dam at Bullards Bar to meet county flood control and water storage needs, and on June 1, 1959, YCWA was established. In 1961, Yuba County voters approved bonds that would provide funding for the Yuba River Development Project,

which would replace the older Colgate facilities. The New Bullards Bar Dam was designed in 1965, and in 1966, YCWA and PG&E reached a funding agreement to construct the new facility. By 1969, construction of the New Bullards Bar Dam was completed. The New Colgate Powerhouse, constructed the following year, included two 18-foot Pelton water wheels.

Prehistoric and Historic-Era Archaeological Resources

In 2009, YCWA reviewed existing records housed at the North Central Information Center at California State University, Sacramento; the Northeast Information Center at California State University, Chico; Corps' offices in Sacramento; the PNF and TNF; and a number of libraries, historical societies, and museums. All relevant data on file at these repositories were examined, including cultural resource records, site location maps, General Land Office maps, other historic maps, NRHP listings, California Register of Historical Resources, Office of Historic Preservation Historic Property Directory, 1996 California State Historic Landmarks, 1976 California Inventory of Historic Resources, and the California Department of Transportation (Caltrans) Bridge Inventory. Additional archival research was conducted in 2011 and 2012 at the Yuba County Library California Reading Rooms in Marysville, the Doris Foley Library for Historical Research in Nevada City, the California State Library in Sacramento, the Center for Sacramento History in Sacramento, the Firehouse Museum in Nevada City, the Special Collections Room of the Meriam Library, the Camptonville Historical Society, and YCWA archives. At the request of the United Auburn Indian Community, researchers visited California State University in 2012 to verify the status of artifacts recovered during excavations around New Bullards Bar Dam in the 1960s that were being curated at the university.

The record searches indicate that 160 cultural resource investigations have previously been conducted within the project boundary and within a 0.25-mile buffer zone surrounding New Bullards Bar Reservoir. Many of these surveys were from more than 10 years ago, and the resulting reports provide insufficient information to determine the adequacy of the coverage employed or lack other crucial data. However, these studies document 24 previously recorded cultural resources (archaeological sites and built-environment resources) within the project APE.

Of the 24 previously recorded archaeological sites and/or built environment resources in the project APE, 14 are prehistoric, 8 are historic, and 2 are multicomponent. The prehistoric components include milling stations, lithic scatters with and without tools, possible housepit depressions, and midden deposits. The historic components include foundations, historic campsites, refuse and can scatters, prospect features, historic roads and road segments, trails, structural remains, and ditches, while the multicomponent sites contain evidence of both prehistoric and historic occupation.

Following completion of the record searches, YCWA conducted archaeological and built environment field investigations within the project APE between 2009 and 2011 (Ramsey Ford et al., 2014, 2016). A report of an additional cultural resources study of

proposed recreational improvements at the Cottage Creek and Dark Day boat launch facilities was submitted to the Commission in September, 2017 (YCWA, 2017d).[121] A second report addressing the reconstruction of Cottage Creek Campground was filed on December 22, 2017 (Ruth et al., 2017). Field investigations consisted of a combination of verifying data from the earlier surveys and systematically investigating locations within the project APE that had been previously but inadequately surveyed and unsurveyed areas. These surveys did not include the land above project tunnels because project operation does not affect lands on the surface at these locations. Because of the older age of most of the previous surveys and the limited amount of previous coverage, new surveys were completed regardless of prior coverage.

In general, the field survey consisted of a team of archaeologists walking parallel transect intervals less than 15 meters apart. Areas considered to be sensitive for cultural resources (i.e., springs and drainages) were more closely inspected. Lands typically inundated by Bullards Bar Reservoir were surveyed as conditions allowed. Areas that could not be accessed in a safe manner (e.g., unsafe steep slopes and locations containing extremely dense vegetation) were not surveyed. However, boat inspections of steep, inaccessible areas around New Bullards Bar Reservoir were conducted using binoculars. This allowed for the identification of sites with large features in areas that were unsafe to survey on foot at that time.

Prehistoric and Historic-period Archaeological Sites

YCWA identified 55 archaeological sites within the project APE. Of these, 31 are newly identified sites, and 24 are sites that were recorded during previous investigations and revisited. The 55 archaeological resources comprise 20 prehistoric sites, 4 multicomponent sites, and 31 historic sites and are summarized in table 3-73.

The 20 prehistoric sites consist of bedrock mortar sites with and without associated artifacts (n=9); sites with bedrock mortars and midden deposits (n=3); a site with bedrock mortars, housepit features, and an associated lithic scatter (n=1); a site with a single housepit feature (n=1); and lithic scatters with flaked and/or groundstone tools (n=6). None of the prehistoric sites have been evaluated for listing in the National Register.

[121] A report addressing the survey of the additional recreation areas was submitted to the California SHPO on January 8, 2018 for review and concurrence and it is expected that the final survey report would be filed with the Commission by May 2018 (February 1, 2018 email from J. Lynch, HDR Inc., Sacramento, CA, to A. Mitchnick, FERC, Washington, D.C., filed February 14, 2018).

Table 3-73. Summary of prehistoric, historic, and multi-component archaeological sites, National Register status, effects and proposed treatment, Yuba River Development Project APE (Source: YCWA, 2016).

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-SIE-1849H (CA-YUB- 1733H / P-58-2733 / 05-17-53-01007)	H	Drainage pipe and railroad spike; historic road segment	Ineligible	Newly recorded	Our House Diversion Dam and Log Cabin Diversion Dam fish release outlet modification; Lohman Ridge Diversion Tunnel modifications No treatment proposed in the HPMP
CA-YUB-0018 (P-58-0036)	P	Bedrock mortar features (7) and midden deposits	Unevaluated	Previously recorded; not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0019 (P-58-0037)	P	Bedrock mortar features (5) and midden deposits	Unevaluated	Previously recorded; not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0020 (P-58-0038)	P	Possible single housepit depression	Unevaluated	Previously recorded; not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0021 (P-58-0039)	P	Bedrock mortars (x51) and village, several areas were indicative of house pits; lithic material	Unevaluated	Previously recorded; not relocated (inundated)	Analyze existing collections for National Register eligibility; develop treatment plan if eligible (10 years)
CA-YUB-0022 (P-58-0040)	P	Bedrock mortars (number not indicated)	Unevaluated	Previously recorded; not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0023 (P-58-0041)	P	Bedrock mortars (5)	Unevaluated	Previously recorded; not relocated (inundated)	Inundation Evaluate as conditions allow

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-YUB-0024 (P-58-0042)	P	Bedrock mortars (x13).	Unevaluated	Previously recorded; not relocated (inundated)	Analyze existing collections for National Register eligibility; develop treatment plan if eligible (10 years)
CA-YUB-0025/H (P-58-0043)	PH	Bedrock mortars (x18) and midden deposits; possible prehistoric camp site; historic stage stop	Unevaluated	Not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0026/H (P-58-0044)	PH	Lithic scatter; historic farm buildings	Unevaluated	Not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0868 (P-58-0886/ 05-17-53-00126)	P	Bedrock mortars (x15) and pestles (4)	Unevaluated	Previously recorded; not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0887 (P-58-0905 / 05-17-53-00127)	P	Bedrock mortars (2), possible midden deposits	Unevaluated	Previously recorded; not relocated (inundated)	Inundation Evaluate as conditions allow
CA-YUB-0894 (P-58-0912)	P	Bedrock mortars (6)	Unevaluated	Updated	Fluctuating water levels and/or wave action; recreation activities and possible looting Evaluate and develop treatment plan if eligible (2 years)
CA-YUB-1054 (P-58-1072/ 05-17-53-00072)	P	Lithic scatter with projectile points, hammerstones, other stone tools, and flakes	Unevaluated	Updated	Fluctuating water levels and/or wave action, recreation activities, and possible looting Evaluate and develop treatment plan if eligible (2 years)

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-YUB- 1124H (05-17-53-00340)	H	Slate foundation and chimney, historic refuse scatter, tailings	Unevaluated	Updated	Fluctuating water levels and/or, possible looting, modern mining activities Evaluate and develop treatment plan if eligible (5 years)
CA-YUB-1574/H (P-58-1918/ 05-11-53-00508)	PH	Milling features (x2), hydraulic cut, tailings, reported location of Wambo Bar hotel and store	Unevaluated	Updated	Fluctuating water levels and/or wave action Evaluate and develop treatment plan if eligible (2 years)
CA-YUB- 1719H (P-58-2715/ 05-11-53-00526)	H	Cottage Creek Campground access road and unpaved road segment	Ineligible	Updated	No project effect Avoid
CA-YUB- 1721H (P-58-2720/05-17-53-01006)	H	Industrial refuse scatter	Ineligible	Newly recorded	No treatment proposed
CA-YUB-1722 (P-58-2721/ 05-17-53-01001)	P	Bedrock mortars (2)	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities, and possible looting Evaluate and develop treatment plan if eligible (4 years)
CA-YUB- 1725H (P-58-2724 / 05-11-53-01087)	H	Prospect trenches, prospect pits, and waste rock piles	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, possible looting, modern mining activities Evaluate and develop treatment plan if eligible (4 years)

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-YUB-1727 (P-58-0038)	P	Bedrock mortar (1)	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities, and possible looting Evaluate and develop treatment plan if eligible (4 years)
CA-YUB-1728 (P-58-2727/ 05-17-53-01002)	P	Bedrock mortar (1)	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities, and possible looting Evaluate and develop treatment plan if eligible (4 years)
CA-YUB-1729 (P-58-2728/ 05-17-53-01003)	P	Projectile points, hammerstones, stone tools, and flakes	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities, and possible looting Evaluate and develop treatment plan if eligible (2 years)
CA-YUB-1730 (P-58-2729/ 05-17-53-01003)	P	Flakes, hammerstones, stone tool fragments	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities, and possible looting Evaluate and develop treatment plan if eligible (2 years)
CA-YUB-1731 (P-58-2730/ 05-17-53-01004)	P	Scraper, flakes, fragments	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities, and possible looting Evaluate and develop treatment plan if eligible (2 years)
CA-YUB- 1732H (P-58-2731 / 05-11-53-01090)	H	Can scatter	Ineligible	Newly recorded	No treatment proposed

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-YUB- 1734H (P-58-2734)	H	Industrial refuse scatter	Ineligible	Newly recorded	No treatment proposed
CA-YUB- 1735H (P-58-2735)	H	Prospect pit, waste rock pile, two road segments	Ineligible	Newly recorded	No treatment proposed
CA-YUB- 1736H (P-58-2736)	H	Concrete platform, concrete slab, concrete footings, metal post, rebar, road segment, metal pipe with bracket	Ineligible	Newly recorded	Active logging, vegetation removal, project operation and maintenance
CA-YUB- 1737H (P-58-2738)	H	Ditch	Unevaluated	Newly recorded	No project effects Avoid
CA-YUB-1739H (P-58-2740 / 05-17-53-01008)	H	Road segment	Ineligible	Newly recorded	No treatment proposed
CA-YUB- 1740H (P-58-2741 05-17-53-01009)	H	Ditch segment	Ineligible	Newly recorded	No treatment proposed
CA-YUB- 1741H (P-58-2742 / 05-17-53-01010)	H	Five segments of a historic road	Ineligible	Newly recorded	No treatment proposed
CA-YUB- 1742H (P-58-2743)	H	Two segments of a paved road on opposite sides of New Bullards Bar Reservoir, cans, bottles, ceramics	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities Evaluate and develop treatment plan if eligible (4 years)
CA-YUB- 1746H (P-58-2750)	H	Metals, cans	Ineligible	Newly recorded	No treatment proposed

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-YUB- 1748H (P-58-2747)	H	Foundation, metal rails, spoil piles	Unevaluated	Newly recorded	No project effects Avoid
CA-YUB- 1750H (P-58-2745)	H	Concrete structure remnants, metal pipes, road segment	Unevaluated	Newly recorded	No project effects Avoid
CA-YUB- 1751H (P-58-2744)	H	Concrete foundations, railroad alignment	Ineligible	Newly recorded	Auxiliary flood control outlet modification No treatment proposed in the HPMP
CA-YUB- 1752H (P-58-2752 / 05-11-53-01093)	H	Road segment	Ineligible	Newly recorded	No treatment proposed
CA-YUB- 1758H (P-58-2764)	H	Road segment	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, project operation and maintenance Evaluate and develop treatment plan if eligible (5 years)
CA-YUB- 1759H (P-58-2765)	H	Trail	Unevaluated	Newly recorded	No project effects Avoid
CA-YUB- 1760H (P-58-2766)	H	Campsite with improved tent pads	Ineligible	Newly recorded	No treatment proposed
CA-YUB-1761 (P-58-2767)	P	Milling features (2), fire-affected rock, flakes, handstone	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action, recreation activities, project operation and maintenance Evaluate and develop treatment plan if eligible (5 years)

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-YUB- 1762H (P-58-2768)	H	Two road segments	Ineligible	Newly recorded	No treatment proposed
CA-YUB-1763 (P-58-2769)	P	Fire-cracked rock, handstones, chopper, pestle	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action Evaluate and develop treatment plan if eligible (5 years)
CA-YUB-1764/H (P-58-2770)	PH	Milling features (x14), projectile points, handstones, bifaces, choppers, milling slabs, core, flakes, historic bottle glass	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action Evaluate and develop treatment plan if eligible (5 years)
CA-YUB- 1765H (P-58-2771)	H	Three road segments	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action Evaluate and develop treatment plan if eligible (5 years)
CA-YUB- 1766H (P-58-2772)	H	Two road segments	Unevaluated	Newly recorded	Fluctuating water levels and/or wave action Evaluate and develop treatment plan if eligible (5 years)
CA-YUB-1767 (P-58-2773)	P	Flakes, flake tools, handstones, bottle glass base	Unevaluated	Newly recorded	Evaluate and develop treatment plan if eligible (5 years)
CA-YUB- 1768H (P-58-2774)	H	Trail	Ineligible	Newly recorded	No treatment proposed

Trinomial (Primary/Forest Service Number)	Type	Description	National Register Eligibility	Recordation Status	Project-related Effects and Proposed Treatment
CA-YUB- 1769H (P-58-2775)	H	Garden Valley Road and Dark Day Road	Ineligible	Newly recorded	Fluctuating water levels and/or wave action Evaluate and develop treatment plan if eligible (5 years)
CA-YUB- 1770H (P-58-2776)	H	Sunset Vista Road and Spur	Ineligible	Newly recorded	No treatment proposed
CA-YUB- 1771H (P-58-2777)	H	Marysville Road segment	Unevaluated	Newly recorded	No project effects Avoid
CA-YUB- 1833H (P-58-2898)	H	Road segment	Ineligible	Newly recorded	No treatment proposed
No trinomial (P-58-2732 / 05-11-53-01091)	H	Stone chimney, flume, trail	Unevaluated	Newly recorded	Unknown; site can only be accessed during full storage capacity of the reservoir; site will be visited when reservoir is at full storage capacity Evaluate and develop treatment plan if eligible (5 years)

[a] Tables 3.3.8.3 and 3.3.8.4 of the application describe this resource as the Our House Diversion Dam access road and state that it remains unevaluated for listing in the National Register. However, in the California SHPO's March 24, 2014, letter and in YCWA's 2016 HPMP, this site is described as a drainage pipe and railroad spike that were determined to be ineligible for listing.

The four multicomponent sites include a site with prehistoric bedrock mortar features and a historic stage stop and a site with a prehistoric lithic scatter and historic-period farm buildings. Both of these previously recorded sites were completely inundated by the reservoir during field surveys and are not accessible. A third site consists of two prehistoric bedrock milling features, a historic hydraulic cut, and tailings. The final site consists of prehistoric bedrock milling features with a lithic scatter and a historic refuse deposit. None of the multicomponent sites have been evaluated for listing in the National Register.

The 31 historic sites include sites consisting of one or more roads/trails (n=15); sites with concrete structural remnants (n=4); refuse scatter sites (n=4); ditches (n=2); habitation sites with associated features (n=2); mining complexes (n=2); a site with a drainage pipe and railroad spike (n=1); and a single campsite with tent pads (n=1). By correspondence filed on July 7, 2016 (dated March 27, 2014, July 23, 2014, and October 7, 2014), October 11, 2016 (dated September 20, 2016), September 14, 2017 (dated August 21, 2017), and August 31, 2018 (dated August 15, 2018), the California SHPO concurred that 17 of the historic sites are ineligible for listing in the National Register. The remaining 14 historic sites could not be assessed based on archival research and field observations.

All unevaluated prehistoric, multicomponent, and historic sites are considered potentially eligible for listing in the National Register pending further research.

Historic Hydroelectric System Features

YCWA also investigated the historic built environment within the project APE, which included documentation and National Register evaluation of the project system (study 12.1, Historic Properties; Ramsey Ford et al., 2014, 2016). This study resulted in the documentation of 11 structures associated with the project. Ten of the structures are less than 50 years old and consist of the facilities constructed in the late 1960s and 1970. One structure, the Old Colgate Diversion Dam (P-58-2710), was constructed in 1904 (table 3-74).

Of the 11 structures, only 3 have been determined to be eligible for listing in the National Register. By letter dated March 27, 2014, the California SHPO concurred that the New Colgate Powerhouse (P-58-2707) and New Colgate Penstock (P-58-2709) are eligible for listing in the National Register under criterion C because they are an excellent example of use of the Pelton water wheel, a California-based hydropower design developed during the nineteenth century. Although not yet 50 years old, the California SHPO also stated that these two structures should also be considered eligible under

National Register consideration G. [122] The Old Colgate Diversion Dam (P-58-2710) appears much as it did in 1904 and was determined to be eligible for listing in the National Register under criterion C[123] as an example of a structure built using hand methods by crews working in remote and difficult terrain. It is also eligible for listing under criterion A[124] for its association with early American hydropower development efforts.

Table 3-74. Summary of the historic hydroelectric system features and National Register status in the Yuba River Development Project APE (Source: YCWA, 2016).

Name	Primary Number	Date Constructed	National Register Eligibility (Criteria)
Camptonville Diversion Tunnel	P-58-2701	1969	Ineligible
Long Cabin Diversion Dam	P-58-2703	1969	Ineligible
Lohman Ridge Diversion Tunnel	P-58-2704	1969	Ineligible
Narrows 2 Powerhouse	P-58-2705	1970	Ineligible
New Bullards Bar Dam	P-58-2706	1970	Ineligible
New Colgate Powerhouse	P-58-2707	1970	Eligible (C); Consideration (G)
New Bullards Bar Reservoir	P-58-2708	1970	Ineligible
New Colgate Powerhouse Penstock	P-58-2709	1970	Eligible (C); Consideration (G)

[122] National Register consideration G applies to properties achieving significance within the past 50 years that is of exceptional importance.

[123] National Register criterion C applies to properties that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

[124] National Register criterion A applies to properties that are associated with events that have made a significant contribution to the broad patterns of our history.

Name	Primary Number	Date Constructed	National Register Eligibility (Criteria)
Old Colgate Diversion Dam	P-58-2710	1904	Eligible (A, C)
Our House Diversion Dam	P-58-2713	1969	Ineligible
New Bullards Bar Dam Bypass Tunnel	P-58-2714	1966	Ineligible

[a] In the HPMP and the license application, the licensee refers to this as the New Colgate Powerhouse Penstock.

In its application, YCWA stated that the New Colgate Penstock was recently reevaluated for listing on the National Register as part of proposed maintenance activities. YCWA has recommended that it is no longer eligible for listing, but the California SHPO has not yet concurred with this recommendation.

Traditional Cultural Properties

Between November 2011 and September 2012, YCWA also consulted with participating Native American tribes and agencies to document potential TCPs that could be affected by the project (Blount et al., 2013). Initially, four tribal groups expressed an interest in participating in the study—the Enterprise Rancheria, Nevada City Rancheria, United Auburn Indian Community, and Strawberry Valley Rancheria. However, additional consultation with these groups resulted in only the United Auburn Indian Community and the Nevada City Rancheria as formal study participants, although individual members of the Strawberry Valley Rancheria also participated. Consultation occurred both off-site and in the field.

Consultation did not result in the identification of any properties that could be defined as TCPs. No specific ethnographic sites were identified within the project APE, and no ceremonial or spiritual locations or resource gathering locations (both traditional and present-day) were documented. On January 18, 2013, YCWA requested California SHPO concurrence that no TCPs would be affected by the issuance of a new license for the project.

Subsequent to the completion of the TCP study, by letter filed March 3, 2014, the United Auburn Indian Community noted that tribal elders had identified a location that was of importance to the tribe that had not been documented during relicensing studies (letter from M. Guerrero, United Auburn Indian Community of the Auburn Rancheria, Auburn, California, to K.D. Bose, Secretary, FERC, Washington, D.C., March 2, 2014). YCWA requested that the Tribe provide further information about this location and stated that once this information is received, further consultation and evaluation of the location as a potential TCP will be completed.

Additionally, some tribal members of the Nevada City Rancheria expressed concern about a potential TCP, associated with the burned Cottage Creek Campground (CA-YUB-1736H), near an area where YCWA proposes recreation improvements. In a letter to the Commission filed December 30, 2016, YCWA proposed to retain an ethnographer to compile background information on the Wenepem Maidu, conduct interviews with Nisenan who used or resided near the area, and conduct an on-site visit to record use areas (letter from C. Aikens, General Manager, YCWA, Marysville, California, to K.D. Bose, Secretary, FERC, Washington, D.C., December 30, 2016). A draft Cottage Creek Campground TCP report, prepared in consultation with participating tribes, was submitted to the California SHPO on September 18, 2017, for review and concurrence. Comments were received from the California SHPO on October 20, 2017, and December 1, 2017, and were addressed in a revised draft supplemental report that was filed with the Commission on June, 2017 (see final report Blount, 2018).

YCWA's final report on recreation improvements at Cottage Creek Campground (Blount, 2018) describes additional consultation undertaken with the United Auburn Indian Community of the Auburn Rancheria, Nisenan tribal members, and a field visit to the campground with representatives of the Nevada City Rancheria, the Forest Service, YCWA, and its consultants. According the report, the Wenepem Maidu, Inc., a Native American organization dedicated to providing job training to Native American youth, had used the area the 1970s, but no specific TCPs were documented. In its December 1, 2017, letter, the California SHPO acknowledges YCWA's supplemental TCP study efforts and agrees that the traditional use of the Cottage Creek Campground area has not occurred since the early 1970s, and that areas where such use had occurred have either been demolished or destroyed during a wildfire event (letter from J. Polanco, California SHPO, Sacramento, California, to C. Aikens, General Manager, YCWA, Marysville, California, to K.D. Bose, Secretary, FERC, Washington, D.C., December 1, 2017). In a letter filed with the final supplemental TCP report on June 22, 2018, the California SHPO concurs with YCWA's recommendation that the potential TCP identified at Cottage Creek Campground is not eligible for listing on the National Register (letter from J. Polanco, California SHPO, Sacramento, California, to C. Aikens, General Manager, YCWA, Marysville, California, to K.D. Bose, Secretary, FERC, Washington, D.C., May 22, 2018).

3.3.7.2 Environmental Effects

Project-related effects on archaeological sites and built environment resources are likely to occur from project operation and maintenance, use and maintenance of project roads, recreation, vandalism, and modifications or repairs to project facilities. No potential TCPs have been identified within the project APE; therefore effects on such resources are not anticipated. 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,

such effects would need to be resolved in consultation with the California SHPO and with other parties.

Operation and maintenance of the project's hydroelectric facilities may also affect significant cultural resources. Reservoir fluctuation and wave action can result in erosion and deterioration of shoreline or submerged archaeological resources. Further, these resources can be subject to vandalism when they are exposed during drawdown or low elevation periods. The project vicinity is also popular for recreational activities such as camping, picnicking, boating, houseboating, swimming, hiking, bicycling, and other activities.

Effects of Project Operation and Maintenance

In its cultural resources studies, YCWA identifies specific ongoing project-related effects at 22 of the 38 unevaluated archaeological sites in the project APE. Under section 106, potential effects on ineligible resources do not need to be considered. Effects at unevaluated sites include a combination of fluctuating water levels and/or wave action resulting in erosion (19 sites), recreational activities (10 sites), possible looting (10 sites), project-related operation and maintenance activities (3 sites), modern mining activities (2 sites), and logging (1 site). Table 3-73 identifies the specific project-related effects observed at these 21 sites. Eleven additional archaeological sites are completely inundated by New Bullards Bar Reservoir. In its HPMP, YCWA states that it is not known if inundation is damaging these sites or helping to preserve them and suggests if and when these sites are exposed, an analysis of effects would determine their current condition. However, two of these sites were previously subject to excavations prior to construction of New Bullards Bar Dam (CA-YUB-0021, CA-YUB-0024). YCWA indicated that one site could not be accessed during field studies and potential effects are therefore unknown (P-58-2732).

Three hydroelectric system structures located in the project APE have been determined to be eligible for the National Register (Old Colgate Diversion Dam [P-58-2710]; New Colgate Powerhouse [P-58-2707]; and New Colgate Penstock [P-58-2709]). As noted in section 3.3.7.1, YCWA has recently recommended that the penstock is no longer eligible, but the California SHPO has not yet concurred. Until concurrence is received, this structure remains eligible for listing. In its application, YCWA states that while some routine maintenance activities would not affect the qualities of these structures that make them eligible for listing in the National Register, other operation and maintenance could adversely affect these structures. Additionally, many of the remaining built environment resources in the APE could become eligible for listing in the National Register over any new license term.

Effects of Proposed Construction-related Activities

In its application, YCWA states that the proposed construction of new facilities could affect cultural resources. These activities, and potentially affected resources are identified in table 3-75.

Table 3-75. Summary of effects of proposed construction activities on identified resources (Source: YCWA, 2017a).

Construction Activity	Affected Eligible or Unevaluated Resources	Affected Ineligible Resources
New Bullards Bar Dam auxiliary flood control outlet	*Archaeological Sites:* CA-YUB-1751H	*Archaeological Sites*: CA-YUB-1719/H, CA-YUB-1723, CA-YUB-1724, CA-YUB-1802H, CA-YUB-1803H, CA-YUB-1768/H, CA-YUB-1833, CA-YUB-1834; *Built Environment:* P-58-27006 (New Bullards Bar Dam); P-58-2708 (New Bullards Bar Reservoir)
New Colgate Powerhouse tailwater depression system	*Built Environment:* P-58-2707 (New Colgate Powerhouse)	None
Modifications to the fish release outlets at Our House Diversion Dam and Log Cabin Diversion Dam	CA-SIE-1849H	*Archaeological Sites:* CA-SIE-1849H, CA-YUB-1735H *Built Environment:* P-58-2701 (Camptonville Diversion Tunnel), P-58-2703 (Log Cabin Diversion Dam); P-58-2704 (Lohman Ridge Diversion Tunnel); P-58-2713 (Our House Diversion Dam)
Modifications to Lohman Ridge Diversion Tunnel intake	*Archaeological Site:* CA-SIE-1849H	*Built Environment:* P-58-2704 (Lohman Ridge Diversion Tunnel), P-58-2713 (Our House Diversion Dam)

Effects of Recreation Facilities, Recreation Rehabilitation and Enhancements

As discussed in section 3.3.5.1, *Recreation, Affected Environment*, New Bullards Bar Reservoir includes 16 developed recreation facilities, 1 parking area at the Our House

Diversion Dam, 2 informal areas, and several improved hiking trails located within the project boundary. Inadvertent damage to cultural resources near these recreation facilities can from result from foot and vehicle traffic from both visitors and maintenance personnel. Documented archaeological resources and previously unidentified resources may also be affected by maintenance, rehabilitation, and construction/removal of these facilities. In addition, cultural resource sites located in proximity to public recreational areas may also be more susceptible to vandalism and looting.

YCWA's application states that not all locations for proposed recreational enhancement, all of which would be included in the project boundary, have been surveyed for cultural resources. However, as noted in section 3.3.7.1, a report addressing recreational improvements at the Cottage Creek and Dark Day boat launch facilities was prepared and submitted to the Commission in September 2017 (YCWA, 2017d). This study identified two resources that would be affected by the proposed improvements (CA-YUB-1719H, CA-YUB-1769H). However, in its August 21, 2017, letter, the California SHPO concurred that these two sites are ineligible for listing in the National Register and issued a finding of No Adverse Effect for these proposed improvements. Additionally, in its December 1, 2017, letter, the California SHPO stated that it did not object to YCWA's finding of "No Adverse Effect" regarding recreation improvements at Cottage Creek Campground (Ruth et al., 2017). In its proposed Recreation Facilities Plan, YCWA proposes to implement a number of other recreational improvements over the license term that could affect historic properties. In its application, YCWA states that prior to implementing any such improvements, cultural resources investigations, including field studies of any previously unsurveyed areas, would be conducted in consultation with the California SHPO, participating tribes, and agencies as appropriate to determine if the activity could adversely affect historic properties.

Historic Properties Management Plan

Continued project operation and enhancements, recreational use, and new construction could affect cultural resources listed in or eligible for inclusion in the National Register. YCWA proposes to manage effects on historic properties through the implementation of an HPMP (CR1). The purpose of the HPMP is to resolve (i.e., reduce, avoid, or mitigate) existing or potential project-related adverse effects on historic properties within the project APE throughout the term of the new license.

YCWA provided a first draft of the HPMP to the California SHPO on March 12, 2014, and received comments back on July 11, 2014. These comments and the results of additional survey work on newly exposed lands were addressed in a revised HPMP that was provided to the Forest Service and participating tribes for review on November 10, 2015. The Forest Service provided comments on December 9, 2015; no comments were received from the tribes. A second revision of the HPMP was prepared to address Forest Service comments and was submitted to the California SHPO on April 22, 2016. On July 5, 2016, YCWA filed a third revision of the HPMP with its license application. Appendix A of the HPMP includes a June 13, 2016, letter from the California SHPO

providing concurrence with the measures contained within the HPMP. YCWA received Forest Service approval of the HPMP on June 29, 2016, and Forest Service 4(e) condition 50 requires that it be implemented for historic properties located on NFS lands.[125]

The HPMP was prepared considering the Commission and Advisory Council's joint document, *Guidelines for the Development of Historic Properties Treatment Plans for FERC Hydroelectric Projects* (Commission and Advisory Council, 2002) and designed to prescribe both general processes and specific actions to manage historic properties over any new license term. It is intended to serve as a guide for operating personnel performing necessary project-related activities and to prescribe site treatments designed to address ongoing and future effects on historic properties.

YCWA's cultural resource management goals emphasize stewardship of historic properties. The HPMP describes a process of consultation with appropriate state and federal agencies and tribes regarding the management of historic properties. The HPMP includes general requirements for designation of a primary individual responsible for implementation of the HPMP, public interpretation, cultural resources regulatory information, cultural resource training for all YCWA employees and contractors, historic properties monitoring, non-emergency construction and maintenance, the treatment of human remains, unanticipated cultural resources, emergency situations, and additional cultural resources surveys, evaluations, and development of mitigation measures. YCWA's HPMP also contains requirements for regular consultation with the Commission, Forest Service, California SHPO, and participating tribes as appropriate. Finally, the HPMP includes requirements for periodic review and revision of the HPMP as necessary.

YCWA's HPMP also contains management measures for individual resources identified within the project APE. Most of the identified archaeological sites have not been evaluated for listing in the National Register. However, in the HPMP, unevaluated sites are treated as eligible and managed accordingly, until their status is determined otherwise. Table 3-73 summarizes the observed project-related effects at each site and YCWA's proposed treatment measures. YCWA proposes treatment of site-specific effects on unevaluated sites in a phased way according to the severity of the effects and access to the property. Six sites would be evaluated for listing in the National Register within 2 years of license issuance, four sites would be evaluated within 4 years, nine sites would be evaluated within 5 years, and two sites would be evaluated within 10 years.

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[125] On December 4, 2017, a revised HPMP that addresses FERC project boundary expansions and updated information was provided to participating tribes and agencies for review and to the California SHPO for concurrence. A final HPMP addressing any comments received was anticipated to be filed by May 2018 (February 1, 2018, email from J. Lynch, HDR Inc., Sacramento, CA, to A. Mitchnick, FERC, Washington, D.C., filed February 14, 2018), but it has not yet been received.

Nine of the inundated resources would be evaluated as conditions allow (e.g., during any periods of low reservoir levels when the sites are accessible). Artifact collections obtained from two previously investigated sites subject to inundation would be used to evaluate these resources. Treatment plans would then be developed for any of the sites that are determined to be eligible for listing in the National Register. No treatment is proposed for six sites where project-related effects may be avoided. Additionally, no treatment is proposed for 17 sites that have been determined, or recommended, to be ineligible for listing in the National Register.

In its HPMP, YCWA identifies two built environment resources that are eligible for listing in the National Register that would be adversely affected by planned project activities: the New Colgate Powerhouse and the Old Colgate Diversion Dam. In the HPMP, YCWA also acknowledges that the remaining nine built environment resources in the APE may become eligible for listing in the National Register over any new license term. For this reason, in the HPMP, YCWA proposes to reevaluate these structures in 2020. Other YCWA-managed recreational areas and project facilities would be evaluated when they reach 50 years of age.

In its HPMP, YCWA does not provide any specific management for TCPs because none were identified during relicensing studies. However, YCWA states that should additional information regarding potential TCPs be identified in the future, this information would be assessed in consultation with the participating tribes, the California SHPO, and the Forest Service, as appropriate.

Our Analysis

YCWA's HPMP provides measures that are consistent with the Commission and Advisory Council's 2002 guidelines. Implementation of the HPMP would ensure that project-related effects on cultural resources would be considered and the appropriate management measures would be implemented prior to undertaking project activities. YCWA anticipates that the Commission would execute a PA with the California SHPO (if the Advisory Council declines to participate) to implement the final HPMP upon license issuance. YCWA, the tribes, and the Forest Service, would be invited to participate in the PA as consulting parties.

YCWA's HPMP was prepared in 2016. In a footnote in its application, YCWA acknowledges that subsequent changes to the project boundary, construction activities, California SHPO consultation, and information received from participating tribes will require the HPMP to be modified. YCWA stated that a revised HPMP would be filed with the Commission by the end of 2017. As noted in a footnote above, YCWA later stated that an updated HPMP would be filed by May 2018 (February 1, 2018, email from J. Lynch, HDR Inc., Sacramento, CA, to A. Mitchnick, FERC, Washington, D.C., filed

February 14, 2018). As of the date of this draft EIS, no updated HPMP has been filed.[126] A revised HPMP that includes this additional information and the additional clarifications identified below would improve the document and would need to be filed.

In its HPMP, YCWA identifies five historic sites (CA-YUB-1751H, CA-YUB-1760H, CA-YUB-1762H, CA-YUB-1768H, and CA-YUB-1770H) as ineligible for listing in the National Register but states that concurrence from the California SHPO had not yet been received. Concurrence on these recommendations was subsequently filed on October 11, 2016. Additionally, subsequent to the preparation of the draft HPMP, YCWA consulted with the California SHPO regarding the National Register evaluation of historic site CA-YUB-1736H, and the site was determined to be ineligible for listing in a letter filed on August 31, 2018. Finally, in its HPMP, YCWA recommends that the New Colgate Penstock is not eligible. In its comments on the draft EIS, YCWA stated that it plans to evaluate the penstock in the future. Inclusion in the revised HPMP of the updated National Register status of the six sites and any additional follow-up consultation with the California SHPO regarding the penstock would ensure that the HPMP captures the current National Register status of these resources.

Site CA-YUB-1733H is described in YCWA's license application as the Our House Dam access road but is described as a drainage pipe and railroad spike in YCWA's draft HPMP. In its comments on the draft EIS, YCWA clarifies that the site was originally documented as a drainage pipe and railroad spike but the description was later updated to include the addition of a segment of the historic Our House Dam Road. YCWA also found that the site is actually located in Sierra County and not in Yuba County and therefore it was assigned a new site number (CA-SIE-1849H). On April 23, 2018, the California SHPO determined that this site is ineligible for listing in the National Register. Inclusion in the revised HPMP of the new site number and description would ensure that any confusion is resolved.

As mentioned above, YCWA retained an ethnographer to prepare a supplemental ethnographic report. This report was filed with the Commission on June 22, 2018 (Blount, 2018). This report, including copies of all section 106 consultation letters pertaining to it, should be summarized in the revised HPMP.

To meet the section 106 requirements, the Commission intends to execute a PA with the California SHPO for the project for the protection of historic properties that would be affected by project construction and operation. The terms of the PA would require YCWA to implement the revised HPMP.

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[126] In a letter filed on October 3, 2018, the California SHPO states that it has consulted several times in the past with YCWA on the draft HPMP and has no comments at this time. (See letter from J. Polaco, California SHPO, to T. Konnert, West Branch Chief, dated October 3, 2018).

3.3.8 Socioeconomics

3.3.8.1 Affected Environment

The project is located in the Yuba River Basin and includes portions of Sierra, Placer, Yuba, and Nevada Counties. In addition to flood control and generating electricity from hydroelectric facilities, a primary responsibility of YCWA is to provide water for irrigation, municipal water supply, and employment support. The four above-mentioned counties have been selected to constitute the region for socioeconomic analysis because of (1) their proximity to the project area and (2) their likelihood to be influenced socially and economically by any changes in project operation. Yuba County is also included because water from the project is provided to irrigators via agreements with YCWA's eight member units.

Population, Housing, and Income

Important population centers in the region include the Yuba City Metropolitan Statistical Area in Yuba County (population: 168,684), which includes Marysville (population: 12,072); Dobbins (population: 698), in Yuba County; Camptonville (population: 172), in Yuba County; and Downieville (population: 213), in Sierra County. Outside the project area, the nearest population center is Sacramento (population: 466,488), located approximately 55 miles outside the region (U.S. Census Bureau, 2015b).

In recent years, the study area's population has grown slightly faster than the populations of California or the United States (table 3-76). Between 2010 and 2015, the population of the study area increased by a 1.2 percent compound annual growth rate, compared to 1.0 percent for the state of California and 0.8 percent for the United States. The number of households also increased at a higher rate in the study area. This continues a similar trend from 2000 to 2010.

Table 3-76. Population and household trends in the study area, California, and the United States (Source: U.S. Census Bureau, 2000, 2010a, 2010b, 2015a, 2015b).

Area	Count	2000	2010	2015
Study area	Population	404,206	509,189	541,308
	Households	152,331	195,595	202,840
California	Population	33,871,648	36,637,290	38,421,464
	Households	11,502,870	12,392,852	12,717,801
United States	Population	281,421,906	303,965,272	316,515,021
	Households	105,480,101	114,235,996	116,926,305

Approximately 202,800 housing units in the study area were occupied in 2015. Sixty-nine percent of those units were owner-occupied, which was a much higher rate compared to the state of California, where approximately 54 percent of units were owner-occupied. Yuba County had the lowest rate of owner-occupancy in the study area, where 58 percent of housing units were owner-occupied (U.S. Census Bureau, 2015c). Approximately 36,800 housing units in the study area were vacant in 2015, 10 percent of which were listed as available for rent.[127]

The median age in the four-county area was 44 in 2015, which was higher than either the median age in the state of California (35.8) or the United States (37.6).

At $74,000, the median household income in the study area was highest in Placer County in 2015. It was lowest in Sierra County at $42,800. Median household income has declined somewhat over the last 5 years, particularly in lower-income Sierra County (table 3-77). For all four counties in the study area, the compound annual growth rate of median household income from 2010 to 2015 was lower than the state average. Only Sierra County's median household income declined more than the national average over this period.

Table 3-77. Median household income for the United States, California, and the study area, 2015 (adjusted to 2015 dollars) (Source: U.S. Census Bureau, 2010a, 2015a).

Area	2010	2015	Compound Annual Growth Rate 2010–2015
United States	$56,428	$53,889	-0.9%
California	$60,883	$61,818	0.3%
Study area average	$57,831	$55,049	-1.0%
Nevada County, California	$57,121	$56,521	-0.2%
Placer County, California	$74,447	$73,948	-0.1%
Sierra County, California	$52,950	$42,833	-4.2%
Yuba County, California	$46,807	$46,892	0.0%

[127] County-level data on vacancy rates has a margin of error as high as 50 percent, and the vacancy rate and rental availability rates should be treated as a rough estimate (U.S. Census Bureau, 2015d).

Employment

Historically, gold mining was the principal driver for development and jobs in the area. The earliest prospectors in the area panned for gold and were succeeded by large-scale lode gold mining in 1853. Although gold mining still continues in the area, sand and gravel mining have played a more prominent role since 1994 (section 3.3.1, *Geology and Soils*).

Private-sector employment in the region is highly specialized in agriculture (NAICS 11) and mining (NAICS 21). In Yuba County, the location quotient for agriculture is 2.35, indicating that there are 235 percent more employees employed locally in this sector compared to employment in the same sector for the entire state of California. Among all counties in the region, Sierra County has the highest specialization in the construction sector. Yuba County has the highest specialization in the mining sector. Retail trade specialization is highest in Placer County, and specialization in accommodation and food services is highest in Sierra County (BLS, 2016).

Public-sector employment accounts for more than half of all employment in Sierra County, although the county has a relatively small employment base. By contrast, public-sector employment constitutes the smallest share of all employment in Placer County, which is the largest of the four counties in terms of total employment and population. In Yuba and Nevada Counties, public-sector employment comprises approximately 40 and 20 percent of all employment, respectively (BLS, 2016). Unemployment in each of the four counties exceeded 10 percent in the months following the Great Recession.[128] All four counties are approaching their pre-recession levels of unemployment, but have not yet reached it. Unemployment levels in both Sierra and Yuba Counties are substantially higher compared to the state of California (table 3-78).

Table 3-78. Unemployment trends in California and the study area (Source: BLS, 2017).

Area	2005	2010	2015
California	5.4%	12.1%	6.2%
Nevada County, CA	4.8%	11.7%	5.5%
Placer County, CA	4.3%	11.6%	5.0%
Sierra County, CA	8.3%	15.3%	9.0%
Yuba County, CA	9.0%	17.8%	9.2%

[128] The National Bureau of Economic Research (2017) defines the Great Recession as the period from December 2007 to June 2009.

Recreation

The primary recreation attractions in the area include both the TNF and PNF. The Forest Service manages TNF with an annual budget of approximately $20 million and 300 employees. The TNF manages public land under a policy of allowing multiple uses, including timber, mining, grazing, water access, and recreation. Recreation opportunities include 160 developed recreation sites, 1,300 miles of motorized and non-motorized trails, 6 ski areas, and water sports at a number of lakes and reservoirs. Recreation opportunities in PNF include developed recreation sites, motorized and non-motorized trails, and many lakes and reservoirs. New Bullards Bar Reservoir provides a variety of recreation activities, including watersports, houseboating, wildlife viewing, fishing, hiking, and lakeside camping. In 2012, total visitation in RDs at New Bullards Bar Reservoir sites was estimated at 60,220 overnight visitors and 56,410 day use visitors. Visitors spend money on camping fees, gas, groceries, hotels, restaurants, retail, and other items. This spending supports local sales, jobs, income, and tax revenue.

Water Allocations and Agricultural Use

Current Allocations under the Existing License and the Yuba Accord

The Yuba Accord consists of four agreements between YCWA and others to (1) increase YCWA's contribution to flows in the lower Yuba River for fishery enhancement; (2) formalize conjunctive use practices in YCWA's service area to help increase the volume of water available to increase the flows; (3) authorize YCWA to sell the water, once it is downstream, to the CALFED Environmental Water Account and others; and (4) amends the YCWA and PG&E power purchase contract (YCWA, 2017a).

YCWA started operating the project consistent with the Yuba Accord in 2006 to test the effects on environmental resources. The agreement was signed by YCWA and stakeholders in 2007. On May 20, 2008, the Water Board adopted its Corrected Order WR 2008-0014, which added the requirements of the Yuba Accord to YCWA's water-right permits. YCWA now operates the project to meet these requirements, although they were not adopted into its existing license. Annual quantities of water required to meet the minimum instream flows in typical wet and dry years are presented in table 3-79.

Table 3-79. Annual water quantities required to meet minimum instream flows (Source: YCWA, 2017c).

	Dry year annually (acre feet)	Wet year annually (acre feet)	Total (acre feet)
Existing license	180,327	175,208	355,535
Yuba Accord	422,306	546,952	969,258
Total (acre feet)	602,633	722,160	1,324,793

Current Allocations for Agricultural Use

One of YCWA's primary purposes is to provide a reliable water supply to its members. Yuba River water is supplied through direct diversion of natural flow and by storage releases from New Bullards Bar Reservoir. Article 33 of the existing license requires YCWA to maintain minimum flows in the Yuba River below Daguerre Point Dam for the entire year. Information describing the required minimum flow is presented below and in section 2.1.4, *Existing Environmental Measures*.

An end-of-September storage of 650,000 acre-feet at New Bullards Bar Reservoir would ensure adequate storage to meet full irrigation demands and dry-year flow requirements for a 99 percent exceedance drought in the following year. In the spring of each year, YCWA makes a determination of anticipated runoff into New Bullards Bar Reservoir, relying on snow course measurements and forecasts of runoff provided by California DWR. YCWA also makes estimates of water needs for local water deliveries and for releases to meet required instream flows for the current water year. Based on these forecasts, YCWA estimates the end-of-September storage requirements. If the forecasted end-of-September storage is higher than a pre-determined target (650,000 acre-feet), releases are increased above the required flows to draw reservoir storage down to the target level. The target storage is an operational measure used to drive releases in relatively wet years, and supports water releases for out-of-basin transfers under the Yuba Accord. Yuba Accord flow schedules are provided in table 3-80.

Table 3-80. Yuba Accord flow schedules (Source: YCWA, 2017a).

Schedule (Yuba Accord Water Year Type)	**Total Annual Volume (Acre-feet) at Marysville Gage**	**Annual Minimum Required Flow Below Narrows 2 Powerhouse (Acre-feet)**	**Available Water Supply North Yuba Index (Acre-feet)**
1	574,200	874,000	$\geq$1,400,000
2	429,066	729,000	$\geq$1,040,000; < 1,400,000
3	398,722	699,000	$\geq$ 920,000; < 1,040,000
4	361,944	662,000	$\geq$ 820,000; < 920,000
5	344,818	635,000	$\geq$ 693,000; < 820,000
6	232,155	532,000	$\geq$ 500,000; < 693,000

Daguerre Point Dam, located downstream of Englebright Reservoir, provides head for diversions of water for irrigation, primarily during the agricultural irrigation season between April and October. Three diversion facilities (Hallwood-Cordua Diversion, Brophy/South Yuba Diversion, and Browns Valley Irrigation District) on the impoundment upstream of the Daguerre Point Dam with a combined capacity of 1,085 cfs (460,540 acre-feet) withdraw water for this purpose. Irrigation water is diverted under YCWA's water right permits and delivered to Brophy Water District, Browns Valley Irrigation District, Cordua Irrigation District, Dry Creek Mutual Water Company, Hallwood Irrigation Company, Ramirez Water Districts, South Yuba Water District, and Wheatland Water District. In addition to YCWA water right permits, several of the member units have their own water rights. Browns Valley Irrigation District receives water at the Pumpline Diversion Facility, located 1 mile upstream from Daguerre Point Dam, which is approximately 13 miles downstream of Englebright Reservoir. Cordua Irrigation District, Hallwood Irrigation Company, and Ramirez Water District receive water through the Hallwood-Cordua Canal (North Canal), located on the north abutment of Daguerre Point Dam. Brophy Water District, South Yuba Water District, Dry Creek Mutual Water Company, and Wheatland Water District receive water through the South Yuba Canal (South Canal), located on the south side of the Yuba River slightly upstream of the south abutment of Daguerre Point Dam. Contract allocations total 436,760 acre-feet for all of the member units. Although Daguerre Dam predates the project, the storage in New Bullards Bar reservoir greatly increases the utility of the Daguerre Point Dam because water available to divert during the dry season would be limited in absence of the storage provided by the project.

Current Irrigated Farmland and Economic Productivity

In 2012, Yuba County had 795 farms. The total market value for all agricultural products sold in the county was $193.4 million, at an average of about $243,300 per farm. Total income from farm-related sources was $10.3 million. Total irrigated crop acreage in Yuba County was 82,475 (USDA, 2012), all of which is served from project operation. The top three crops of rice, walnuts, and dried plums (prunes) account for 70 percent of the county's total farmland production value. This production in turn provides more than $866,000,000 to the local economy from processing, transportation, marketing, and other farm-related services directly or indirectly tied to agriculture.

Water Transfer Revenues

Water transfers constitute an important revenue-generating component of current project operation. These transfers occur in two forms: stored water transfers made from storage releases from New Bullards Bar Dam and groundwater substitution transfers made in coordination with YCWA member units. Groundwater substitution transfers can occur in years when the state is in need of water. During these years, farmers can pump groundwater to raise crops and forgo their surface allotment to be sold. YCWA has a policy to not fallow fields, which helps to support the region's agricultural economy.

YCWA uses some revenue from these transfer for administrative fees, with the remainder given to the irrigation district, which divides the revenue among the groundwater pumping entities. In 2013 and 2014, water sales from this practice generated $60 million, $58 million of which went to groundwater pumping entities (Creasey, 2016). In the 30 years from 1987 through 2016, YCWA transferred water in 22 years, averaging about 90,950 acre-feet in each transfer year.

Flood Control

The need for flood control on the Yuba River was the principal reason for the creation of the YCWA and construction of New Bullards Bar Dam. The reduction in flood flows by the project primarily protects the urban areas of Marysville, Yuba City, and Reclamation District 784, as well as surrounding rural areas. The value of structures and contents in Yuba City and Reclamation District 784, which includes the communities of Linda and Olivehurst, totals more than $8.5 billion, and these areas have a combined population of about 110,000.

3.3.8.2 Environmental Effects

Population, Housing, and Income Effects

To provide better flood management flexibility, YCWA proposes to construct an auxiliary flood control outlet at an elevation lower than the existing New Bullards Bar Dam spillway. Construction of the proposed outlet and tunnel would require excavation in the upper left abutment area of the dam site. YCWA estimates that construction labor would be about 30 to 40 people over a 2-year construction period.

YCWA also proposes to construct a new tailwater depression system at New Colgate Powerhouse, which would enhance peak generating flexibility by allowing New Colgate Powerhouse to operate during flood flows, further enhancing YCWA's flood control operations. YCWA anticipates that the total duration of the construction of the tailwater depression system is 5 months, and the construction labor force would include about 12 people.

For the modification to the Lohman Ridge Diversion Tunnel intake, the construction labor force would be include about 8 people, and modification to Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets would require about 10 people. The work would occur for a few months in late summer when the minimum flow release from each dam is generally low and equal to inflow into the impoundment.

Our Analysis

Construction of the proposed recreation facilities, as well as the auxiliary flood control outlet, tailwater depression system, diversion tunnel intake and fish release outlets, are unlikely to have any measurable effect on population, housing, or income in Yuba County and neighboring areas. These project components would generate short-term construction jobs and potentially increase local area population temporarily by

bringing in technical experts and contractors with expertise in hydropower projects. However, because of their limited time frame and relatively low number of construction personnel, these activities would not generate a measurable increase in population in Yuba County. While additional labor would be required during the peak construction time frame for those project components, the project would not create substantial additional workforce requirements during the construction or operational phases of the project. As a result, the project would not generate increases in demand for local housing, strain public services, or contribute to social disruption that might be observed in other settings where larger scale and longer term resource development projects have occurred.

Recreation

Project operation could change opportunities for recreation by providing more flows for boaters and expanded recreation sites for day users and overnight camping.

Under proposed measure RR1, YCWA would implement the Recreation Facilities Plan and expand existing recreation facilities and develop new facilities to provide for near-term recreation growth. The measure proposes substantial expansion of and improvement to existing recreation facilities associated with the project. Under proposed measure RR3, YCWA would provide weekend boating days from October 1 to March 31 by regulating river flows to between 600 cfs and 2,000 cfs, as measured at the USGS gage 11408880 (see the schedule provided in table 3-64).

Our Analysis

Proposed measure RR1 would expand existing recreation facilities and develop new facilities to meet growing recreation demand. The proposed facilities would address existing and future demand where some recreation sites are nearing capacity. Shoreline day use facilities would be improved to allow higher use where demand is already high, but supply is limited. YCWA would improve recreation trails to provide increased connectivity between recreation sites, particularly on the PNF side of the New Bullards Bar Reservoir. The camping expansions and new facilities would meet the increased demand for large and small group camping, RV camping, and boat-in camping and enhance the facilities with modern amenities (e.g., RV hookups, showers, and flush restrooms). Boaters spend money on gas, food, and lodging during whitewater rafting activities, and the opportunities created by YCWA's proposal would create new opportunities that do not currently exist. Dollars spent by boaters would benefit local recreational outfitters, stores, and other ancillary services. Given the relatively large scale of the local economy, beneficial effects from the increased recreation opportunities resulting from the project would represent a small, positive economic benefit on the region.

Agricultural Use Effects

Changes in project flows and reservoir storage could limit total irrigation deliveries or otherwise affect YCWA's ability to provide irrigation water to its members.

For conference years, YCWA proposes to increase the minimum flows at the Marysville gage from 70 to 150 cfs between July 1 and September 30 during conference years (AR3). These higher flows would require an additional 14,598 acre-feet of water to pass the Marysville gage between July and September in conference years, an increase of about 114 percent increase for this period. While flows would be increased during these summer months, the majority of increased flows would occur in the winter months from January 16 to April 15 when minimum flows would be revised from 245 to 350 cfs. These increased flows would also only occur during conference years. It should also be noted that conference year flows would be decreased from October 1 to December 31 and from June 16 to June 30.

California DFW, FWS, Interior, BLM, NMFS, the Water Board and FWN all make recommendations based on YCWA's proposed measure AR3. California DFW (10(j) recommendation 2.5) recommends increasing the minimum instream flows. Whereas the YCWA proposes to increase the minimum flows for conference years as described above, California DFW recommends a range from 150 to 395 cfs at the Marysville gage during conference years as well as increased flows between March 23 and May 31 in six of the seven water year types. FWS 10(j) recommendation 1 and BLM 10(a) recommendation 7 contain the same proposed changes to the lower Yuba River minimum flow requirements in response to YCWA's proposed measure AR3 (YCWA, 2017c).

Our Analysis

YCWA diverts 436,760 acre-feet per year to eight member irrigation units. Annual unimpaired flow at the Smartsville gage at RM 23.9, which is just downstream of Englebright Dam, has ranged from a maximum of approximately 4,700,000 acre-feet in 1995 to a minimum of approximately 360,000 acre-feet in 1977. This lowest annual flow of 360,000 acre-feet is 76,000 acre-feet less than the total of 436,760 acre-feet per year of water that is currently diverted to YCWA's eight member units. Increased minimum flow requirements resulting from YCWA's proposed measure AR3 would increase the total volume of water required to flow past the Marysville gage during conference years from the 174,208 acre-feet required to meet the Yuba Accord conference year requirements to a new total of 197,445 acre-feet. The new proposed requirements would result in an additional 23,237 acre-feet of water being required to flow past the Marysville gage during conference years, which YCWA estimates would occur about 1 percent of the time. These higher flows during conference years would not severely limit total irrigation deliveries or affect YCWA's ability provide late-season irrigation water to its members during dry years.

YCWA also maintains conjunctive use agreements that include a provision for YCWA to pay groundwater pumping costs to member units that need to pump groundwater to replace shortages in surface water deliveries. Between 1987 and 2016, YCWA conducted more than 35 transfers with an average of 90,950 acre-feet each transfer year. These groundwater substitution transfers have occurred during dry and critical years, and have ranged from 26,033 acre-feet (in 1994) to 88,901 acre-feet (in 2009), indicating that an adequate amount of groundwater could be brought online should it be required to supplement surface water irrigation deliveries in dry years.

It should also be noted that YCWA can elect to modify its carryover storage targets for New Bullards Bar Reservoir. Even over prolonged dry years, the amount of irrigation water required would not approach the total usable capacity. New Bullards Bar Reservoir has a gross storage capacity of approximately 966,103 acre-feet with a minimum pool of approximately 230,000 acre-feet, leaving approximately 736,103 acre-feet of usable capacity available for project operation. A portion of the usable capacity, 170,000 acre-feet, must be available for flood management from November 1 through March 31, while the full pool of the reservoir is available for storage and generation between June 1 and September 15. Exercising the option of modifying carryover storage would potentially mitigate effects on irrigators from the proposed flow regime, resulting in virtually no effect on local irrigation deliveries should YCWA elect to do so.

If YCWA were to adopt California DFW's 10(j) recommendation 2.5, which recommends increased minimum flows below Englebright Reservoir, effects on agricultural productivity could be larger than those described above. Whereas YCWA proposes to increase the minimum flows at the Marysville gage from 70 to 150 cfs (AR3), California DFW (10(j) recommendation 2.5) recommends a range from 150 to 395 cfs at the Marysville gage during conference years as well as substantially increased minimum flows between March 23 and May 31 in six of the seven water year types.

Such increases in instream flow requirements could result in water delivery shortages to local farmers in some wetter water years and would significantly reduce the water supply reliability for farmers and farm operations in some years. Water balance/operations modeling results for the California DFW recommendation show irrigation diversion shortages in two of the years when these recommended flows would occur, and additional diversion shortages would occur if the Narrows 1 Powerhouse were not available. In two of the simulated years, when 3,500 cfs would be required in April, all diversions in the last week of the month would have to cease for YCWA to comply with the agency's recommendation. This type of shortage would occur in 5 additional schedule 1 years and in 7 of 19 schedule 1 years in the period of simulation (YCWA, 2017c).

The economic effect of these delivery shortages would be in the form of increased costs incurred by YCWA and local farmers to pay for groundwater pumping as a substitute supply to avoid farm production losses incurred during periodic drought

conditions. In the recent drought of 2015, YCWA reimbursed member units at the rate of $35/acre-foot for groundwater pumping to make up for surface water delivery shortages. If irrigation shortages occurred in dry water years, a $35/acre-foot cost would be incurred by YCWA up to the contractually obligated limits of YCWA's agreements with member units. Any additional irrigation groundwater pumping costs beyond $35/acre-foot required by farmers to withdraw water up would be borne by individual farmers or member units.

Assuming 2 acre-feet of water are required to irrigate 1 acre of land, the volume of water shortfall would affect about 11,619 acres of irrigated agricultural land, representing 14 percent of the total irrigated farmland acreage currently served from operations of the project. Assuming an annual economic output per irrigated acre in Yuba County of $2,154.62, lost agricultural productivity from irrigation shortages could potentially affect $25 million worth of agricultural commodities in Yuba County. It is likely, however, that farms would not curtail farming given the option of pumping groundwater to make up for these losses. If YCWA reimbursed up to $35/acre-foot for groundwater pumping as a substitute supply to avoid farm production losses, the resulting reimbursement groundwater pumping costs incurred to YCWA would be $70 per acre or $813,295 county-wide.

Flood Control Effects on Downstream Property Owners

Under proposed measure WR6, YCWA would operate New Bullards Bar Reservoir for flood control. Further, YCWA would incorporate an auxiliary flood control outlet at New Bullards Bar Dam and a new tailwater depression system at New Colgate Powerhouse. Currently, New Bullards Bar Reservoir has mandatory reserved flood storage space criteria from mid-September through the end of May.

Our Analysis

YCWA's proposal would continue valuable flood protection and also enhance it with the addition of the new auxiliary flood control outlet at New Bullards Bar Dam and new tailwater depression system at New Colgate Powerhouse. The auxiliary flood control outlet would increase operational flexibility during storm events, which would result in lower flood stages downstream and provide flood system resiliency. The project would provide essential flood management by reducing the peak flood flow and protecting residents and agricultural lands downstream, resulting in continuing beneficial effects on regional economic productivity though enhanced flood control measures. YCWA would continue to operate New Bullards Bar Dam for the purpose of flood protection, with direct economic benefits on agricultural producers downstream whose industry relies on irrigation and flood protection provided by YCWA. These continuing economic benefits would accrue to the local and regional economy for the foreseeable future.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative the project would continue to operate as it has in the past. None of the licensee's proposed measures or the resource agencies' recommendations and mandatory conditions would be required. None of the staff-recommended measures would be implemented, including measures to enhance environmental conditions for fish and wildlife within the project, measures to improve flow conditions downstream of the project for salmonid fish, and measures that would expand and improve recreation opportunities.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Yuba River Development Project's use of the Yuba River, Middle Yuba River, North Yuba River, and Oregon Creek, a tributary to the Middle Yuba River 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.*,[129] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using the 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 EIS 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.

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

As currently operated, the Yuba River Development Project has an authorized installed capacity of 361.9 MW and generates an average of 1,402,250 MWh annually (based on operation model results).

Table 4-1 summarizes the assumptions and economic information we use in our analysis. This information was provided by YCWA in its license application. We find that the values provided by YCWA are reasonable for the purposes of our analysis.

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[129] 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.

Cost items common to all alternatives include: taxes and insurance costs; net investment (the total investment in power plant facilities remaining to be depreciated); estimated future capital investment required to maintain and extend the life of plant equipment and facilities; relicensing costs; normal operation and maintenance cost; and Commission fees.

Table 4-1. Parameters for the economic analysis of the Yuba River Development Project (Source: YCWA, 2017a).

Parameter	Value
Period of analysis (years)	30
Term of financing (years)	20
Federal, state and local taxes	Exempt
Net investment, $[a]	435,000,000
Relicensing cost, $[b]	38,492,230
Operation and maintenance, current, $/year[c]	21,651,730
Operation and maintenance, future, $/year[d]	22,921,450
Commission fees, $/year[e]	747,020
Commission fees, $/year[f]	632,840
Energy value ($/MWh) (no action and proposed)[g]	32.60
Ancillary services value ($/MWh) (no action)[g]	3.64
Ancillary services value ($/MWh) (proposed)[g]	3.85
Capacity value ($/MW-year)[h]	0
Interest rate (percent)[i]	2
Discount rate (percent)[i]	5

[a] Net investment is the depreciated project investment allocated to power purposes. Value provided by licensee in 2016 dollars was updated to January 2018 by staff.

[b] Relicensing costs include the administrative, legal/study, and other expenses to date. Value provided by licensee in 2016 dollars was updated to January 2018 by staff.

[c] Existing plant operation and maintenance includes operation and maintenance related to environmental measures associated with the current license. Value provided by licensee in 2016 dollars was updated to January 2018 by staff.

[d] Existing plant operation and maintenance includes operation and maintenance. Value provided by licensee in 2016 dollars was updated to January 2018 by staff. Value does not include operation and maintenance for proposed environmental measures.

[e] Commission fees are based on statements of annual charges received from the Commission for use of federal lands and administrative charges based on authorized capacity. Value shown provided by licensee based on recent fees.

[f] Commission fees estimated for first year of new license by staff.

[g] Amended application, exhibit D, table 7.0-1.

[h] Due to uncertainties in the current capacity market, the licensee was unable to assign a value for capacity to the project.

[i] Amended application, exhibit D, table 2.1-1

We discuss the effects of proposed operational changes on power benefits in section 4.2.2.

4.2 COMPARISON OF ALTERNATIVES

Table 4-2 compares the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this draft EIS: no action, YCWA's proposal, the staff alternative, and staff alternative with mandatory conditions.

Table 4-2. Summary of the annual cost of alternative power and annual project cost for the alternatives for the Yuba River Development Project (Source: staff).

	No Action	**YCWA's Proposal**	**Staff Alternative**	**Staff Alternative with Mandatory Conditions**
Installed capacity (MW)	361.9	361.9	361.9	361.9
Annual generation (MWh)	1,418,044	1,374,003	1,374,003	1,374,003
Dependable capacity (kW)	230,259	230,310	230,310	230,310
Annual cost of alternative power	$51,389,910	$50,082,410	$50,082,410	$50,082,410
($/MWh)	36.24	36.45	36.45	36.45

	No Action	YCWA's Proposal	Staff Alternative	Staff Alternative with Mandatory Conditions
Annual project cost ($/MWh)	$47,047,690 33.18	$62,411,700 45.42	$62,759,350 45.68	$64,898,870 47.23
Difference between the cost of alternative power and project cost ($/MWh)	$4,342,220 3.06	($12,329,290)[a] (8.97)	($12,676,940)[a] (9.23)	($14,816,460)[a] (10.78)

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

4.2.1 No-action Alternative

Under the no-action alternative, the project would continue to operate as it does now. The project has an authorized capacity of 361.9 MW, a dependable capacity of 230,259 kW, and generates an average of 1,418,044 MWh of electricity annually. The average annual project cost is about $51,389,910, or $36.24/MWh. When we add the energy value and ancillary services value for the project, the total value of the project's power is $$47,047,690, or $33.18/MWh in 2017 dollars. To determine whether the proposed project is currently economically beneficial, we subtract the project's cost from the value of the project's power. Therefore, the project costs $4,342,220, or $3.06/MWh, less than the likely alternative.

4.2.2 Applicant's Proposal

YCWA's proposed project environmental measures are listed in section 4.3, table 4-3.

As proposed, the project would have an authorized capacity of 361.9 MW, a dependable capacity of 230,310 kW, and would generate an average of 1,374,003 MWh of energy annually. When we add the energy value and ancillary services value for the project, the total value of the project's power is $50,082,410, or $36.45/MWh in 2017 dollars. As proposed by YCWA, the annual cost of operating the project is $62,411,700, or $45.42/MWh. To determine whether the proposed project is economically beneficial, we subtract the project's cost from the total value of the project's power. The result is that in the first year of continued operation, the project would cost $12,329,290, or $8.97/MWh, more than the likely alternative.

4.2.3 Staff Alternative

Section 4.3, table 4-3 also shows the staff-recommended measures, including additions, deletions, and modifications to YCWA's proposed environmental protection and enhancement measures, and the estimated cost of each.

As recommended by staff, the project would have an authorized capacity of 361.9 MW, a dependable capacity of 230,310 kW, and would generate an average of 1,374,003 MWh of energy annually. When we add the energy value and ancillary services value for the project, the total value of the project's power would be $50,082,410, or $36.45/MWh in 2017 dollars. As recommended by staff, the annual cost of operating the project would be $62,759,350, or $45.68/MWh. To determine whether the proposed project is economically beneficial, we subtract the project's cost from the total value of the project's power. The result is that in the first year of continued operation, the project would cost $12,676,940, or $9.23/MWh, more than the likely alternative.

4.2.4 Staff Alternative with Mandatory Conditions

Section 4.3, table 4-3 also shows the staff-recommended measures, including additions, deletions, and modifications to YCWA's proposed environmental protection and enhancement measures, taking into consideration the mandatory conditions for the project and the estimated cost of each.

As recommended by staff with mandatory conditions, the project would have an authorized capacity of 361.9 MW, a dependable capacity of 230,310 kW, and would generate an average of 1,374,003 MWh of energy annually. When we add the energy value and ancillary services value for the project, the total value of the project's power would be $50,082,410, or $36.45/MWh in 2017 dollars. As recommended by staff with mandatory conditions, the annual cost of operating the project would be $64,898,870, or $47.23/MWh. To determine whether the proposed project is economically beneficial, we subtract the project's cost from the total value of the project's power. The result is that in the first year of continued operation, the project would cost $14,816,460, or $10.78/MWh, more than the likely alternative.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 4-3 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 4-3. Cost of proposed and recommended measures for the Yuba River Development Project (Source: staff).

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
General				
1. GEN1 Organize ecological group and host meetings.	YCWA, Forest Service (4(e) condition 2), Water Board (preliminary 401 condition 26), FWS, California DFW (10(j) recommendation 1.1), FWN	$0	$26,120	$26,120
2. GEN2 Annual review of special-status species lists and assessment of new species on NFS lands.	YCWA, Forest Service (4(e) condition 30), Water Board (preliminary 401 condition 29)	$0	$16,960	$16,960
3. Annual review of special-status species lists and assessment of new species on Forest Service lands.	California DFW (10(j) recommendation 1.2), FWN	$0	$500[d]	$500
4. Special-status species protection, mitigation, and consultation.	NMFS (10(j) recommendation 7)	$0	$500[d]	$500
5. Consult with FWS on effects on ESA listed species.	FWS (10(j) recommendation 6)	$0	$500[d]	$500

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
6. Recovery of special-status aquatic species in the lower Yuba River.	Forest Service (10(a) recommendation 6)	$0	$0[e]	$0
7. GEN3 Provide environmental training to employees.	YCWA, Forest Service (4(e) condition 28), Water Board (preliminary 401 condition 27), FWS, California DFW (10(j) recommendation 1.3), FWN	$0	$7,750	$7,750
8. GEN4 Develop and implement a coordinated operations plan for the Yuba River Development Project and the Narrows Project.	YCWA, Water Board (preliminary 401 condition 28), FWS, California DFW (10(j) recommendation 2.8), FWN	$0	$11,670	$11,670
9. Install New Colgate Powerhouse tailwater depression system.	YCWA, staff	$14,789,990	$0	$769,930
10. Install New Bullards Bar Dam auxiliary flood control outlet.	YCWA, staff	$162,628,870	$0	$8,466,090

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
Geology and Soils				
1. GS1 Implement the proposed Erosion and Sediment Control Plan.	YCWA, Forest Service (4(e) condition 52), Water Board (preliminary 401 condition 24), FWS, California DFW (10(j) recommendation 2.16), FWN, staff	$0	$0[f]	$0
2. GS2 Implement the proposed Log Cabin and Our House Diversion Dams Sediment Management Plan.	YCWA, Forest Service (4(e) condition 37), Water Board (preliminary 401 condition 12), FWS, California DFW (10(j) recommendation 2.17), FWN, staff	$332,560	$43,010	$60,320
3. GS3 Pass large woody debris at Our House and Log Cabin Diversion Dams.	YCWA, Forest Service (4(e) condition 38), Water Board (preliminary 401 condition 11), California DFW (10(j) recommendation 2.18, staff	$801,350	$215,100	$256,820

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
4. Modify GS3 to include rapid removal of LWM from New Bullards Bar Reservoir to control bullfrogs (measure included in revised GS3).	FWN (IX)	$0	$0[g]	$0
5. Develop a LWM and sediment enhancement management plan for the North Yuba River.	Forest Service (10(a) recommendation 5), Water Board (preliminary 401 condition 11 & 12), FWS (10(j) recommendation 9), BLM (10(a) recommendation 3), California DFW (10(j) recommendation 2.19), FWN (VIII)	$0	$722,100[h]	$722,100
6. Implement LWM augmentation program.	NMFS (10(j) recommendation 3)	$0	$722,100[h]	$722,100
7. Develop and implement a LWM enhancement plan for the lower Yuba River.	Staff	$30,000[i]	$100,000[i]	$101,560

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
8. Develop shot rock removal and stabilization and gravel augmentation plan for the Englebright Dam Reach.	Water Board (preliminary 401 condition 3), FWN (XI)	$0[j]	$0[j]	$0
Water Resources				
1. WR1 Implement the proposed Hazardous Materials Management Plan.	YCWA, Forest Service (4(e) condition 21 and 10(a) recommendation 7), Water Board (preliminary 401 condition 25), California DFW (10(j) recommendation 1.4), FWN, staff	$0	$0[k]	$0

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
2. Modify the proposed Hazardous Materials Management Plan to: (1) include specifications for primary and secondary containment of hazardous materials; (2) include protocol used for addressing spills; (3) provide an appropriate time limit to access cleanup materials from project facilities on non-NFS lands; and (4) add FWS's FERC Coordinator to the notification contact list.	Staff, FWS (10(j) recommendation 6), YCWA	$5,000	$0	$260

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
3. WR2 Determine water year types for conditions pertaining to the Our House Diversion Dam, Log Cabin Diversion Dam, and the New Bullards Bar Dam.	YCWA, Forest Service (4(e) condition 31 and 10(a) recommendation 1, Water Board (preliminary 401 condition 4, FWS, California DFW (10(j) recommendation 2.1), FWN, staff	$0	$1,020	$1,020
4. WR3 Determine water year types for conditions pertaining to the Narrows 2 Powerhouse and Narrows 2 full bypass, but without changing water year type based on the Bulletin 120 February 1 forecast.	YCWA, FWS, California DFW, staff	$0	$1,020	$1,020
5. Implement spring snowmelt pulse flow and recession.	NMFS (10(j) recommendation 1)	$0	$1.5M to $40M[h]	$1.5M to $40M

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
6. WR4 Implement the proposed Streamflow and Reservoir Level Compliance Monitoring Plan.	YCWA, Forest Service (4(e) condition 36 and 10(a) recommendation 4), Water Board (preliminary 401 condition 6), FWS, California DFW (10(j) recommendation 2.14), FWN, staff	$1,321,010	$10,230	$79,000
7. WR5 Maintain the New Bullards Bar Reservoir minimum pool.	YCWA, FWN, staff	$0	$0[f]	$0
8. WR6 Operate the New Bullards Bar Reservoir for flood control.	YCWA, FWN, staff	$0	$10,230	$10,230
9. WR7 Implement the proposed Water Temperature Monitoring Plan.	YCWA, Forest Service (4(e) condition 44 and 10(a) recommendation 14), Water Board (preliminary 401 condition 14), FWS, California DFW (10(j) recommendation 2.24), FWN	$33,450	$44,820	$46,560

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
10. WR8 Implement the proposed Water Quality Monitoring Plan.	YCWA, Forest Service (4(e) condition 45 and 10(a) recommendation 15), Water Board (preliminary 401 condition 13), FWS, California DFW (10(j) recommendation 2.25), FWN	$8,370	$31,900	$32,330
11. WR9 Implement the proposed Drought Management Plan.	YCWA	$0	$1,560	$1,560
12. Modify WR9 to develop a drought definition that is relevant to the Yuba River Watershed and use a trigger only for extreme drought conditions.	Forest Service (4(e) condition 54), Water Board (preliminary 401 condition 23), FWS (10(j) recommendation 14), BLM (10(a) recommendation 6), California DFW (10(j) recommendation 2.15), FWN (IV), staff	$0	$1,630[h]	$1,630

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
13. Use the upper intake for New Colgate Powerhouse in March, April, and May and consult with the ecological group to determine which intake to use each month in June through September.	Water Board (preliminary 401 condition 8, FWS (10(j) recommendation 13), California DFW (10(j) recommendation 2.7)	$0	$1,125,650[h]	$1,125,650
14. Forecasted target flow and flow ramping information.	FWN (XIV)	$0	$30,000[h]	$30,000
Aquatic Resources				
1. AR1 Maintain minimum streamflows below Our House and Log Cabin Diversion Dams.	YCWA, Forest Service (4(e) condition 32), Water Board (preliminary 401 condition 1), FWS, California DFW (10(j) recommendation 2.3), FWN, staff	$2,496,540	$7,370	$137,330
2. AR2 Control project spills at Our House Diversion Dam.	YCWA, Forest Service (4(e) condition 33), Water Board (preliminary 401 condition 5), California DFW (10(j) recommendation 2.9), staff	$0	$1,490	$1,490

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
3. AR3 Maintain minimum streamflows at Narrows 2 Powerhouse and Narrows 2 full bypass.	YCWA, staff	$0	$12,280	$12,280
4. Maintain minimum streamflow in lower Yuba River to conserve salmonid and ecosystem function.	FWS (10(j) recommendation 1), BLM (10(a) recommendation 7), California DFW (10(j) recommendation 2.5), FWN (I)	$0	$375,740[l]	$375,740
5. Maintain summer water temperatures in the lower Yuba River in schedule 6 years.	FWS (10(j) recommendation 2), BLM (10(a) recommendation 8), NMFS (10(j) recommendation 2), California DFW (10(j) recommendation 2.6), staff	$0	$0[m]	$0
6. AR4 Control project spills at New Bullards Bar Dam.	YCWA, Forest Service (10(a) recommendation 3), Water Board (preliminary 401 condition 5), California DFW (10(j) recommendation 2.11), FWN, staff	$0	$0[f]	$0

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
7. Revise AR4 – spills at New Bullards Bar Dam.	FWS (10(j) recommendation 12)	$0	$0[g]	$0
8. AR5 Implement the proposed Aquatic Invasive Species Management Plan.	YCWA, Forest Service (4(e) condition 39 and 10(a) recommendation 8), Water Board (preliminary 401 condition 18), California DFW (10(j) recommendation 2.20), FWN, staff	$34,040	$25,240	$27,010
9. Revise AR5 – Aquatic Invasive Species Management Plan to include bullfrog monitoring and suppression.	FWS	$0	$11,710[n]	$11,710
10. Revise AR5 to add monitoring for Asian clams at Cottage Creek, Dark Day Boat Launch, and Emerald Cove.	Staff	$0	$5,000[o]	$5,000

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
11. AR6 Implement the proposed New Bullards Bar Reservoir Fish Stocking Plan.	YCWA, Forest Service (10(a) recommendation 19), Water Board (preliminary 401 condition 20), California DFW (10(j) recommendation 2.21), FWN, staff	$0	$17,650	$17,650
12. Modify AR6 to include annual consultation with California DFW to determine species of fish appropriate for stocking.	Staff	$0	$0[g]	$0
13. Implement a spring-run chinook stocking plan for New Bullards Bar Reservoir.	FWS	$0	$17,650	$17,650
14. AR7 Implement the proposed Upper Yuba River Aquatic Monitoring Plan.	YCWA, Forest Service (4(e) condition 43 and 10(a) recommendation 13), Water Board (preliminary 401 condition 15), FWS, California DFW (10(j) recommendation 2.23), FWN	$0	$181,310	$181,310

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
15. Revise AR7 – Upper Yuba River Aquatic Monitoring Plan.	FWS	$0	$0[e]	$0
16. AR8 Implement the proposed Lower Yuba River Aquatic Monitoring Plan.	YCWA, Water Board (preliminary 401 condition 16, FWS, California DFW (10(j) recommendation 2.26), FWN	$0	$446,890	$446,890
17. Revise AR8 to include only LWM monitoring, screw trap monitoring, and monitoring of interactions of anadromous fish with Narrows 2 facilities.	Staff	$20,000[p]	$51,870[p]	$52,910
18. Anadromous fish monitoring (NMFS 10(j) 6).	NMFS	$0	$173,960[h]	$173,960
19. AR9 Control project ramping and flow fluctuation downstream of Englebright Dam.	YCWA, Water Board (preliminary 401 condition 2), staff	$0	$79,820	$79,820

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
20. Revise AR9 – Project ramping and flow fluctuations downstream of Englebright Dam.	BLM (10(a) recommendation 8)	$0	$80,000[q]	$80,000
21. Control project ramping downstream of Englebright Dam to support riparian seeding survival.	BLM (10(a) recommendation 5)	$0	$80,000[q]	$80,000
22. Develop and implement a Narrows Reach fish stranding prevention plan.	Water Board (preliminary 401 condition 17), FWS (10(j) recommendation 4), California DFW (10(j) recommendation 2.27), FWN (X), staff	$10,000[r]	$0	$520
23. Develop a Narrows Reach fish stranding prevention plan.	NMFS (10(j) recommendation 5)	$10,000[r]	$0	$520
24. AR10 Maintain minimum streamflow below New Bullards Bar Dam.	YCWA	$0	$0[f]	$0

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
25. Revise AR10 – Minimum streamflow below New Bullards Bar Dam.	Forest Service (10(a) recommendation 2), FWS (10(j) recommendation 11), BLM (10(a) recommendation 10), California DFW (10(j) recommendation 2.4), FWN (VII)	$255,830[h]	$563,040[h]	$576,360
26. Revise AR10 – Minimum streamflows below New Bullards Bar dam.	Water Board (preliminary 401 condition 1)	$0	$0[s]	$0
27. Revise AR10 – Minimum streamflows below New Bullards Bar dam – use YCWA flows in October through May and agency flow recommendations in June through September.	Staff	$255,830[t]	$226,790[t]	$240,110

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
28. AR11 Periodically close Lohman Ridge Diversion Tunnel, includes capital cost to modify the tunnel intake.	YCWA, Forest Service (4(e) condition 35), staff	$5,397,570	$14,120	$295,110
29. Revise AR11 – Close Lohman Ridge diversion tunnel.	FWS (10(j) recommendation 10), California DFW (10(j) recommendation 2.13), FWN (XII)	$0	$457,090[h]	$457,090
30. AR12 Control project spills at Log Cabin Diversion Dam.	YCWA, Forest Service (4(e) condition 34), Water Board (preliminary 401 condition 5), FWS, California DFW (10(j) recommendation 2.10), FWN, staff	$0	$450	$450
31. Reservation of section 10(j) fish passage authority).	California DFW (10(j) recommendation 2.30)	$0	$0[g]	$0
32. Fish passage.	FWN (III)	$0	$0[u]	$0

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
33. Restore and enhance juvenile salmonid rearing habitat in the lower Yuba River.	FWS (10(j) recommendation 3), BLM (10(a) recommendation 4), California DFW (10(j) recommendation 2.29), FWN (II)	$0	$2,327,500[v]	$2,375,500
34. Mitigate for loss of floodplain resulting from operations of the proposed flood control outlet.	FWS (10(j) recommendation 15)	$0	--[w]	--
35. Develop and implement physical habitat improvement projects for juvenile salmonid rearing.	NMFS (10(j) recommendation 4)	$0	$2,327,500[v]	$2,327,500
36. Report unplanned flow reductions in a timely manner.	FWS (10(j) recommendation 5), California DFW (10(j) recommendation 2.28), staff	$0	$0[g]	$0
37. Develop a sensitive amphibians management plan.	FWS (10(j) recommendation 8)	$10,000[r]	$0	$520

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
38. Comply with NMFS Recovery Plan recovery plan for the evolutionarily significant units of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the DPS of California Central Valley steelhead.	FWS (10(a) recommendation 1)	$0	$0[g]	$0
39. Support actions as identified by the Anadromous Fish Restoration Program's Final Restoration Plan.	FWS (10(a) recommendation 2)	$0	$0[g]	$0
40. Restoration plan.	Water Board (preliminary 401 condition 3)	$0[e]	$0	$0
41. Our House and Log Cabin Diversion Dam mitigation plan.	Water Board (preliminary 401 condition 10)	$0[e]	$0	$0

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
42. Placeholder for future action for the Corps' Yuba River Ecosystem Restoration Program.	Friends of the River et al.	$0	$0[g]	$0
Terrestrial Resources				
1. TR1 Implement the proposed Integrated Vegetation Management Plan.	YCWA, Forest Service (4(e) condition 10 and 10(a) recommendation 9), California DFW (10(j) recommendation 3.1), staff	$0	$60,700	$60,700
2. Modify TR1 plan to extend measures related to treatment of non-native invasive plants, revegetation, and pesticide use to all areas in the project boundary and to protect sensitive amphibians and include pre-disturbance surveys for elderberry.	Staff	$0	$24,300[x]	$24,300

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
3. TR2 Implement the proposed Bald Eagle and American Peregrine Falcon Management Plan.	YCWA, Forest Service (4(e) condition 41 and 10(a) recommendation 10), Water Board (preliminary 401 condition 19), California DFW (10(j) recommendation 3.2), staff	$0	$25,050	$25,050
4. Modify TR2 to include additional surveys for a new eyrie below New Bullards Bar Dam in years 1-3.	Staff	$0	$590[y]	$590
5. TR3 Implement the proposed Ringtail Management Plan.	YCWA, Forest Service (10(a) recommendation 12), FWS, California DFW (10(j) recommendation 3.4), staff	$0	$3,150	$3,150
6. TR4 Implement the proposed Bat Management Plan.	YCWA, Forest Service (4(e) condition 42 and 10(a) recommendation 11), FWS, California DFW (10(j) recommendation 3.3), staff	$15,610	$2,050	$2,860

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
7. Monitor water temperature in Oregon Creek and Middle Yuba River to protect foothill yellow-legged frog.	YCWA, Forest Service (4(e) condition 44 and 10(a) recommendation 14), Water Board (preliminary 401 condition 14), FWS, California DFW (10(j) recommendation 2.24), FWN, staff	$0	$1,030[z]	$1,030
8. Ensure procedures for decontaminating field equipment to prevent spread of aquatic pests and disease between waterbodies, as described in the Upper Yuba Aquatic Monitoring Plan, are applied to all activities where equipment is transported from one body of water to another.	FWS, staff	$0	$0	$0
9. Develop a lower Yuba River riparian restoration plan to revegetate 100 acres of floodplain habitat	Staff	$10,000[aa]	$246,060[aa]	$246,580

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
below Englebright Dam with plantings every 7 years starting in year 5.				
Recreation Resources				
1. RR1 Implement the updated Recreation Facilities Plan, filed on September 19, 2018.	YCWA, Forest Service (4(e) condition 46 and 10(a) recommendation 16), FWN, staff	$25,653,040	$832,950	$2,168,390
2. RR2 Provide recreation flow information and forecasts.	YCWA, Forest Service (4(e) condition 47 and 10(a) recommendation 18), FWS, FWN (XIII), staff	$0	$5,120	$5,120
3. RR3 Provide whitewater boating flows below Our House Diversion Dam.	YCWA, Forest Service (4(e) condition 48), Water Board (preliminary 401 condition 21), FWS, FWN, staff	$0	$1,800	$1,800
4. Ensure adequate operation and maintenance funding for Oregon Creek Day Use Area.	FWN (XIII)	$0	$5,500[bb]	$5,500

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
5. Provide public vehicular access, parking, and a pedestrian access trail between the parking area and the river below New Bullards Bar Dam.	Forest Service (10(a) recommendation 17), Water Board (preliminary 401 condition 22), National Park Service (10(a) recommendation 14), California DFW (10(j) recommendation 2.22), FWN (XIII)	$750,000[cc]	$20,000	$59,040
6. Daguerre Point dam portage trail.	BLM (10(a) recommendation 11)	$0	$10,230[h]	$10,230
7. Hammon Grove take-out.	BLM (10(a) recommendation 12)	$0	$4,090[h]	$4,090
8. Sign plan.	BLM (10(a) recommendation 13)	$0	$2,560[h]	$2,560
9. Allow up to 120 houseboats with a maximum size of 18 feet wide by 70 feet long on New Bullards Bar Reservoir.	Emerald Cove Marina	$0	$0[g]	$0

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
Land Use				
1. LU1 Implement the proposed Transportation System Management Plan.	YCWA, Forest Service (4(e) condition 51 and 10(a) recommendation 21), staff	$0	$834,490	$834,490
2. LU2 Implement the proposed Fire Prevention and Response Plan.	YCWA, Forest Service (4(e) condition 53), staff	$0	$930	$930
3. Revise LU2 – Fire Prevention and Response Plan.	FWS	$0	$0[g]	$0
Aesthetic Resources				
1. VR1 Implement the proposed Visual Resource Management Plan.	YCWA, Forest Service (4(e) condition 49), FWS, staff	$0	$113,140	$113,140
Cultural Resources				
1. CR1 Implement the proposed HPMP.	YCWA, Forest Service (4(e) condition 50 and 10(a) recommendation 20), staff	$0	$0	$260
2. CR1 Implement a revised HPMP Plan	Staff	$5,000	$0	$260

Enhancement/Mitigation Measures	Entities	Capital Cost[a,c] (Jan 2018$)	Annual Cost[b,c] (Jan 2018$)	Levelized Annual Cost (Jan 2018$)
that includes: (a) cultural resources information and consultation results developed after preparation of the 2016 draft HPMP; (b) updated determinations of National Register eligibility of six historic sites (CA-YUB-1751H, CA-YUB-1760H, CA-YUB-1762H, CA-YUB-1768H, CA-YUB-1770H, and CA-YUB-1736H) and the New Colgate Penstock; (c) clarification of the description of site CA-YUB-1733H, and (d) the results of YCWA's supplemental TCP report.				

[a] Costs were provided by YCWA in its amended license application filed on June 5, 2017, 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 the cost to implement the measure to be $500/year for an annual review of the list.

[e] Staff considers the available information to be insufficient to develop a cost estimate for the measure.

[f] YCWA states that there would be no additional cost to implement the measure.

[g] Staff determined that there would be no additional cost to implement the measure.

[h] YCWA estimated a cost in its ready for environmental analysis notice reply comments filed October 10, 2017.

[i] Cost estimated by staff includes $30,000 for plan development, and annual cost of $10,000 per truckload of LWM, delivered to the river 10 times per year.

[j] Staff concludes that there would be no cost required for this measure because it is already addressed by the Corps' placement of salmonid spawning-sized gravel to the reach.

[k] YCWA states that the cost to implement the measure would be covered by routine operation and maintenance.

[l] The cost provided by YCWA includes the projected average annual energy losses but does not include potentially significant water transfer losses that could occur, which YCWA states would have been $2,500,000 in 2013 and $40,000,000 in 2014.

[m] Staff estimates that the additional 12 cfs would have a negligible effect on annual generation.

[n] Staff estimates $24,000 every other year to implement the measure.

[o] Cost estimated by staff includes $5,000 per year for monitoring of Asian clam.

[p] Cost estimated by staff includes $20,000 for plan revisions, $19,000 per year in year 3, 10, 20, and 30 for monitoring of LWM, $250,000 per year in years 1–3 for screw trap monitoring, and $5,000 per year in years 1 through 30 for monitoring of interactions of anadromous fish with Narrows 2 facilities.

[q] Staff estimates the cost for this measure to be comparable to the cost for proposed measure AR9.

[r] Staff estimates a cost of $10,000 to modify the plan.

[s] Staff could not estimate a cost because no flows were specified.

[t] Staff estimated additional energy losses of 7,620 MWh/year beyond what was proposed to provide the additional minimum flows, compared to an additional 20,830 MWh/year for the agencies' recommendation.

[u] Staff did not estimate a cost for this measure because it is not a project structure.

[v] Staff assumes a cost of $75,000 per acre for riparian planting (251 acres) and $150,000 per acre for riparian planting with floodplain lowering (340 acres).

[w] Cost included in previous measure (aquatics measure #32).

[x] Cost estimated by staff includes $24,300 per year to implement the measure.

[y] Staff estimates the cost to be $3,300 per year in years 1–3.

[z] Staff estimates cost to be $5,800 in years 1–3.

[aa] Staff estimates the cost to include $10,000 to develop a plan and $1,875,000 each for four plantings in years 5, 12, 17, and 26.

[bb] Staff estimates $5,500/year to implement the measure (this would be handled as an off-license measure).

[cc] Staff estimates $750,000 to provide road improvements and $20,000 for annual maintenance.

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 relicensing the Yuba River Development Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we selected the staff alternative as the preferred alternative. We recommend this alternative because: (1) issuing a new license for the project would allow YCWA to operate the project as an economically beneficial and dependable source of electrical energy; (2) the 361.9 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; (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 and improve recreation opportunities at the project.

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

5.1.1 Measures Proposed by the Yuba County Water Agency

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

General[130]

- ~~Organize an ecological group comprising various stakeholders and host meetings at least once a year to facilitate consultation between YCWA and resource agencies and present results of any annual monitoring results (GEN1).~~

- ~~Annually review special-status species lists and assess new species on National Forest System (NFS) land that might be affected by project operations. Develop and implement study plans for newly added species that occur on NFS lands (GEN2).~~

- ~~Provide environmental training to employees to help them identify special-status and noxious weed species and familiarize them with known locations of sensitive habitats in the project boundary (GEN3).~~

- ~~Develop and implement a coordinated operations plan to assure YCWA's compliance with the new license flow requirements (GEN4).~~

Geology and Soils

- Implement the Erosion and Sediment Control Plan (GS1), filed on October 27, 2016, that includes measures to control sedimentation and erosion when stabilizing slopes affected by the project, and prepare an SWPPP to prevent stormwater from carrying pollutants to project waters.

- Implement the updated Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2), filed on July 27, 2018, that includes measures for the removal, transport, and removal of sediment from behind Log Cabin and Our House Dams.

- Implement the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan (GS3) that includes measures for the collection, storage, and disposal of woody material from project reservoirs.

[130] YCWA also proposes measures GEN5 (preparation of a biological evaluation for actions that may affect Forest Service special-status species or critical habitat) and GEN6 (review of improvements) related to future development of NFS lands. Any development of facilities not included in the license application would require a license amendment. Therefore, we consider GEN5 and GEN6 to be administrative in nature and do not analyze them as environmental measures.

Water Quantity

- Determine water year types for flow requirements in the Middle Yuba River downstream of Our House Diversion Dam, in Oregon Creek downstream of Log Cabin Diversion Dam and in the North Yuba River downstream of New Bullards Bar Dam using the Smartsville Hydrologic Index (WR2).
- Determine water year types for related measures pertaining to Narrows 2 Powerhouse and Narrows 2 full bypass using the North Yuba Index. Additionally, when the current water year type is a schedule 5, 6, or conference year and the total volume of New Bullards Bar Reservoir from October 1 through January 31 is less than 220,000 acre-feet, YCWA would not reevaluate the applicable water type in February of the following water year (WR3).
- Implement the Streamflow and Reservoir Level Compliance Monitoring Plan (WR4).
- ***Must*** maintain New Bullards Bar Reservoir at a minimum pool elevation of 1,730 feet, except when drawdowns below this elevation are necessary to meet minimum streamflow requirements (WR5).
- Operate New Bullards Bar Reservoir for flood control in accordance with rules prescribed by the Corps in the 1972 agreement (WR6).
- Implement the proposed Drought Management Plan (WR9) that includes a mechanism to address drought conditions in license conditions, ***with modifications to, in consultation with the Forest Service, FWS, BLM, the Water Board, and California DFW, define drought conditions based on available data specific to the proposed project, including current storage in New Bullards Bar Reservoir, watershed snowpack and soil moisture conditions, current and projected operating requirements for instream flows and water supply deliveries, weather forecasts, and other project operation limitations rather than state-wide declarations***.

Water Quality

- Implement the proposed Hazardous Materials Management Plan (WR1) with modifications to: (1) include specifications for primary and secondary containment of hazardous materials; (2) include protocols used for addressing spills; (3) provide an appropriate time limit to access cleanup materials from project facilities on non-NFS lands; and (4) add FWS's FERC Coordinator to the notification contact list.
- ~~Implement Water Temperature Monitoring Plan (WR7) that includes installation of continuous water temperature recorders at 12 stream locations~~

~~and collection of water temperature profiles in New Bullards Bar Reservoir and Englebright Reservoir.~~

- ~~Implement the Water Quality Monitoring Plan (WR8) that includes sampling *in situ*, general, and recreation water quality and bioaccumulation data at 15 stream locations and New Bullards Bar and Englebright Reservoirs.~~

Aquatic Resources

- Maintain minimum streamflows (depending on time of year and water year type) of 40 to 120 cfs in the Middle Yuba River below Our House Diversion Dam, 6 to 43 cfs below Log Cabin Diversion Dam (AR1), and 5 to 13 cfs below New Bullards Bar Dam (AR10). ***Revise minimum streamflows below New Bullards Bar dam (AR10) to use YCWA's proposed flows in October through May and agency flow recommendations in June through September.***
- Limit the rate of flow reductions in the Middle Yuba River downstream of the Our House Diversion Dam to a maximum of 50 cfs every 3 days for spills under 200 cfs; 100 cfs every 3 days for spills between 200 and 300 cfs; and 100 cfs every 2 days for spills between 300 and 600 cfs to protect resident fish populations and foothill yellow-legged frogs (AR2).
- Maintain minimum flows of 500 to 700 cfs (as measured at Smartsville) and from 150 to 2,000 cfs (as measured at Marysville) in the Yuba River, depending on time of year and water year type, from Narrows 2 Powerhouse and Narrows 2 full bypass to protect anadromous fish populations (AR3). ***Modify AR3 to maintain summer water temperatures in the lower Yuba River in schedule 6 years by increasing minimum flows to 350*** cfs ***(as measured at Marysville) from June 1 through August 31.***
- Reduce flows of 2,000 cfs or less from New Bullards Bar Dam between May 1 and July 31 at a rate of 250 cfs per day until the spill had ceased (AR4) to protect resident fish populations.
- Implement the proposed Aquatic Invasive Species Management Plan (AR5) that includes measures to prevent the introduction and spread of aquatic invasive species, ***with modifications to include monitoring Asian clams at Cottage Creek, Dark Day Boat Launch, and Emerald Cove***.
- Implement the proposed New Bullards Bar Reservoir Fish Stocking Plan (AR6) that includes measures to maintain the rainbow and kokanee recreational fisheries, ***with a modification to include annual consultation with California DFW to determine species of fish appropriate for stocking for recreational purposes***.

- ~~Implement the Upper Yuba River Aquatic Monitoring Plan (AR7) that includes monitoring aquatic and riparian resources in the North Yuba, Middle Yuba, and Yuba Rivers and Oregon Creek.~~

- Implement the proposed Lower Yuba River Aquatic Monitoring Plan (AR8) that includes measures to develop information regarding aquatic resources in the Yuba River downstream of Englebright Dam in response to flow conditions in the new license, ***with modifications to remove: (1) BMI monitoring in the lower river; (2) upstream fish passage monitoring at Daguerre Point Dam; (3) weekly Chinook salmon and steelhead spawning surveys in the lower river; and (4) monitoring of substrate and riparian vegetation cover and community structure.***

- Reduce the rate of flow fluctuations in the Yuba River downstream of Englebright Dam associated with hydroelectric project operation to minimize salmonid fry and juvenile stranding and redd dewatering and enhance riparian seedling recruitment. Specifically, from September 1 through December 1, maximum flow reductions, depending on base flow, would range from 200 to 750 cfs per day. From January 1 through May 31, maximum flow reductions, depending on base flow, would range from 200 to 950 cfs per day. To enhance riparian seedling recruitment, maximum daily flow reduction would range from 79 and 200 cfs from April 1 through July 15 and would be target rates from July 16 through September 30 (AR9).

- Close the Lohman Ridge Diversion Tunnel in wet water years when end-of-March New Bullards Bar Reservoir storage is equal to or greater than 775,000 acre-feet (AR11) to decrease fish entrainment.

- Reduce flows in Oregon Creek downstream of Log Cabin Diversion Dam by a maximum of 20 cfs every 4 days (AR12) to protect aquatic resources by reducing the potential for fish stranding.

Terrestrial Resources

- Implement the proposed Integrated Vegetation Management Plan (TR1) that includes measures for controlling non-native plant species, protecting special-status species, and revegetating disturbed areas, ***with modifications to: (1) include treatment and monitoring plans for target non-native invasive species on all lands in the project boundary; (2) apply revegetation measures (sections 4.1 through 4.5 of the plan) to all lands in the project boundary; (3) implement BMPs to protect foothill yellow-legged frog and California red-legged frog habitat when vegetation management activities occur within 300 feet of streams; (4) define BMPs for any pesticide use that is deemed necessary within the project boundary and within 500 feet of known locations of foothill yellow-legged frog that avoid adverse effects on individuals and their habitats; (5) prohibit the use of pesticides within a***

260-foot buffer around the mean high-water mark of aquatic features, unless necessary to ensure project safety; (6) avoid stockpiling and subsequent removal of any fuels, slash, or debris related to hazard tree removal within 1,000 feet of wetlands or aquatic features; and (7) prior to any activities that would result in vegetation disturbance, conduct surveys for elderberry plants within 165 feet of the activity area and consult with FWS if elderberry plants areas are found to determine if additional protective measures are necessary.

- Implement the proposed Bald Eagle and American Peregrine Falcon Management Plan (TR2) that includes measures protecting eagles and falcons from disturbance***, with modifications to include surveys for American peregrine falcon eyries every year or until a new eyrie is documented***.
- Implement the proposed Ringtail Management Plan (TR3) that includes measures excluding ringtails from project facilities.
- Implement the proposed Bat Management Plan (TR4) that includes measures excluding bats from project facilities.

Recreation Resources

- Implement the updated Recreation Facilities Plan, filed on September 19, 2018 (RR1).
- Provide recreation flow information at Yuba, North Yuba, and Middle Yuba Rivers and Oregon Creek and reservoir levels at New Bullards Bar to the public on a real-time basis and provide at least monthly flow forecasts by the 15th of the month for Middle Yuba River immediately downstream of Our House Diversion Dam, Oregon Creek immediately downstream of Log Cabin Diversion Dam, North Yuba River immediately downstream of New Bullards Bar Dam and spillway, and Yuba River at Smartsville (RR2).
- Provide whitewater boating flows of 600 to 2,000 cfs below Our House Diversion Dam on weekends between October 1 and March 31, with the frequency and flow amount determined by water year type (RR3).

Land Use

- Implement the proposed Transportation System Management Plan (LU1) that provides guidance for the rehabilitation and maintenance of primary project roads and trails.
- Implement the proposed Fire Prevention and Response Plan (LU2) that provides measures for preventing, reporting, and investigating wildfires.

Aesthetics

- Implement the proposed Visual Resource Management Plan (VR1) that includes measures to reduce the visual contrast of some project facilities.

Cultural Resources

- ***Revise*** the proposed HPMP (CR1) that provides specific actions and processes to manage historic properties, ***to include: (1) cultural resources information and consultation results developed after preparation of the 2016 draft HPMP; (2) updated determinations of National Register eligibility of six historic sites*** (***CA-YUB-1751H, CA-YUB-1760H, CA-YUB-1762H, CA-YUB-1768H, CA-YUB-1770H, and CA-YUB-1736H) and the New Colgate Penstock; (3) clarification of the description of site CA-SIE-1849H (previously CA-YUB-1733H; and (4) the results of YCWA's supplemental TCP report and all copies of all associated correspondence.***

5.1.2 Additional Measures Recommended by Staff

In addition to YCWA's proposed measures listed above, as modified by staff, we recommend including the following new measures in any license issued for the Yuba River Development Project:

Aquatic Resources

- Develop a Narrows Reach fish stranding prevention plan for the lower Yuba River downstream of the Narrows 1 and Narrows 2 Powerhouses, to include conducting fish rescues when stranding is observed, reporting estimates of the number and species of fish stranded and the number of fish rescued, recording any evidence of harm caused by project facilities or operation, identifying potential operational and/or structural measures that could be implemented to reduce stranding, and reporting requirements for unplanned flow reductions.
- Develop a comprehensive LWM enhancement plan that: (1) identifies sources of LWM in the project reservoirs; (2) includes provisions for storing and transporting collected LWM; (3) identifies suitable LWM size classes for placement; (4) identifies locations for placement in the lower Yuba River; (5) details a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests; and (6) contains a monitoring and mapping process to provide an indication of the stability of these enhancements and inform the need for future placement activities.

Terrestrial Resources

- Develop a lower Yuba River riparian restoration plan, in consultation with FWS, California DFW, NMFS, and SYRCL, that includes: (1) planting

riparian vegetation on 100 acres of floodplain in the lower Yuba River, including no fewer than four separate planting sites; (2) a species list for plantings that include, at a minimum, cottonwood and willow species; (3) a description of planting methods consistent with methods used at the Hammon Bar restoration site, including planting to ground water depth; (4) success criteria based on survivorship of plantings; (5) monitoring methods and a schedule for determining success; (6) provisions for additional plantings if success criteria are not met; (7) a process and schedule for identifying planting sites; and (8) a reporting schedule.

- Monitor water temperature continuously from April 1 through September 15 for 3 years at two foothill yellow-legged frog breeding sites in the Middle Yuba River downstream from Our House Diversion Dam and at two sites in Oregon Creek downstream of Log Cabin Diversion Dam. Monitoring sites should be selected to represent the upstream and downstream limit of breeding sites in each reach. After 3 years, file a summary report that: (1) summarizes the results of the temperature monitoring; (2) evaluates how often water temperatures fall below 16ºC during the tadpole development period; and (3) describes any changes in flow releases from Our House and Log Cabin Diversion Dams that may be warranted to address adverse effects on foothill yellow-legged frog reproduction.
- Ensure procedures for decontaminating field equipment to prevent spread of aquatic pests and disease between waterbodies, as described in the Aquatic Invasive Species Monitoring Plan, are applied to all activities where equipment is transported from one body of water to another.

Below, we discuss our rationale for our additional staff-recommended measures and modifications to the proposed measures.

Drought Management Plan

YCWA proposes to implement the Drought Management Plan (WR9), which it designed to ensure that drought management measures requiring a variance to license conditions would be implemented in a timely, efficient, and effective manner. YCWA's proposal would implement the drought management plan under any of the following conditions: (1) the Governor of State of California declares a drought emergency for the State or areas of the Yuba River Basin; (2) the Water Board enacts specific regulations for the purpose of managing drought conditions in the State or the Yuba River Basin; (3) a very dry water year associated with a schedule 6 or a conference year occurs; (4) from November through January, following a very dry water year, where end-of-September storage in New Bullards Bar Reservoir is less than 450,000 acre-feet; and (5) if in the January to March period, snowpack development to date is below 60 percent of average.

Commenting agencies state generally that they agree with YCWA's proposal, with a few recommended modifications. California DFW (10(j) recommendation 2.15), FWS (10(j) recommendation 14), and BLM (10(a) recommendation 6) call for revising the proposed drought management plan to include, at a minimum: (1) a drought definition that is relevant to the Yuba River Watershed, and (2) utilization of a trigger that would implement drought management operations only for extreme drought conditions. Forest Service 4(e) condition 54 also specifies that the plan include: (1) an appropriate definition of a drought specific to the Yuba River Development Project; (2) YCWA's process for notification of a drought concern; (3) YCWA's proposed drought response measures; (4) potential impacts on resources (i.e., fish and wildlife species, water quality, vegetation, and recreation); (5) monitoring that would be conducted by YCWA to identify the impacts of any drought-related variance; (6) a description of how and when YCWA's drought variance would expire; (7) YCWA's process for discussing drought conditions, potential license variances, and related drought response measures with the Forest Service and other parties; (8) the process by which YCWA would obtain approval from the TNF and PNF supervisors for any variances from Forest Service 4(e) conditions in any future license; and (9) YCWA's plan revision process throughout the license term. The Water Board (preliminary 401 condition 23) specifies the development and implementation of a drought management plan that outlines overarching guidance for operations during multi-year drought conditions. If particular conditions are likely to require a variance in extended drought periods, the Water Board could include a drought management protocol in such conditions. The Water Board does not believe single drier water year types should warrant the development of a drought plan because they are already addressed through the designation of water year types (e.g., conference year). The Water Board contends these recommendations would ensure drought-related modifications to licensed operations only occur when prolonged drought conditions affect the project area rather than relying on the unimpaired runoff values of the Yuba River, which vary year to year. Compared to proposed drought measures, following the Water Board's recommendations would result in fewer water years labeled as drought and therefore more occurrences of normal operations and higher minimum flows.

As discussed in section 3.3.2.2, in the subsection *Drought Management*, implementing YCWA's proposed Drought Management Plan would allow the project to continue operations during very dry water years while providing sufficient flow to protect aquatic resources, balancing the potentially competing needs of reservoir level, streamflow, irrigation, and power generation. However, YCWA's definition of a drought could result in classifying more years as extreme conditions, which could exacerbate drought conditions in downstream reaches by reducing flows from the reservoirs more often compared to the agencies' proposal. As recommended by FWS, BLM, and California DFW, using available data specific to the proposed project, rather than using the governor's classification for the state, which may only include areas well away from the Yuba River, would ensure that drought classifications would be defined

based on actual conditions in the Yuba River Basin, and the resulting reduction in flows would only occur during drought years affecting Yuba River resources. Defining drought in the Yuba River Basin based on local metrics would provide a relevant basis and triggers for drought management options within the Yuba River. As a result, a localized definition of drought would better protect resources susceptible to the effects of project operation during drought conditions.

Consequently, we recommend YCWA modify its Drought Management Plan, in consultation with the Forest Service, FWS, BLM, the Water Board, and California DFW, to define drought conditions based on available data specific to the proposed project, including current storage in New Bullards Bar Reservoir, watershed snowpack and soil moisture conditions, current and projected operating requirements for instream flows and water supply deliveries, weather forecasts, and other project operation limitations. We estimate that the plan with these revisions would have a levelized annual cost of $1,630, and the benefits to aquatic resources would be worth the cost.

Hazardous Materials Management Plan

Construction of new project facilities, modification of existing project facilities, and routine and non-routine maintenance could affect water quality if pollutants (e.g., fuels, lubricants, herbicides, pesticides, and other hazardous materials) are discharged into project waterways. YCWA proposes to implement its Hazardous Materials Management Plan (WR1), which addresses the storage, use, and transportation of hazardous materials used within the project boundary, with special emphasis on NFS lands.

California DFW recommends YCWA's proposed Hazardous Materials Management Plan in 10(j) recommendation 1.4. The Forest Service would require implementation of the plan for locations on or directly affecting NFS lands within the project boundary (4(e) condition 21) and recommends its implementation on non-NFS lands within the project boundary (10(a) recommendation 7).

The Water Board (preliminary 401 condition 25) states that it would likely specify that YCWA develop, in consultation with relevant resource agencies, a plan for storage, use, transportation, and disposal of hazardous materials in the project area. The Water Board states this plan should address locating primary and secondary containment of hazardous chemicals away from watercourses, appropriate measures and equipment to prevent any hazardous material spill from spreading, and protocols to prevent adverse effects on beneficial uses in the event of a hazardous material spill.

FWS states that it conceptually supports YCWA's proposed Hazardous Materials Management Plan but comments that additional measures may be required for handling pesticides on non-NFS lands to protect federally listed and sensitive species. FWS (10(j) recommendation 6) states that FWS's FERC Coordinator for the Bay-Delta Fish and Wildlife Office should be added to the spill notification list to facilitate a

determination on whether emergency consultation is necessary for potential effects on federally listed species.

Based on our analysis in section 3.3.2.2, in the subsection *Hazardous Material Management*, YCWA's proposed measures would manage some of the risks associated with the project's use of hazardous materials by: (1) defining locations for hazardous materials used for the project; (2) ensuring YCWA staff receive training for managing hazardous materials; and (3) cleaning up any hazardous material spills. However, the proposed plan does not specify primary and secondary containment of hazardous materials, mitigation measures to prevent any hazardous material spill from spreading, or provide assurance that adequate spill cleanup materials would be available within an appropriate time limit for project facilities on non-NFS lands. Revising the plan to include specifications for primary and secondary containment of hazardous materials away from watercourses would minimize the frequency and magnitude of spills that could reach and harm environmental resources. Adding a description of the protocols used for addressing spills in the plan would communicate how hazardous waste spills would be addressed at different project facilities throughout the project. Providing an appropriate time limit to access cleanup materials from all project facilities would ensure timely initial response for cleanup of spills, regardless of the location of the spill.

Subsequent to the publication of the draft EIS, YCWA proposed to modify its Hazardous Materials Management Plan consistent with the additional staff recommendations. We estimate the proposed modifications to the plan would have a levelized annual cost of $260, and the protections to water quality and environmental resources would be worth the cost.

Lower Yuba River Riparian and Salmonid Habitat Restoration

FWS, NMFS, and California DFW recommend a variety of measures to restore riparian vegetation and associated juvenile salmonid rearing habitat along the lower Yuba River. These recommendations consist of riparian plantings, modifications to floodplain elevations, increased flows during spring, and installation of LWM, all of which would function together to improve salmonid habitat. We discuss our conclusions and recommendations regarding these restoration measures below.

Riparian Planting and Floodplain Lowering

The project captures and stores water during spring snowmelt flows and moderates flow volumes and floodplain inundation in the lower Yuba River. These effects constrain development of riparian vegetation by limiting soil moisture and sediment deposition in areas above the baseflow channel. To mitigate for these effects, FWS (10(j) recommendation 3), NMFS (10(j) recommendation 4), and California DFW (10(j) recommendation 2.9) recommend that YCWA develop a lower Yuba River habitat restoration and enhancement plan. The plan would include riparian restoration and enhancement measures (e.g., removing sediments to lower floodplain surfaces and increasing floodplain inundation at flows between 1,500 and 3,000 cfs and planting

riparian vegetation). Resource agencies recommend removing floodplain sediments to lower 340 acres of floodplain currently inundated at 5,000 cfs to be accessible to flows between 1,500 and 3,000 cfs and revegetating an additional 251 acres of floodplain currently inundated at flows between 3,000 and 21,000 cfs. FWN supports these recommendations.

YCWA contends that the existing constraints on riparian vegetation in the lower Yuba River are primarily a result of past land use practices that resulted in large deposits of sediment in the floodplain. YCWA states its studies indicate little change in riparian structure has occurred since development of the project and concludes there is no project nexus for floodplain restoration. However, YCWA proposes to provide reduced ramping rates during the declining limb of spring snowmelt flows to better support riparian seedling germination success (AR9).

Based on our analysis in section 3.3.3.2, in the subsection *Riparian Vegetation*, project operation does result in reduced acres of floodplain inundation during February 1 through June 15. Based on average monthly flows during this period, project operation reduces floodplain flooding by about 100 acres compared to without-project inundation models. Limiting flood flows in these areas prevents establishment of riparian vegetation because soil moisture is too low during the riparian recruitment period to support seedling establishment, and there is limited deposition of fine sediments to create suitable seed germination sites. Therefore, we recommend YCWA develop a lower Yuba River riparian restoration plan to revegetate 100 acres of currently unvegetated floodplain with cottonwood and willow.

Other restoration efforts are planned in the lower Yuba River through partnerships between FWS, SYRCL, and other entities. California DFW and NMFS also have interest in restoration efforts to meet management goals for federally listed salmonids. Implementing the lower Yuba River riparian restoration plan using a phased approach, and in consultation with these entities, would identify restoration sites where access to private lands is available and potentially where other entities have implemented site preparation including surface lowering and infrastructure for site access. Dispersing the 100 acres of revegetation activities across four or more sites would increase the benefit of these activities at a landscape scale. Implementing planting methods consistent with methods used at the Hammon Bar restoration site, including installation of plant materials at near-groundwater depths, would eliminate irrigation needs and increase potential for success.

Development of success criteria based on planting survivorship or vegetation cover would determine whether revegetation efforts are having the desired effect on ecological processes, including sediment retention, seed production, and fish and wildlife habitat. A monitoring component of the plan is needed to determine whether success criteria are met, or whether additional planting activities are needed to meet the goals of the plan.

With regard to the agency recommendations for floodplain lowering, we conclude that there is limited evidence the project has contributed to artificially elevated floodplain elevations. Based on our analysis, we conclude that the current conditions of floodplain isolation and channelization are the result of historical land use practices, including hydraulic mining, sediment management, and flood control that resulted in large volumes of sediment buildup in the lower Yuba River floodplain. Even prior to mining, the river was highly altered by sedimentation, agriculture, and engineering projects. These effects were evident prior to the construction of the project, and we find that the project has not contributed to these conditions. Further, based on work presented in the cbec (2013) report, it is not certain that floodplain lowering activities would persist following extremely high flows that would likely deposit bedload in lowered areas. Hence, we do not recommend floodplain lowering as a component of staff's recommended lower Yuba River riparian restoration plan.

Instead, we recommend YCWA develop, in consultation with NMFS, FWS, California DFW, and SYRCL, a lower Yuba River riparian restoration plan that includes: (1) riparian vegetation planting on 100 acres of floodplain in the lower Yuba River, at no fewer than four separate planting sites; (2) a species list for plantings that includes, at a minimum, cottonwood and willow species; (3) a description of planting methods consistent with methods used at the Hammon Bar restoration site, including planting to groundwater depth; (4) success criteria based on survivorship of plantings; (5) monitoring methods and a schedule for determining success; (6) provisions for additional plantings if success criteria are not met; (7) a process and schedule for identifying planting sites; and (8) a reporting schedule. We estimate that the annualized cost of developing and implementing the plan would be $246,580, about $1,892,450 less than our estimated annualized cost for the agencies' recommendation. Our recommended measure, in conjunction with YCWA's proposed spring flow recession rates (AR9) would increase riparian vegetation structure in the lower Yuba River and thereby contribute organic carbon to the food web. Tree stems would slow water velocities and increase deposition of finer sediments, creating suitable germination sites for riparian seeds. The slower flow velocities among riparian stands would also provide rearing habitat for juvenile salmonids. Therefore, we find the benefits to vegetation, wildlife, and fisheries resources would be worth the cost of the staff recommendation.

Pulse Flows

In general, YCWA proposes to continue to meet minimum flow requirements consistent with the Yuba Accord. YCWA does not propose to implement any fall, winter, or spring pulse flows in the lower Yuba River.

Under the resource agencies' recommended flow regime (California DFW 10(j) recommendations 2.3, 2.4, 2.5, and 2.6; FWS 10(j) recommendations 1, 2, and 11); and BLM (10(a) recommendation 10), minimum flows in the lower Yuba River would be the same as those proposed by YCWA except during spring (March 23 to May 31), when they would be substantially higher than YCWA's proposal during schedule 1 and

2 water years and slightly higher during schedule 3, 5, 6, and conference years (see table 3-43). They would also be substantially higher for February 1 to 6 of schedule 5, 6, and conference years, when higher flows had not already occurred during the previous December 1 through February 1 period. The agencies support YCWA's proposed ramping rates.

As noted in the resource agencies' 10(j) recommendations, their recommended spring pulse, and conditional winter pulse flows are intended to more closely mimic the natural hydrograph in the lower Yuba River to promote floodplain inundation; the transport, storage, deposition, and recruitment of substrates and organic matter (such as woody materials); and the development, recruitment, and persistence of riparian vegetation. The agency flows are also designed to facilitate salmon and steelhead reproduction and outmigration, increase the amount of important off-channel rearing habitat, and enhance riparian seedling recruitment.

Based on our analysis in section 3.3.2.2, in the subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*, the resource agencies' recommended spring floodplain inundation and conditional winter pulse flows would likely have a negligible effect on the existing, degraded floodplain aquatic habitat because these flows are unlikely to overtop the existing river banks and substantially improve floodplain inundation and off-channel habitat availability below Englebright Dam. We also find that implementation of the resource agencies' recommended conditional winter pulse flows would not improve the adult steelhead upstream passage rate because empirical data describing adult steelhead upstream passage at Daguerre Point Dam and associated flows demonstrate that a winter pulse flow is not needed to facilitate adult steelhead upstream passage. Additionally, there is insufficient information to support a finding that the recommended adult spring-run Chinook salmon attraction flows would be beneficial. Finally, as demonstrated in section 3.3.2.2, in the subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*, the resource agencies' higher and longer duration spring pulse and winter flood flows would likely substantially reduce water storage in New Bullards Bar Reservoir and could result in the need for additional groundwater use for agricultural practices that rely on water from the project.

The draft EIS included a recommendation to develop and implement a plan to provide short-duration (up to 48 hours), moderate magnitude, spring pulse flows in the lower Yuba River to facilitate outmigration and increase the survival of juvenile salmon and steelhead. The draft EIS also recommended monitoring juvenile outmigration during these events to provide a measure of effectiveness and make recommendations regarding adjusting future spring pulse releases. We made these recommendations as a means to better understand the potential effects of pulse flows on juvenile salmonid outmigration and survival in a manner that acknowledges the multiple competing water demands in the basin (i.e., water supply, hydroelectric power, and aquatic habitat).

Based on information provided during the August 24, 2018, 10(j) meeting, we no longer recommend implementing the short-duration spring pulse flows, as described in the draft EIS. During the August 24, 2018, 10(j) meeting, we were informed that our pulse flows recommended in the draft EIS may result in the outmigration of undersized juvenile salmonids, which would likely decrease their survival in the lower Yuba and Feather Rivers.

Large Woody Material Enhancement

Under existing conditions, the storage and diversion of water associated with operation of the project and other dams and diversions in the Yuba River Watershed blocks the downstream movement of LWM. YCWA does not propose any measures to modify or enhance physical habitat or place LWM into the lower Yuba River. However, YCWA is proposing to pass LWM at Our House and Log Cabin Diversion Dams and to rapidly remove LWM from New Bullards Bar Reservoir and make it available for use by the agencies or other entities for habitat enhancement in the lower Yuba River (GS3).

FWS, NMFS, California DFW, BLM, and FWN each recommend, as part of a program to restore and enhance juvenile salmonid rearing habitat in the lower Yuba River, that YCWA transport LWM from project reservoirs to the lower Yuba River. FWS recommends YCWA place 492 LWM pieces from Englebright Dam downstream about 20.9 miles through the Hallwood Reach to RM 3.3. Under FWS's recommendation, YCWA, California DFW, FWS, NMFS, and the Water Board would determine placement and density of LWM. Material would be at least 24 inches in diameter and 18 feet in length with 50 percent of the pieces maintaining a crown or rootwad. In addition, 10 percent of the pieces would be secured to the bank and accessible at flows as low as 880 cfs upstream of Daguerre Point Dam or 530 cfs downstream of the dam, based on installation location. Half of the pieces would be placed by year 5 of the new license, and the remainder would be placed by year 10. YCWA would then conduct surveys every 10 years and replace LWM as needed. Recommendations from BLM and California DFW are essentially the same as FWS's.

NMFS recommends YCWA collect and stockpile wood from all project reservoirs for use in enhancements projects downstream. Specifically, NMFS's recommendation would require YCWA to remove LWM from project reservoirs and place 100 pieces of LWM in the lower Yuba River annually until there are 100 pieces per mile of stream channel in the 18.5-mile-long reach from Timbuctoo Reach to Hallwood Reach. FWS also recommends that YCWA remove wood that accumulates just upstream of the Cottage Creek Boat Launch in New Bullards Bar Reservoir and make 200 key pieces of LWM (24–36 inches in diameter at the widest end, not including the rootwad, and greater than 25 feet in length) available to entities conducting salmonid restoration actions in the lower Yuba River.

Based on our analysis in section 3.3.2.2, in the subsection *Lower Yuba River Habitat Restoration and Large Woody Material Management*, the project does block LWM transport to the lower Yuba River. We find LWM augmentation would: (1) increase aquatic habitat diversity; (2) provide cover and holding habitat for juvenile salmonids; and (3) aid in the retention of spawning gravel, organic debris, and nutrients. LWM additions would create habitat for macroinvertebrates and other aquatic organisms (which are important components of the aquatic food web) and hydraulic refugia. However, as discussed in section 3.3.5.2, LWM is also a potential hazard for whitewater boaters because it can accumulate in "strainers" that have the potential to trap boaters. While wood is a part of any navigable river in the region and whitewater boaters are accustomed to managing the risk, programs that add LWM to a river system at a single point can introduce more hazards compared to natural processes. However, augmenting LWM at multiple location throughout the lower river would greatly minimize this risk. As such, it is anticipated that the environmental benefits associated with LWM program would outweigh any risks to boaters in the lower Yuba River.

Therefore, we recommend that YCWA, in consultation with FWS, NMFS, the Forest Service, and California DFW develop a LWM enhancement plan that: (1) identifies sources of LWM in the project reservoirs or nearby NFS lands; (2) includes provisions for storing and transporting LWM collected at New Bullards Bar Reservoir downstream to the lower Yuba River; (3) identifies suitable LWM size classes for placement; (4) identifies locations for placement in the lower Yuba River; (5) details a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests (e.g., American Whitewater); and (6) contains a monitoring and mapping process to provide an indication of the stability of these enhancements and inform the need for future placement activities. Revisiting the LWM enhancement plan goals and the timing and frequency of placement events once within the first 3 years of license issuance and then in license year 10 and every 10 years thereafter (i.e., license years 20 and 30) would facilitate adaptive revisions to the plan as conditions improve in the lower river. We estimate implementation of a LWM enhancement plan, with our recommended modifications, would have a levelized annual cost of $101,560, and the benefits to aquatic resources would be worth the cost.

Minimum Streamflows Below New Bullards Bar Dam

Release of minimum instream flows downstream of the New Bullards Bar Dam influences aquatic habitat availability and water temperature in the North Yuba River below the dam and in the Yuba River between the confluence of the North Yuba and Middle Yuba Rivers, downstream to the New Colgate Powerhouse. YCWA proposes minimum flows below the New Bullards Bar Dam that vary from 5 cfs to 13 cfs depending on season and water year type (AR10). Forest Service (10(a) recommendation 2), FWS (10(j) recommendation 11), BLM (10(a) recommendation 10), and California DFW (10(j) recommendation 2.4) all recommend higher flows that range from 30 cfs to 60 cfs, depending on season. The Water Board (2017c) states that

current flow and habitat conditions in the North Yuba River do not appear to support native fauna and suggests the Commission evaluate flow releases that range from flows proposed by YCWA to the maximum flow proposal made for the North Yuba River below New Bullards Bar Dam.

As discussed in section 3.3.2.2, in the subsection *Effects of Flow Regulation on Aquatic Habitat Upstream of Englebright Dam,* YCWA's proposed minimum flows and the agencies' recommended flows would increase WUA for rainbow trout compared to existing conditions. However, because summer water temperatures in the Yuba River can exceed suitable temperatures for rainbow trout, the resource agencies place a high value on reducing water temperature to provide refuge habitat during summer months. The agencies' recommended minimum flow releases during June through September would provide a greater frequency of daily mean water temperature of 12ºC to 20ºC in the bypassed reach from the North Yuba-Middle Yuba River confluence to New Colgate Powerhouse, compared to YCWA's proposed flow releases. However, from October through May, YCWA's proposed flow releases would provide daily mean temperatures of 12ºC to 20ºC in this subreach at either a greater or equal frequency than the agencies' recommended minimum flow releases. We estimate implementation of the agencies' recommended minimum flows over the full calendar year would have a levelized annual cost of $576,360. However, implementing the agency recommendations only during June through September, when the benefit of higher flows has the greatest value would reduce the levelized annual cost to $240,110. We determine the benefits to rainbow trout habitat during the summer months would be worth the cost. Therefore, we recommend YCWA modify its proposed minimum flows below New Bullards Bar Dam to include the agency-recommended flows of 60 cfs from June 1 through June 30; 40 cfs from July 1 through August 31; and 30 cfs from September 1 through September 31. To ensure upramping and downramping rates do not adversely affect aquatic resources, we recommend changes between the YCWA proposed flows and agency-recommended flows occur over the 3-day periods from June 1 through June 3 and September 28 through September 31.

Schedule 6 Water Year Summer Flows

During schedule 6 water years, YCWA would provide a 30,000 acre-feet water transfer, as required by the groundwater substitution program in the Yuba Accord. While the Yuba Accord does not specify the timing of this water delivery, YCWA would consult with stakeholders, including FWS, NMFS, Forest Service, and California DFW between April 10 and May 21 to determine a schedule for this water delivery. If no agreement is reached, the delivery would be equally distributed from June 1 through August 1, at a flow of 338 cfs. During the low water years of 2014 (schedule 5) and 2015 (schedule 6), California DFW determined high water temperatures restricted habitat for Chinook adult holding, spawning, embryo development, juvenile rearing, and downstream movement. Temperatures were also too high for steelhead egg and fry development. To reduce temperature effects on spawning salmonids during low water

years, FWS (10(j) recommendation 2), BLM (10(a) recommendation 8), NMFS (10(j) recommendation 2), and California DFW (10(j) recommendation 2.6) recommend increasing minimum flows to 350 cfs from June 1 through August 31 of schedule 6 water years. This increase would result in an additional delivery of 2,050 acre-feet.

As discussed in section 3.3.2.2, in subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*, increasing minimum flows would provide cooler water temperatures and benefit anadromous salmonids. We estimate the additional flows would have a negligible effect on project economics. Therefore, we recommend YCWA modify the minimum flow schedule for schedule 6 water years to include flows of 350 cfs from June 1 through August 31.

Aquatic Invasive Species Management Plan

Aquatic invasive species compete for habitat resources with native species and have the potential to permanently change the species assemblage in aquatic communities. California DFW has documented two aquatic invasive species at the project—New Zealand mudsnails in the Yuba River upstream and downstream of Englebright Dam near the town of Smartsville, and Asian clams in New Bullards Bar Reservoir.

YCWA proposes to implement its Aquatic Invasive Species Management Plan (AR5) that includes a process to develop BMPs intended to minimize the potential for the introduction and spread of aquatic invasive species into project streams and reservoirs and provide education and outreach to ensure public awareness of aquatic invasive species effects and management efforts. In addition, the plan includes monitoring programs to provide a process for early detection of aquatic invasive species at the project and a provision to ensure that all management activities comply with federal and State of California laws, regulations, policies, and management plans, and with Forest Service directives and orders regarding aquatic invasive species. With regard to American bullfrog suppression, YCWA's plan includes monitoring and removal of American bullfrogs for the first 5 years of any license issued for the project on both banks of the cove upstream of the Moran Cove Boat Ramp, 300 feet upstream of the NMWSE in Little Oregon Creek, and 200 feet upstream of the NMWSE in each of the two unnamed tributaries north of Little Oregon Creek. After 5 years YCWA would consult with the Forest Service, FWS, California DFW, and the Water Board on whether to continue the suppression efforts and collaboratively discuss any modifications to the methods.

If any invasive mollusks, other than dreissenid mussels (quagga and zebra mussels), are detected and if well-documented practical measures are available for control and/or eradication of the species in similar situations, YCWA would consult with California DFW, FWS, the Water Board, and the Forest Service to develop a plan to control and/or eradicate them. If zebra or quagga mussels are detected in New Bullards Bar Reservoir or in either diversion dam impoundment, YCWA would

immediately notify California DFW and, in consultation with the agency, develop measures to avoid infestation and a plan to control or eradicate dreissenid mussels pursuant to California DFW regulations.[131]

The Forest Service specifies that YCWA should implement its Aquatic Invasive Species Management Plan for locations on non-NFS lands (10(a) recommendation 8) as well as NFS lands (4(e) condition 39). California DFW recommends that YCWA implement its plan as described above (10(j) recommendation 2.20). FWN supports YCWA's proposed plan.

Consistent with YCWA's proposal, the Water Board (preliminary 401 condition 18) specifies that it would likely require YCWA to develop and implement a plan to manage aquatic invasive species, which would identify and describe invasive species currently established in the project area, as well as invasive species with a high potential to become established in the project area. Furthermore, the plan may include similar measures as those proposed by YCWA regarding educational outreach, monitoring, and compliance with state and federal regulations, as well as additional specific metrics and measures to be taken if new invasive species are discovered in the project area.

FWS supports the majority of YCWA's proposed plan, but suggests that the proposed American bullfrog monitoring and suppression may not be adequate for protecting sensitive or listed frogs. FWS (10(j) recommendation 8) recommends that YCWA extend its American bullfrog suppression effort to include areas downstream of Our House and Log Cabin Diversion Dams. Such efforts would include timely surveys for bullfrogs downstream of the dams in late spring and early summer of any below normal, dry, or critically dry water year following a normal, dry, or critically dry water year, when resulting pool stagnation may provide habitat for bullfrogs. If bullfrogs were detected in these reaches, FWS contends that bullfrog suppression efforts would be warranted.

YCWA argues that additional bullfrog suppression efforts are not needed for two reasons: (1) if foothill yellow-legged frog become listed under the ESA and the project has a reasonable potential to affect it, the Commission would consult with FWS under section 7; and (2) FWS has not demonstrated that its recommendation would provide any additional protection compared to YCWA's proposed measures.

As we discuss in our analysis in section 3.3.2.2, in the subsection *Aquatic Invasive Species Management*, the public education and outreach component of YCWA's Aquatic Invasive Species Management Plan would help to ensure public

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[131] Section 2301 of the California Fish and Game Code prohibits the possession, importation, shipment, or transportation of mussels of the genus *Dreissena* in California except as authorized by California DFW and provides measures that California DFW may implement to control and prevent the spread of dreissenid mussels.

awareness of aquatic invasive species and how to prevent their spread at the project. The plan's process to develop BMPs to manage and control the spread of invasive species would ensure that measures are responsive to future specific and identified threats to the aquatic ecosystem. However, we note that YCWA proposes to survey New Bullards Bar Reservoir in three locations, and these locations do not include sites where the Forest Service observed Asian clams (at the mouth of Cottage Creek, the Dark Day Boat Launch, and Emerald Cove). Conducting surveys in these areas as part of the plan would help YCWA control the spread of Asian clams in New Bullards Bar Reservoir through early detection and implementation of control measures.

Based on our analysis in section 3.3.3.2, in the subsection *Foothill Yellow-legged Frog*, under repeated low-water conditions, low-flow releases from Our House and Log Cabin Diversion Dams could result in pool stagnation and provide habitat for bullfrogs. Increases in bullfrog populations in these areas would increase competition and predation on foothill yellow-legged frogs. Our draft EIS included a recommendation to include bullfrog monitoring during low water years and implement control measures if bullfrogs are identified in stream reaches downstream of Our House and Log Cabin Diversion Dams. However, further review of the scientific literature indicates control measures in open systems, like streams, where recolonization is expected, are rarely successful. Greater success is achieved through habitat modification to reduce favorability for bullfrogs. Increasing flows in the Middle Yuba River and Oregon Creek, as proposed, would likely reduce bullfrog populations in these reaches. We estimate bullfrog survey and control measures would have a levelized annual cost of $11,710 and conclude the benefits do not justify the cost.

Therefore, we recommend YCWA modify the Aquatic Invasive Species Management Plan to include monitoring for Asian clams at Cottage Creek, Dark Day Boat Launch, and Emerald Cove. We estimate implementation of a revised Aquatic Invasive Species Management Plan, with our recommended modifications, would have a levelized annual cost of $33,010, and the benefits to aquatic resources would be worth the cost.

New Bullards Bar Reservoir Fish Stocking Plan

New Bullards Bar Reservoir has been historically stocked with rainbow trout, kokanee, brook trout, and cutthroat trout to meet the reservoir's recreation demand. Under existing conditions, the reservoir supports a diverse assemblage of cold and warmwater fishes, including sport and nongame species. Without supplementing natural production, the fishery and its associated recreational fishing experiences would likely decline. YCWA proposes to implement its New Bullards Bar Reservoir Fish Stocking Plan (AR6) that includes fish stocking processes and procedures, stocking targets, and periodic creel surveys. Specifically, YCWA's plan includes a provision to begin stocking 65,000 fingerling kokanee and 3,000 catchable rainbow trout in New Bullards Bar Reservoir in the first full calendar year after the issuance of any license for the project and annually thereafter. The plan also includes a provision to conduct creel

surveys on kokanee and rainbow trout in the reservoir from June 1 through September 30 in the first full calendar year, and next two consecutive years, after the issuance of any license, with additional surveys in each year prior to filing a required Form 80 with the Commission. As part of the plan, YCWA would file annual reports with the Commission that document the fish stocking in that calendar year, any creel survey data, and any recommended changes to the plan.

The Forest Service (10(a) recommendation 19) and California DFW (10(j) recommendation 2.21) recommend YCWA implement its New Bullards Bar Reservoir Fish Stocking Plan. FWN supports YCWA's proposed plan. The Water Board (preliminary 401 condition 20) specifies that it would likely require YCWA to develop and implement a plan to supplement the fishery at New Bullards Bar Reservoir, which may include annual stocking of kokanee and rainbow trout, hatchery restrictions to maintain genetic integrity, and a monitoring component to measure effectiveness. FWS supports YCWA's plan in concept but suggests there would be greater conservation value in stocking New Bullards Bar Reservoir with hatchery spring-run Chinook salmon.

Based on our analysis in section 3.3.5.2, in the subsection *Fish Stocking*, we find YCWA's proposed New Bullards Bar Reservoir Fish Stocking Plan would continue to help meet the demand for recreation at the reservoir, and thereby, protect the reservoir's fish populations. However, the plan does not include annual consultation with fishery management agencies. Annual consultation with California DFW would ensure species and quantities of annual stocking efforts are consistent with the state's management goals and responsive to recreational fishing pressure for New Bullards Bar Reservoir. Therefore, we recommend YCWA modify the plan to include annual consultation with California DFW to determine the species of fish appropriate for stocking. In addition, in years following the proposed creel surveys, the annual stocking report should evaluate the existing stocking targets and, if appropriate, propose new stocking targets that are responsive to any changes in fishing pressure. FWS's recommendation to stock Chinook salmon can be evaluated as part of the annual consultation. We estimate implementation of the New Bullards Bar Reservoir Fish Stocking Plan, with our recommended modification, would have a levelized annual cost of $17,650, and the benefits to aquatic and recreation resources would be worth the cost.

Lower Yuba River Aquatic Monitoring

A number of measures under the staff-recommended alternative would alter aquatic and riparian habitat conditions in the Yuba River downstream of Englebright Dam (e.g., developing and implementing plans for LWM enhancement, maintaining minimum streamflows at Narrows 2 Powerhouse and Narrows 2 full bypass, and controlling project ramping and flow fluctuations downstream of Englebright Dam). These altered habitat conditions could affect the distribution and abundance of resident and anadromous salmonids and BMI in the lower Yuba River.

To address this issue, YCWA proposes to implement the Lower Yuba River Aquatic Monitoring Plan (AR8) that would include the monitoring of: (1) the passage of fish (by species) at the Corps' Daguerre Point Dam year-round; (2) annual spawning population abundance for spring-run Chinook salmon, fall-run Chinook salmon, and steelhead; (3) temporal and spatial distributions and habitat use of spawning steelhead upstream and downstream of Daguerre Point Dam; (4) the abundance, size, and timing of emigrating salmonids; (5) the interactions of anadromous fish with Narrows 2 facilities and operation; (6) channel substrate and LWM; (7) riparian vegetation cover and community structure; and (8) BMI community structure.

The Water Board (preliminary 401 condition 16) specifies that YCWA develop a plan to collect information regarding aquatic resources in the Yuba River downstream of Englebright Reservoir to understand project effects on designated beneficial uses (e.g., cold and warm freshwater habitat, wildlife habitat, and spawning). The objective of this plan would be to collect data on the distribution, abundance, and condition of BMI, channel substrate, riparian vegetation, LWM, and adult and juvenile anadromous fish. Additional focus would be on monitoring for stranded salmonids during Narrows 2 Powerhouse flow fluctuations that have a potential to negatively affect anadromous salmonids (e.g., Chinook salmon and steelhead trout).

Developed in consultation with FWS, California DFW, and other relicensing participants, YCWA's proposed plan is a comprehensive fish habitat and fish population monitoring program for the lower Yuba River. However, based on our analysis in section 3.3.2.2, in the subsection *Lower Yuba River Aquatic Monitoring*, certain measures included in the plan lack a clear project nexus or would not inform future license conditions. These include the monitoring of: (1) fish passage (by species) at the Corps' Daguerre Point Dam year-round; (2) annual spawning population abundance for spring-run Chinook salmon, fall-run Chinook salmon, and steelhead; (3) temporal and spatial distributions and habitat use of spawning steelhead upstream and downstream of Daguerre Point Dam; (4) BMI community structure; (5) riparian vegetation cover and community structure (except for areas planted by YCWA as a component of lower Yuba River restoration efforts discussed above in *Lower Yuba River Riparian Habitat Restoration Plan*); and (6) channel substrate.

While YCWA's proposed monitoring of upstream fish passage at Daguerre Point Dam would provide year-round data on the abundance, size, passage efficiency, and migration timing of hatchery and wild anadromous fish entering the Yuba River, it is not clear how the results of the monitoring would be used to address project effects on the resource. In addition, annual abundance of salmon and steelhead can be highly variable in a given river system and influenced by factors outside YCWA's control, including ocean and estuary conditions, annual hatchery augmentation practices, state and federal fishery management, weather conditions, and the operation of other dams and water diversions. Similarly, it is uncertain how YCWA's proposed Chinook salmon and steelhead spawning surveys would be used to identify specific project effects.

While the proposed operation of the project could alter aquatic habitat conditions in the lower Yuba River, it is anticipated that the staff-recommended measures discussed in this section, including Yuba Accord minimum instream flows, ramping rates to support riparian vegetation seedling success, addition of LWM, and construction BMPs would adequately protect or maintain aquatic habitat in the project-affected reach. As such, we cannot envision a scenario where project construction and operation, with the protection and enhancement measures included in any new license, would substantially alter channel substrate or result in a significant effect on BMI.

As discussed in section 3.3.2.2, in the subsection *Ramping Rates Downstream of Englebright Dam*, rapid decreases in flow associated with shutdowns of the Narrows 2 Powerhouse have the potential to strand aquatic resources in the 1,000-foot-long reach of the Yuba River between the Narrows 2 partial bypass and PG&E's Narrows 1 Powerhouse and could also dewater salmon and steelhead redds and incubating eggs. As a component of the proposed Lower Yuba Aquatic Monitoring Plan, YCWA would continue to monitor fish stranding at the Narrows 2 facilities following specified flow reductions and dewatering events and would notify NMFS, California DFW, and the Commission of any fish mortality or stranding incidents. YCWA may also rescue stranded fish or alert agency representatives for an opportunity to conduct a fish rescue. A more rapid notification of the resource agencies following a downramping event would also further protect juvenile salmonids from stranding and minimize potential adverse effects on salmon and steelhead behavior and spawning success. Furthermore, developing a formalized Narrows Reach fish stranding prevention plan as discussed above in consultation with California DFW, NMFS, the Water Board, and FWS, consistent with YCWA's proposed measure AR8, would help guide in the implementation of this measure and ensure that the resource agencies have an opportunity to provide input on the monitoring plan.

Project operation has reduced the frequency and duration of spring peak flows in the lower Yuba River. Over time, this has created a relatively stable channel with little scour; however, these low and stable flows during the spring have the potential to negatively affect juvenile salmonid outmigration rates and survival in the lower river. YCWA's proposed rotary screw trap sampling in the lower Yuba River would provide information on the weekly, monthly, seasonal, and annual abundances and time-period specific size structure of emigrating juvenile Chinook salmon and help examine potential relationships between these metrics and the flows and water temperatures in the lower Yuba River.

YCWA's proposed LWM monitoring, as a component of the plan, would help inform how LWM distribution and abundance may be changing under new license conditions and whether these changes are suitable for spawning and rearing anadromous salmonids. The results of the LWM monitoring program would also allow YCWA and the resource agencies to adaptively adjust the amount, size, and placement of LWM to maximize its benefit over time. Monitoring once within the first 3 years of license

issuance and then in license year 10 and every 10 years thereafter (i.e., license years 20 and 30) should be adequate to ensure this program is meeting its objectives.

Rather than fully adopt YCWA's broad monitoring plan, we recommend modifying the plan as follows: (1) remove BMI monitoring in the lower river; (2) remove upstream fish passage monitoring at Daguerre Point Dam; (3) remove weekly Chinook salmon and steelhead spawning surveys in the lower river; and (4) remove monitoring of substrate and riparian vegetation cover and community structure (except for areas planted by YCWA as a component of lower Yuba River restoration efforts discussed above in *Lower Yuba River Riparian Habitat Restoration Plan*). We estimate implementation of YCWA's proposed Lower Yuba River Aquatic Monitoring Plan, as modified by staff, would have a levelized annual cost of $52,910, and the benefits to aquatic resources would be worth the cost. However, we recognize that an aquatic monitoring plan for the lower Yuba River is included in Water Board preliminary 401 condition 16 and Forest Service 4(e) condition 43 and would be included as a mandatory condition in any license issued for the project if it is included in the final certification or 4(e) condition.

Narrows Reach Fish Stranding Prevention Plan

As a component of its Lower Yuba River Aquatic Monitoring Plan (AR8), YCWA proposes to monitor interactions of anadromous fish with Narrows 2 facilities and operation. YCWA would use binoculars to scan the approximately 1,000-foot-long section of the Yuba River that extends from the Narrows 2 facilities to the Narrows 1 Powerhouse for stranded Chinook salmon and steelhead during periods of receding flows.

FWS (10(j) recommendation 5) recommends YCWA, within the first full calendar year of the new license term, develop a Narrows Reach fish stranding prevention plan in consultation with California DFW, NMFS, the Water Board, and FWS. The plan would be consistent with YCWA's proposed surveys, focus on the reach of the lower Yuba River from immediately below Englebright Dam to the Narrows 1 Powerhouse, and include long-term measures to reduce or eliminate the stranding potential of fish during flow transitions of normal operation of the project. FWS also recommends (10(j) recommendation 5) that YCWA report a potential fish-stranding event to FWS, NMFS, and California DFW if a flow reduction of greater than 500 cfs occurs for more than 5 minutes. If the unplanned flow reduction occurs on a weekday, reporting to the fisheries agencies would be on the same day, via email and telephone. If the unplanned flow reduction occurs after 5:00 p.m. on a Friday, reporting to the fisheries agencies would be by 10:00 a.m. on the following Monday, via email and telephone.

NMFS 10(j) recommendation 5, Water Board preliminary 401 condition 17, and BLM 10(a) recommendation 9 are consistent with FWS's recommendation regarding the need for a Narrows Reach fish stranding plan. However, NMFS also recommends

YCWA notify NMFS, FWS, and California DFW within 24 hours if a project flow reduction triggers monitoring and if the subsequent monitoring finds stranded fish. FWN supports the 10(j) recommendations proposed by California DFW and FWS.

As discussed in our analysis in section 3.3.2.2, in the subsection *Ramping Rates Downstream of Englebright Dam*, YCWA's studies indicate steelhead and Chinook strandings have occurred during shutdowns of the Narrows 2 facilities, which is a part of normal operation. YCWA's proposed measure to conduct surveys for stranded fish following a shutdown of the Narrows 2 development, including when bypassed reach flows cease or during certain upramping and downramping events, would continue to provide information about the timing and magnitude of stranding effects. However, it is unclear how YCWA's proposal would prevent or reduce the number of strandings that occur because the proposed measure would not identify actions that could be implemented to reduce any ongoing adverse effects on fish. While the fish stranding component of YCWA's proposed Lower Yuba River Aquatic Monitoring Plan would incorporate a provision to report any observations of stranded fish to NMFS, FWS, California DFW, and the Water Board within 48 hours, NMFS's recommended reporting requirements for potential fish-stranding events (within 24 hours) would allow the resource agencies to conduct a more timely fish rescue than what would occur under YCWA's requirement and would help the resource agencies to identify and obtain an adequate count of dead fish before substantial predation can occur. Therefore, we recommend YCWA, in consultation with FWS, NMFS, California DFW, and the Water Board, develop a Narrows 2 reach fish stranding prevention plan to help reduce project effects on stranding. Including a detailed list of potential operational and/or structural measures or other actions and their associated costs that could be implemented at the project would identify the most efficient and effective measures to reduce stranding in the reach. We also recommend the plan include FWS's recommended reporting requirements for potential fish-stranding events and stipulate that YCWA conduct fish rescues when stranding is observed. The plan should include provisions to record estimates of the number and species of fish stranded and the number of fish rescued, record any evidence of harm caused by project facilities or operation, and provide the information to NMFS, FWS, and California DFW. We estimate the plan would have a levelized annual cost of $520, and the benefits to anadromous fish would be worth the cost.

Integrated Vegetation Management Plan

To minimize potential effects of project operation and maintenance on vegetation, YCWA proposes to implement its Integrated Vegetation Management Plan (TR1). The plan provides protocols for the management of non-native invasive plants, routine vegetation management around project facilities, revegetation, protection of sensitive areas, pesticide use, employee training, and reporting. For many components, the plan distinguishes between measures for NFS and non-NFS lands.

The commenting agencies, tribes, non-governmental organizations, and other stakeholders generally agree that the Integrated Vegetation Management Plan would protect vegetation resources. Forest Service (4(e) condition 40) specifies that YCWA implement the plan as filed, on NFS lands, and calls for the plan to apply to non-NFS lands (10(a) recommendation 9). FWS recommends modifying the plan to include protocols for management of slash and woody debris left after vegetation management activities to protect California red-legged frog and foothill yellow-legged frog habitat. FWS also recommends (10(j) recommendation 6) ESA consultation should be prior to initiating improvements in ESA listed species habitat or critical habitat. Additionally, FWS recommends (10(j) recommendation 6) that YCWA conduct surveys for elderberry plants within 165 feet of activities that would disturb vegetation.

YCWA's proposed Integrated Vegetation Management Plan includes annual monitoring and treatment of non-native invasive plants on NFS lands but would only treat populations on non-NFS lands every 5 years. For treatment activities on NFS lands, YCWA would consult with the Forest Service to develop treatment plans; however, no such plan development is proposed for treatments on non-NFS lands. Based on our analysis in section 3.3.3.2, in the subsection *Vegetation Management*, we do not find justification for these different methods because non-NFS lands are just as vulnerable to the spread of invasive plant species resulting from habitat disturbance from recreation or maintenance activities as NFS lands. YCWA's proposal would potentially include treatment of 13 acres of project lands, including about 1 acre of NFS lands and about 12 acres of non-NFS lands. Incorporating treatment methods developed for NFS lands into the treatment for non-NFS lands would better protect project lands from the spread of invasive plant species and associated effects on wildlife habitat and agricultural lands. Further, limiting monitoring and treatment on non-NFS lands to 5-year intervals, as proposed, would result in a high volume of seed production and spread of invasive plants, likely negating the benefits of treatment. Monitoring and treating invasive plants on non-NFS lands on an annual basis, as proposed for invasive plants on NFS lands, would limit this potential.

Following treatment of large areas (defined in the plan as > 0.5 acre) of non-native invasive weeds, revegetation activities would promote transition to native communities and help prevent reestablishment of non-native species. For NFS lands, YCWA's Integrated Vegetation Management Plan includes preparation of site-specific revegetation plans and specific monitoring schedules and criteria to determine success. However, on non-NFS lands, YCWA proposes to limit revegetation activities to those required by existing regulations or permits. YCWA notes that there are five populations, totaling 10.2 acres, of skeletonweed on YCWA property. While YCWA does not specify the size of each population, some or all of these populations must be more than the 0.5-acre threshold. Therefore, these areas would benefit from revegetation activities following treatment. Based on our analysis in section 3.3.3.2, in the subsection *Revegetation Activities,* we recommend extending revegetation measures proposed for NFS lands to also include non-NFS areas. These measures would provide

better management and control of non-native plants and promote transition of treated populations to native species in the project area.

YCWA's Integrated Vegetation Management Plan also describes proposed measures to prevent effects on sensitive amphibians, including limiting the use of pesticides and routine vegetation maintenance near breeding sites. YCWA would conduct site-specific assessments during hazard tree removal to identify and minimize potential effects for foothill yellow-legged frog and California red-legged frog habitat. On NFS lands, YCWA proposes to restrict conducting vegetation maintenance within 300 feet of known breeding sites, without prior consultation with Forest Service. YCWA proposes to obtain Forest Service approval prior to use of pesticides on NFS lands, and any such use within 500 feet of know foothill yellow-legged frog locations. Based on our analysis in section 3.3.3.2, in the subsection *Foothill Yellow-legged Frog*, we find that limiting these protection buffers to NFS lands and known breeding sites would leave habitats outside NFS lands and lifestages other than eggs and tadpoles susceptible to effects of vegetation maintenance. To provide additional protection to sensitive amphibians, we recommend that YCWA modify the proposed plan to: (1) include BMPs to protect foothill yellow-legged frog and California red-legged frog habitat when vegetation management activities occur within 300 feet of streams; (2) define BMPs for any pesticide use that is deemed necessary in the project boundary and within 500 feet of known locations of foothill yellow-legged frog to avoid adverse effects on individuals and their habitats; and (3) prohibit the use of pesticides in a 260-foot buffer around the mean high-water mark of aquatic features, unless necessary to ensure project safety. Concerns about project safety are related to the potential establishment of trees and other brush around project facilities, which could obscure visual inspection and harbor burrowing animals. Both woody vegetation and burrowing animals could threaten the structural integrity and performance of project dams by allowing seepage. Vegetation around project facilities also increases the risk of wildfire damage. Therefore, YCWA needs to be able to control vegetation using herbicides, if necessary, to ensure the proper and safe functioning of project facilities. However, herbicides and pesticides are harmful to sensitive amphibian species. YCWA's Integrated Vegetation Management Plan states that any herbicides applied within or adjacent to any river, stream, lake, impoundment, and/or associated riparian habitat and/or floodplain would be registered for aquatic use by the California Department of Pesticide Regulation. Implementing the protection buffers we recommend above, with the exception of areas around dams where treatment is needed to protect public safety, would reduce potential adverse effects of herbicides and pesticides on amphibians.

FWS recommends that any cleared hazard tree removal or fuels reduction/slash be removed within 24 hours, or be left in place and not removed, or removed the same day it is cut and not be stored within 1,000 feet of a wetland, riparian area, or critical habitat. California red-legged frogs use terrestrial habitats and could be attracted to debris piles that would provide shelter from predators and retain moisture. Leaving woody debris or slash in place for several days and then burning or transporting the

debris could result in direct injury or mortality to any frogs occupying the associated habitat. Therefore, we recommend modifying the Integrated Vegetation Management plan to include restrictions on debris removal.

As discussed in section 3.3.4.2, YCWA conducted surveys for elderberry plants (host plants for the threatened valley elderberry longhorn beetle) within 100 feet of proposed project activities, consistent with FWS protocols at that time. Subsequently, FWS modified survey protocols to extend survey distances to 165 feet based on recent evidence that the valley elderberry beetle life cycle typically extends up to 165 feet from the host plants. Because there is potential that elderberry plants are present outside the original survey area, but within 165 feet, there is potential for proposed activities to affect valley elderberry longhorn beetle. Therefore, to further minimize potential adverse effects on valley elderberry longhorn beetles, we recommend that YCWA, prior to initiating activities resulting in vegetation disturbance, conduct surveys for elderberry plants within 165 feet of the proposed activities and consult with FWS if elderberry plants are identified in this area to determine if additional protective measures are necessary.

We recommend YCWA, in consultation with California DFW, the Forest Service, and FWS, modify the Integrated Vegetation Management Plan to: (1) develop treatment plans and annual treatment and monitoring for target non-native invasive species on all lands in the project boundary; (2) apply revegetation measures (sections 4.1 through 4.5 of the plan) to all lands in the project boundary; (3) implement BMPs to protect foothill yellow-legged frog and California red-legged frog habitat when vegetation management activities occur within 300 feet of streams; (4) ensure any pesticide use that is deemed necessary in the project boundary and within 500 feet of known locations of foothill yellow-legged frog would be designed to avoid adverse effects on individuals and their habitats; (5) prohibit the use of pesticides in a 260-foot buffer around the mean high-water mark of aquatic features unless necessary to ensure project safety; (6) avoid stockpiling and subsequent removal of any fuels, slash, or debris from hazard tree removal within 1,000 feet of wetlands or aquatic features; and (7) conduct pre-activity surveys for elderberry plants within 165 feet of areas where vegetation disturbance would occur and consult with FWS if elderberry is identified in these areas to determine if additional protective measures are necessary. We estimate implementation of YCWA's Integrated Vegetation Management Plan would have a levelized annual cost of $60,700, and our recommended modifications to it would have an additional estimated levelized annual cost of $24,300. We conclude that the benefits to terrestrial resources would be worth the cost.

Temperature Monitoring for Foothill Yellow-legged Frog

As discussed in section 3.3.3.2, in the subsection *Foothill Yellow-legged Frog*, monitoring water temperature below Our House and Log Cabin Diversion Dams, as proposed in YCWA's proposed Water Temperature Monitoring Plan (WR7) and required by Forest Service 4(e) condition 44 and preliminary 401 condition 14, is

necessary to ensure project operation does not affect the seasonal fluctuations in water temperature that trigger breeding behavior for foothill yellow-legged frogs or reduce development rates for tadpoles, which require temperatures above 16ºC. Breeding activity for this species typically starts at water temperatures around 10ºC. Eggs take two to three weeks to develop. Continuing high spring flow releases after this period could result in egg masses or tadpoles being washed out of ideal habitat. Tadpoles develop through the summer and metamorphosis occurs in late summer, so low water temperatures can inhibit the timing of foothill yellow-legged frog metamorphosis and tadpole growth.

Because the recommended flow measures may cause water temperatures in the Middle Yuba River and Oregon Creek to warm later than under existing conditions, we recommend that YCWA monitor water temperature from April 1 through September 15 for 3 years at two foothill yellow-legged frog breeding sites in the Middle Yuba River downstream from Our House Diversion Dam and at two sites in Oregon Creek downstream of Log Cabin Diversion Dam. Monitoring sites should be selected to represent the upstream and downstream limit of breeding sites in each reach. After 3 years, we recommend that YCWA prepare and file a report that: (1) summarizes the results of this temperature monitoring; (2) evaluates how often water temperatures fall below 16ºC during the tadpole development period; and (3) describes any changes in flow releases from Our House and Log Cabin Diversion Dams that may be warranted to address adverse effects on foothill yellow-legged frog reproduction. We estimate that annualized cost of water temperature monitoring and preparation of the summary report would be $4,280, and we conclude that the benefits warrant the costs.

Decontamination to Prevent the Spread of Chytrid

YCWA's proposed Upper and Lower Yuba Aquatic Management Plans include measures to decontaminate equipment between monitoring sites to prevent the spread of chytrid fungus and invasive invertebrates. Although we are not recommending the Upper Yuba River Aquatic Management Plan, it would be required by Forest Service condition 43. Similar measures are also included in the Aquatic Invasive Species Management Plan for mussel sampling. However it is not clear whether other activities that fall outside these plans, including treatment of weeds in riparian areas or other operation-related activities that could include the use of waders or other equipment in streams would receive the same decontamination procedure.

As a component of its sensitive amphibians management plan, FWS recommends (10(j) recommendation 8) that YCWA establish decontamination protocols to ensure that any project activities that require movement from one waterbody to another have decontamination measures implemented.

Based on our analysis in section 3.3.3.2, in the subsection *Foothill Yellow-legged Frog*, we find that implementing decontamination procedures, consistent with those described in the Aquatic Invasive Species Monitoring Plan, during any project activities

that require movement from one waterbody to another would provide additional protection to sensitive amphibians and aquatic resources. We find that the costs for this measure would be negligible because the additional activities not already covered by the Upper and Lower Yuba Aquatic Management Plans and Aquatic Invasive Management Plan that would require implementing decontamination protocols are limited.

Bald Eagle and American Peregrine Falcon Management Plan

Constructing a new auxiliary flood control outlet on New Bullards Bar Dam and developing public access below the dam could potentially disturb and adversely affect nesting peregrine falcons in the dam vicinity. YCWA proposes to implement the Bald Eagle and American Peregrine Falcon Management Plan (TR2) to minimize project effects on bald eagles and falcons. The proposed plan includes surveys for peregrine falcons during the first year of the new license and once every 5 years for the license term or until a new nest is documented. In comments on the draft EIS, the Forest Service provided new information that a pair of peregrine falcons are known to perch for extended periods within a hole near the top of the south side of New Bullards Bar Dam and suspect a nest may be present in the vicinity. Because peregrines do not nest every year, the Forest Service states a survey during the first year of the project license might not detect a new nest location, and no protection measures would be in place.

Based on our analysis in section 3.3.3.2, in subsection *Special-status Wildlife*, we conclude that modifying the proposed Bald Eagle and American Peregrine Falcon Management Plan to include annual surveys for peregrine falcon nests, or until a new nest is documented, would increase the likelihood that the unknown peregrine falcon nesting location would be identified and protected. We find that the frequent presence of peregrine falcons at the dam indicates a nest is present likely nearby. Annual surveys would identify the nest location during the next nesting year and enable implementation of appropriate protection measures, as identified in the plan, including limited operation periods for vegetation maintenance or non-routine activities that result in loud noises that could disrupt nesting success. Depending on the nest location, this could include activities associated with construction of the new spillway. Surveys would occur during the proposed annual bald eagle surveys and would have minimal effects on the cost of plan implementation. We estimate the levelized annual cost of implementing staff's recommended modification would be $590, and the benefits to peregrine falcons would be worth the cost.

Recreation Flow Information

The project affects whitewater boating opportunities on the reaches downstream of New Bullards Bar and Our House Diversion Dams because, under current operations, flows are diverted from the reaches, and minimum flow releases do not provide sufficient flow for whitewater boating. Also, other constraints, such as lack of available flow information, may discourage boaters from taking advantage of existing opportunities when flows are within the boatable range. YCWA proposes to provide publicly available

real-time flow information from the following gages: North Yuba River upstream and downstream of New Bullards Bar Reservoir, Middle Yuba River downstream of Our House Diversion Dam, Oregon Creek downstream of Log Cabin Diversion Dam, and Yuba River at Smartsville and Marysville.

Forest Service 4(e) condition 47 is consistent with YCWA's proposal, and FWN recommends including YCWA's proposed measure in a new license. The Water Board indicates it would include a requirement (preliminary 401 condition 21) for YCWA to develop a plan in consultation with others to specify scheduling, flow, duration, and method of public notification of flows for the reach downstream of Our House Diversion Dam.

BLM, the National Park Service, and FWN support YCWA's proposal relative to providing recreation flow information. FWN also recommends that YCWA be required to publicly report short- and long-term forecast flows and flow ramping rates on the lower Yuba River (downstream of Englebright Reservoir) and the Middle Yuba River downstream of Our House Diversion Dam. The Forest Service recommends (10(a) recommendation 18) providing public flow information from gages on the North Yuba River downstream of New Bullards Bar Dam and the Yuba River at Smartsville and Marysville.

Based on our analysis in section 3.3.5.2, in the subsection *Whitewater Boating Use and Flow Information*, the lack of reliable and publicly available flow information constrains recreational boating in various reaches downstream of project facilities. Providing real-time and forecast flow information to the public would ease this constraint by providing the certainty and predictability boaters need to determine when suitable boating conditions exist. It would also be consistent with the current trend of providing real-time and forecast flow information at an increasing number of gaging stations located on California streams and rivers. Therefore, we recommend YCWA provide recreation flow information and forecasts to the public, consistent with its proposal and the supplemented RR2 content suggested in its July 30, 2018, comment letter.[132] We find this measure would provide a benefit to recreational boaters and be worth our estimated levelized annual cost of $5,120.

Changes to the Project Boundary

The existing project boundary includes lands that are not needed for the continued project operation and maintenance. YCWA proposes to revise the project boundary to: (1) include lands necessary for current and future operation and

[132] Because the proposed revision relates to flow information, we believe YCWA proposes revising its condition RR2, Provide Recreation Flow Information, rather than, as stated in its comment letter, RR3, Provide Whitewater Boating Below Our House Diversion Dam.

maintenance and recreation development; (2) remove lands where there are no project-related uses necessary for operation and maintenance; and (3) reduce the shoreline buffer of project impoundments to 30 feet where project infrastructure and recreation facilities are not located along the shoreline. YCWA's proposed changes would remove 1,591.8 acres from within the project boundary. No agencies or stakeholders commented on the proposed changes to the project boundary.

Based on our analysis in section 3.3.6.2, in the subsection *Project Boundary*, we find that, in general, YCWA's proposed changes to the project boundary reflect lands needed to fulfill project purposes, with two exceptions. Around New Bullards Bar Reservoir, the proposed reduction in land within the project boundary would continue to provide sufficient shoreline access and be consistent with Commission guidelines that the project boundary should not extend more than 200 feet upslope from the NMWSE. However, comparing the proposed project boundary, as shown on exhibit G maps, and the proposed West Shoreline Trail alignment, as shown in the proposed Recreation Facilities Plan, the proposed project boundary would remove at least some project lands where this trail would be constructed. The trail would be part of YCWA's recreation facilities that support public access to the project, and we recommend that the project boundary include the trail in any new license issued for the project.

Additionally, the proposed project boundary does not appear to include sufficient land for operating and maintaining the New Bullards Bar Dam auxiliary flood control outlet. We note this proposed facility would require an access road, borrow sites, and disposal areas that appear to be located outside the proposed project boundary. YCWA would likely need to periodically use the access road after construction to perform maintenance at outlet works (e.g., remove vegetation, repairs). Similarly, borrow and disposal sites would likely require ongoing monitoring and treatment to address erosion and visual effects. Accordingly, these lands would be necessary for the construction and maintenance of the auxiliary flood control outlet, and therefore, should be enclosed within the project boundary.

Therefore, for the reasons noted above, we recommend YCWA modify the proposed project boundary to enclose project land in the vicinity of: (1) Marysville Road and New Bullards Bar Dam access road, and (2) the west shoreline of New Bullards Bar Reservoir between Cottage Creek Campground and Madrone Cove Boat-in Campground. Because these lands are already part of the project boundary of the current license, there is no cost (relative to existing conditions) to enclose these lands within the project boundary.

In response to the staff recommendation in the draft EIS, YCWA (July 30, 2018, comments on the draft EIS) proposes to modify the project boundary consistent with the staff recommendation.

Historic Properties Management Plan

Continued project operation and enhancements, recreational use, and new construction could affect cultural resources listed in or eligible for inclusion in the National Register. YCWA proposes to manage effects on historic properties through the implementation of its HPMP. Appendix A of the HPMP includes a June 13, 2016, letter from the California SHPO providing concurrence with the measures contained in the HPMP. Further, YCWA received Forest Service approval of the HPMP on June 29, 2016, and the Forest Service (4(e) condition 50) specifies that it be implemented for historic properties located on NFS lands.

Based on our analysis in section 3.3.7.2, in the subsection *Historic Properties Management Plan*, we conclude YCWA's HPMP provides measures that are consistent with the Commission and Advisory Council's 2002 guidelines. Implementation of the HPMP would ensure that project-related effects on cultural resources would be considered and the appropriate management measures would be implemented prior to undertaking project activities. However, following preparation of the HPMP that was included in the amended final license application, YCWA acknowledged that subsequent changes to the project boundary, construction activities, California SHPO consultation, and information received from participating tribes would require additional modifications to the HPMP. YCWA also proposes to retain an ethnographer to compile background information on the Wenepem Maidu, conduct interviews with Nisenan who used or resided near recreation areas, and conduct an on-site visit to record use areas. However, the results of this work have not been provided.

Therefore, we recommend YCWA revise the HPMP included in the amended final license application (CR1) to include: (1) cultural resources information and consultation results developed after preparation of the 2016 draft HPMP; (2) updated determinations of National Register eligibility of six historic sites (CA-YUB-1751H, CA-YUB-1760H, CA-YUB-1762H, CA-YUB-1768H, CA-YUB-1770H, and CA-YUB-1736H) and the New Colgate Penstock; (3) clarification of the description of site CA-SIE-19849H (previously CA-YUB-1733H); and (4) the results of the supplemental TCP study filed on June 22, 2018, and all associated correspondence. Including additional follow-up consultation with the California SHPO and final eligibility determinations in the revised HPMP would ensure that the HPMP captures the current National Register status of these sites. Clarifying the description of site CA-SIE-1849H in the revised HPMP would also ensure that this resource is appropriately addressed. Including the results of the final TCP study would provide clarity in the HPMP. We estimate implementation of the revised HPMP would have a levelized annual cost of $6,100. Our recommended revisions to the plan, which are needed to fulfill the Commission's responsibilities under section 106 of the NHPA, would have an estimated levelized annual cost of $260, and the benefits to cultural resources would be worth 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 YCWA or other interested parties would not contribute to the best comprehensive use of Yuba River 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.

Additional Consultation and Review

YCWA proposes to organize an ecological group comprising various stakeholders and host meetings at least once a year (GEN1) and conduct an annual review of federally listed and special-status species, assess newly added species occurring on federal land, and, if necessary, consult with agencies to develop and implement protection measures (GEN2). Forest Service 4(e) conditions 2 and 30 specify implementation of both of these measures. California DFW (10(j) recommendation 1.1) and FWN recommend implementation of GEN1, and NMFS (10(j) recommendation 7) recommends implementation of GEN2. FWS comments that an annual review of federally listed species is not consistent with the ESA because species lists cover a period of 90 days, and it is not clear how YCWA would respond to a new listing between the listing and the annual review. Thus, FWS recommends (10(j) recommendation 6) that YCWA develop a new list of threatened and endangered species every 120 days and consult with FWS if a new species is listed. FWS also recommends (10(j) recommendation 6) that YCWA: (1) complete ESA consultation prior to initiating project improvements; (2) contact FWS if a hazardous materials spill occurs; (3) consult with FWS regarding use of pesticides; and (4) perform surveys for elderberry shrubs prior to the start of project activities and consult with FWS if the surveys find elderberry shrubs.

Our analysis in sections 3.3.2.2 and 3.3.3.2, indicates that although we agree that consultation prior to new construction and non-routine maintenance would help protect federally listed species and their habitats over the term of the license, we typically do not include license conditions that require compliance with applicable environmental statutes, such as ESA. If ESA issues arise during the term of the license, either based on new listings or availability of new information, post-licensing procedures developed by the Commission and resource agencies (FERC et al., 2000) provide a framework for identifying issues, information gaps, and need for protection measures. The Commission typically includes in its licenses a standard license article providing such protection. If a licensee does not agree to implement needed measures, this license article contains a fish and wildlife reopener provision that could be used to require changes to project facilities or maintenance plans upon Commission motion, or as recommended by the appropriate state and federal fish and wildlife agencies, after notice and opportunity for hearing. This standard reopener 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 the license issued for the project. Additionally, YCWA's proposed plans include agency review and consultation for reports, prior to Commission approval. Implementation of an annual ecology group meeting would be redundant because there is already a mechanism for agency comment, and it is unclear how the meeting would provide additional benefit to environmental resources in the project area. Although we have no objection to YCWA conducting this agency consultation, the standard license article would provide a similar level of protection as the proposed measure. We find the benefits of an annual consultation meeting and annual review of sensitive species lists are not worth the estimated levelized annual cost of $26,620. Therefore, we do not recommend including these measures as part of any new license issued for the project. However, we recognize that these annual review and consultation measures are included in Forest Service's 4(e) conditions 2 and 30 and Water Board preliminary 401 condition 26 and would be included as mandatory conditions in any license issued for the project.

With respect to FWS's additional consultation recommendations, we note that ESA consultation between the Commission and FWS would be completed prior to the issuance of a new license. As such, requiring consultation as a component of project plans is not necessary. As discussed above, we have recommended modifications to the Hazardous Materials Management Plan and Integrated Vegetation Management Plan to address FWS's comments related to hazardous material spills, use of pesticides, and surveys for elderberry plants.

Annual Training

Implementation of project operation and maintenance activities would require interactions between YCWA staff and sensitive resources. To minimize potential for inadvertent effects, YCWA proposes to provide annual environmental training for employees. Some components of this training are identified in resource management plans. For example, the Integrated Vegetation Management Plan includes training YCWA staff to recognize sensitive and non-native invasive plant species. However, the extent of the full training curriculum is not clear. While we agree such training would benefit environmental resources, licensees are expected to train their employees to the extent needed for the licensee to maintain compliance with a license. Therefore we do not recommend incorporating this measure as part of any license issued for the project. This measure, however, would be required by Forest Service 4(e) condition 28 and Water Board preliminary 401 condition 27 and would be included as mandatory conditions in any license issued for the project.

Coordinated Operations Plan

YCWA's Narrows 2 Powerhouse and PG&E's Narrows Project both receive water from Englebright Reservoir and measure license compliance at streamflow gages on the Yuba River downstream of the facilities. YCWA proposes to consult with PG&E following licensing to develop a coordinated operations plan to make efficient use of available water (GEN4). California DFW (10(j) recommendation 2.8) and the Water Board (preliminary 401 condition 28) both support the proposed plan. Additionally, Water Board preliminary 401 condition 28 specifies the submittal of status updates during the development of the coordinated operations plan.

Based on our analysis in section 3.3.2.2, in the subsection *Coordinated Operations*, we find development of a coordinated operations plan would not be necessary to assure efficient and timely implementation of future license conditions. Coordinated project operations would be required and decided upon by YCWA and PG&E regardless of whether a separate plan is in place. If an agreement on coordinated operations between YCWA and PG&E is not reached, YCWA would ultimately consult with the Commission to continue operations and meet the terms of the new license. Neither an additional plan nor submission of status updates would provide clear benefits. Therefore, we conclude that development of a coordinated operations plan is not worth the estimated levelized annual cost of $11,670 and do not recommend including this measure as part of any license issued for the project. However, we recognize that a coordinated operations plan is included in the preliminary 401 condition 28 and would be included as a mandatory condition in any license issued for the project if it is included in the final certification.

Water Temperature Monitoring Plan

YCWA proposes to implement its Water Temperature Monitoring Plan (WR7) with the rationale that this monitoring would result in a long-term record of water temperature in the project area that would be useful as general information and would help explain ecological perturbations observed during the license term. Monitoring would occur annually for the duration of a new license period at 14 stream locations. The plan also calls for vertical profiles in New Bullards Bar Reservoir and Englebright Reservoir at one location near the corresponding dams once each month from April through September.

Commenting agencies generally agree with YCWA's proposal, including California DFW 10(j) recommendation 2.24, Forest Service 4(e) condition 44, and Forest Service 10(a) recommendation 14. Water Board preliminary 401 condition 14 is generally the same as WR7, but also specifies water temperature monitoring of inflow to project reservoirs.

We agree that water temperature monitoring would help to ensure project operation does not affect the seasonal fluctuations in water temperature that trigger breeding behavior for foothill yellow-legged frogs.

However, we note that YCWA's proposed flow-related measures are expected to generally maintain or reduce water temperatures in project-affected waters. There appears to be little basis for requiring a broad water temperature monitoring plan to verify probable improvements in water temperature that would occur from YCWA′s proposal for the full duration of any license issued for the project. Rather than fully adopt YCWA's proposed temperature monitoring plan, we recommend requiring monitoring of water temperature in the Middle Yuba River and Oregon Creek to assess the potential effects of increased flow releases on the suitability of water temperatures for foothill yellow-legged frogs. We estimate implementation of YCWA's WR7 would have a levelized annual cost of $46,560; however, because these broad water temperature monitoring efforts are not warranted, neither are the costs. In contrast, our recommended targeted monitoring measure would have a levelized annual cost of $5,280 and would directly benefit foothill yellow-legged frogs in the Middle Yuba River and Oregon Creek. We recognize that a water quality monitoring plan is included in preliminary 401 condition 13 and Forest Service 4(e) condition 44. Forest Service 4(e) condition 44 would be included as a mandatory condition in any license issued for the project; if the Water Board's final certification includes a condition for water temperature monitoring, it would also be included as a mandatory condition in any license issued for the project.

Water Quality Monitoring Plan

YCWA proposes to implement its Water Quality Monitoring Plan (WR8) to sample *in situ*, general, and recreation water quality and bioaccumulation data with the intent of identifying unexpected water quality issues under a new license. YCWA would:

- Conduct *in situ* sampling of water temperature, DO, pH, specific conductance, and water clarity during either August or September of years 1 through 3 of the new license.
- Conduct *in situ* sampling upon initiation of operation of the proposed New Bullards Bar Dam low-level outlet and New Colgate Powerhouse tailwater depression system.
- Sample general water quality (i.e., dissolved and suspended solids, organic carbon, inorganic ions, nutrients, and metals) targeting below normal or drier water year periods.
- Monitor recreation water quality parameters (i.e., sample total coliform, fecal coliform, *E. coli*, and total petroleum hydrocarbons in the gasoline range; and visual observations of oil and grease on the water) in years 1 through 3 of the new license and periodically throughout the license term.
- Collect aquatic organisms and conduct bioaccumulation analyses of their tissues periodically throughout the license term.

YCWA's proposed Water Quality Monitoring Plan is recommended by California DFW 10(j) recommendation 2.25, specified for NFS lands in Forest Service 4(e) condition 45, and recommended for non-NFS lands in Forest Service 10(a) recommendation 15.

Water Board preliminary 401 condition 13 specifies a water quality monitoring plan, which includes monitoring *in situ* conditions, water chemistry, recreation-related water quality, and bioaccumulation components. These requirements are consistent with YCWA's proposed Water Quality Monitoring Plan. In addition, preliminary 401 condition 13 specifies that YCWA notify the Water Board immediately at any point when monitoring suggests water quality conditions exceed Basin Plan water quality objective(s).

Based on our analysis in section 3.3.2.2, in the subsection *Water Quality Monitoring*, we find development of a water quality monitoring plan would be of no value, from a license compliance perspective. Therefore, we conclude that development of a water quality monitoring plan is not worth the estimated levelized annual cost of $32,330, and we do not recommend including this measure as part of any license issued for the project. However, we recognize that a water quality monitoring plan is included in preliminary 401 condition 13 and Forest Service 4(e) condition 45. Forest Service 4(e) condition 45 would be included as a mandatory condition in any license issued for the project; if the Water Board's final certification includes a condition for water quality monitoring, it would also be included as a mandatory condition in any license issued for the project.

Upper Yuba River Aquatic Monitoring Plan

Our recommended and YCWA's proposed project operation would include several modifications to existing operations that could affect biotic habitat and biota in the Upper Yuba River. These changes include increased minimum instream flows, controlled spill recession rates, fish stocking, and LWM and sediment management.

YCWA proposes to implement its Upper Yuba River Aquatic Monitoring Plan (AR7) that would include the collection of data on the distribution, abundance, and physical condition of stream fishes, BMI, foothill yellow-legged frog, and western pond turtle in addition to habitat characteristics (channel morphology, riparian vegetation, and LWM) in the Middle Yuba River, Oregon Creek, North Yuba River, and Yuba River from the confluence of the North and Middle Yuba rivers to Englebright Reservoir.

California DFW (10(j) recommendation 2.23), Forest Service, and FWN support YCWA's plan as described above.[133] Interior also supports YCWA's proposed plan; however, if the foothill yellow-legged frog becomes a federally listed species in the future, Interior asks that YCWA conduct additional monitoring for foothill yellow-legged frogs in below normal, dry, or critically dry water years following a below normal, dry, or critically dry water year.

The Water Board (preliminary 401 condition 15) states that it would likely require YCWA to develop a plan to collect information regarding aquatic resources in project-affected creeks, rivers, and reservoirs upstream of Englebright Dam. The Water Board further specifies that the plan should provide information on project impacts to designated beneficial uses, and monitoring should identify effects on aquatic resources resulting from protection, mitigation, and enhancement measures. The Water Board may also include specific metrics or methods to be included with the plan or include specific measures to be implemented for adaptive management, based on the data collected.

Monitoring the distribution and abundance of fish, western pond turtles, and foothill yellow-legged frogs would track changes in these variables over time, but the proposed plan does not include any mechanisms to isolate project-related effects from non-project-related effects on these resources. Additionally, the plan does not identify how monitoring results would affect project operation. Further, the best available science indicates that YCWA's proposed measures for increasing sediment transport and increasing LWM at the Our House and Log Cabin Diversion Dams would provide net benefits to aquatic resources in Oregon Creek and the Middle Yuba River. Monitoring of biotic populations to quantify these benefits is not needed because it would not provide additional benefit.

In section 5.1.1, we recommend adopting YCWA's proposed Log Cabin and Our House Diversion Dams Sediment Management Plan (GS2), which would maximize sediment transport through these facilities. These measures would restore sediment transport to stream reaches below the diversion dams. Monitoring channel geometry and substrate in these areas would quantify the results of sediment transport, but it is not clear how this monitoring would be used to modify project operations. Therefore, such monitoring would provide no additional benefit. The same is true for proposed measures to monitor LWM. As discussed in section 3.3.2.2, in the subsection *Managing Sediment and Large Woody Material in the North and Middle Yuba Rivers and Oregon Creek*, YCWA proposes to pass all LWM over the Our House and Log

[133] Forest Service 4(e) condition 43 specifies that YCWA implement its Upper Yuba River Aquatic Monitoring Plan for locations on NFS lands and its 10(a) recommendation 13 recommends the plan apply to non-NFS lands, consistent with YCWA's proposal.

Cabin Diversions Dams. Monitoring LWM in these reaches would identify retention rates and track changes in LWM density over time, but it is not clear how that information would be used to modify project operation or what additional benefit it would provide to aquatic resources.

As discussed in section 5.1.3, in the subsection *Sediment and Large Woody Material Enhancement below New Bullards Bar Dam*, we do not recommend sediment or LWM enhancement measures in the bypassed reach between the New Bullards Bar Dam and the Middle Yuba River confluence. As discussed below, we do not recommend the passage of sediment or LWM downstream of New Bullards Bar Dam in the bypassed reach between the dam and the Yuba River confluence. Additionally, as discussed in section 3.3.2.2, in the subsection *Upper Yuba River Aquatic Monitoring*, we do not recommend modifying project operation based on the results of the proposed stream channel morphology and LWM monitoring components of YCWA's Upper Yuba River Aquatic Monitoring Plan as specified by Water Board (preliminary 401 condition 15). Therefore, there is no value in monitoring channel morphology and LWM in this reach, and consequently, we do not recommend implementing the proposed and recommended stream channel morphology or LWM monitoring measures in this reach.

While we agree that BMI assemblages are an important part of the aquatic ecosystem and provide a fundamental food source for many resident fish, most of the physical habitat characteristics that YCWA proposes to monitor with BMI (e.g., channel width, substrate composition, pebble counts, and canopy cover) would also be included in the proposed monitoring of other aquatic resources (i.e., stream fish monitoring). Additionally, the implications of any effects on BMI could be observed through stream fish and water quality monitoring proposed by YCWA. Therefore, it is unclear what unique value the BMI monitoring component of YCWA's proposed Upper Yuba River Aquatic Monitoring Plan would provide, and as such, we do not recommended it as a component of the plan.

The objective of YCWA's riparian vegetation monitoring component in its Upper Yuba River Aquatic Monitoring Plan is to determine the effects of proposed operation measures (e.g., increased minimum instream flows and controlled spill recession rates) on riparian habitat. While we agree this monitoring would provide valuable information to track the condition of riparian forests in the project area, it is not clear how the results of the monitoring would be used to inform project operation or assess mitigation needs. Therefore, we do not recommend it as a component of the plan.

We estimate that the levelized annual cost of implementing the Upper Yuba Aquatic Monitoring Plan would be $181,310, and that the benefits to aquatic and terrestrial resources would not be worth the cost. However, we recognize that an aquatic monitoring plan for the upper Yuba River is included in Water Board preliminary 401 condition 15 and Forest Service 4(e) condition 43 and would be

included as a mandatory condition in any license issued for the project if it is included in the final certification or 4(e) condition.

Extending Lohman Ridge Diversion Tunnel Closure Periods

YCWA's fish monitoring study detected fish entrainment in the Lohman Diversion Tunnel. Fish entrained into the Lohman Ridge and Camptonville Diversion Tunnels may affect the species composition and recruitment of fish to the reaches downstream of the diversion facilities.

YCWA proposes to periodically close the Lohman Ridge Diversion Tunnel (AR11) during wetter water years and when there is sufficient storage in New Bullards Bar Reservoir to meet water management objectives. If the end-of-March New Bullards Bar Reservoir storage is 775,000 acre-feet or greater and the subsequent April is a wet water year (defined in YCWA's proposed measure WR2), YCWA would close the Lohman Ridge Diversion Tunnel within 2 business days of publication of California DWR's April Bulletin 120, and it would remain fully closed through September 30 of that calendar year. Concurrent with the Lohman Ridge Diversion Tunnel closure, YCWA would open the low-level outlet and fish release valve at Log Cabin Diversion Dam, but may leave the Camptonville Diversion Tunnel fully open. Additionally, if May is a wet, above normal or below normal water year (defined in YCWA's proposed measure WR2) and the subsequent end-of-September New Bullards Bar Reservoir storage is 600,000 acre-feet or greater, YCWA would fully close the Lohman Ridge Diversion Tunnel from October 1 through December 31 of that calendar year.

The Forest Service specifies (4(e) condition 35) that YCWA should periodically close the Lohman Ridge Diversion Tunnel under the same circumstances as described in YCWA's proposed measure AR11.

FWS supports YCWA's proposed tunnel closures in concept, but argues that the proposed closure periods would not be sufficient to cover the most important migratory period of rainbow trout. FWS 10(j) recommendation 10 calls for YCWA to periodically close the tunnel during the spring and summer periods as described above. Additionally, it calls for YCWA to fully close the Lohman Ridge Diversion Tunnel from October 1 through December 31 of each year, regardless of the water year type. California DFW's 10(j) recommendation 2.13 is the same as FWS's 10(j) recommendation 10. FWN supports FWS and California DFW's recommendations for increased tunnel closures during the fall.

In section 3.3.2.2, in the subsection *Fish Entrainment*, we note that the estimated daily entrainment under current operations is about 0.56 fish/day for the Lohman Ridge Diversion Tunnel and 0.03 fish/day for the Camptonville Diversion Tunnel. The proposed tunnel closure would have a number of environmental benefits in addition to the reduced risk of entrainment, including maintaining more natural flow in Oregon Creek and Middle Yuba River and the associated aquatic habitat benefits, as well as improved recreation opportunities for whitewater boating and fishing downstream of the

diversion dams. We agree that FWS and California DFW's 10(j) recommendations for increasing Lohman Ridge Diversion Tunnel closures would reduce the potential for rainbow trout and other fish to be entrained through the diversion tunnel more than YCWA's proposed measure AR11. However, the risk of entrainment is low, and the tunnels do not lead to a generating facility where fish are subject to injury from turbine strikes. Additionally, entrainment studies suggest that entrained fish may swim back through the diversion tunnels and return to Oregon Creek or the Middle Yuba River.

In its comments on the draft EIS, the Forest Service states that one of the main objectives for tunnel closures, as a way to reduce impacts associated with entrainment, is to maintain fish and other aquatic organism biomass in their native streams and that fish are entrained at a rate greater than 30 percent into the project's tunnel system. The Forest Service contends that rainbow trout populations upstream and downstream of Our House Diversion Dam are not in good condition. The Forest Service correctly notes a 30 percent entrainment rate into the Lohman Ridge Diversion Tunnel. However, this does not mean that 30 percent of the fish community upstream of the diversion dams are regularly entrained into the diversion tunnels. YCWA only tagged rainbow trout and brown trout during the entrainment study; other species that inhabit Oregon Creek and the Middle Yuba River upstream of the diversion dams may or may not be entrained at the same rate. Regarding the condition of rainbow trout populations in the Middle Yuba River and Oregon Creek, YCWA staff observed multiple age-classes of rainbow trout upstream and downstream of both diversion dams, suggesting successful reproduction and population sustainability, in spite of the diversion tunnels. Considering the low daily entrainment rates and the limited risk of mortality associated with entrainment through turbines, we conclude YCWA's proposed measure AR11 would reduce the existing entrainment rates and that the higher frequency of tunnel closures recommended by FWS and California DFW would have negligible additional benefit.

We also consider the potential for diverted water to be spilled at New Bullards Bar Dam and consequently have no benefit to generation. In section 3.3.2.2, in the subsection *Ramping Rates and Controlling Project Spills Upstream of Englebright Dam*, we note that YCWA's proposed measures would close the tunnel beginning in April through September, in 7 of 41 years (17 percent of years), and would prevent an average diversion of 131,289 acre-feet in those years. YCWA's proposed measures would close the tunnel from October through December, in 24 of 41 years (59 percent of years) and would prevent an average diversion of 11,788 acre-feet per year during those years. California DFW and FWS's recommendations would result in 4 additional spring closures, resulting in approximately 413,206 acre-feet of water that would not be diverted, and 17 additional fall closures, resulting in 199,732 acre-feet of water that would not be diverted. During those same water years from April through September, YCWA's operations model of base case conditions for New Bullards Bar Reservoir spillways indicate that 164,283 acre-feet of water would be spilled from New Bullards Bar Dam and about 248,923 acre-feet of water would not have remained in the reservoir

and been available for generation. During the same water years from October through December, YCWA's operations model of base case conditions for New Bullards Bar Reservoir spillways indicate that 116,752 acre-feet of water would be spilled from New Bullards Bar Dam and about 82,980 acre-feet of water would not have remained in the reservoir and been available for generation.

We also consider the recreational benefits associated with periodically closing the tunnel. Under YCWA's proposal, the number of days when the level of flow is within the boatable range would increase in about 9 of 41 years in the period of record; closing the tunnel in wet and above normal years (FWS, California DFW, and FWN recommendation) would provide this benefit in about 20 of 41 years. However, the effects associated with diverting flow in above normal water year types are addressed by YCWA's proposed whitewater boating flows below Our House Diversion Dam (RR3), which would provide 6 weekend days of flows between October 1 and March 31 in above normal water years. The scheduled releases would provide more predictable boating opportunities than tunnel closure would. If, over time, providing a more natural flow regime in the reach associated with the YCWA's tunnel closure improves fish habitat, angling opportunities may increase. However, it is not certain that there would be any notable incremental angling benefit from additional tunnel closure beyond that proposed by YCWA.

Therefore, while we find that YCWA's proposed tunnel closure would benefit environmental resources, we do not agree that the benefits of the additional tunnel closures recommended by the agencies are worth the estimated levelized annual cost of $457,090, and we do not recommend including them as part of any license issued for the project.

Sediment and Large Woody Material Enhancement below New Bullards Bar Dam

New Bullards Bar Dam traps sediment and LWM that otherwise would be transported through the 2.4-mile bypassed reach between the dam and the confluence with the Middle Yuba River. YCWA does not propose to perform any sediment or LWM enhancement in this reach. The Forest Service (10(a) recommendation 5), FWS (10(j) recommendation 9), BLM (10(a) recommendation 3), and California DFW (10(j) recommendation 2.19) all recommend that YCWA develop and implement a North Yuba River LWM and sediment enhancement and management plan.

The agencies' recommended plan for gravel/cobble and LWM placement in the North Yuba River downstream of the dam would provide habitat enhancement for fishes, including rainbow trout. However, as discussed in section 3.3.1.2, in the subsection *Sediment Transport in the North Yuba River*, spill events in this reach occur regularly and can vary greatly in magnitude; peaks events would exceed 40,000 cfs. In addition, the narrow channel and its steep gradient (2 percent on average, with sections as steep as 5.5 percent) result in high-flow velocities that would mobilize both the

gravel/cobble and LWM. Simulated flow velocities at a relatively low spillage flow of 2,880 cfs showed maximum velocities of from 5 to 21 feet per second, and higher spillage flows would undoubtedly result in even higher velocities across more of the channel. Both anchored and unanchored LWM is expected to be mobilized by even less than peak flow events. Mobilization would require frequent replenishment of gravel/cobble and LWM, following monitoring, to meet the recommendations of the agencies. Considering the limited habitat benefits and the need for frequent replenishment, the major logistical effort required to repeatedly access a river reach that has limited to no access for this type of augmentation program, and the estimated levelized annual cost of $722,100, we do not recommend including this measure as part of any license issued for the project.

Use of New Colgate Power Tunnel Upper Intake to Control Downstream Water Temperatures

Since 1993, at the recommendation of FWS and California DFW, YCWA has not used the New Colgate Power Tunnel upper intake, with the intention to only use the coldest water in New Bullards Bar Reservoir for downstream flow releases. YCWA proposes to continue to only use the lower intake during operation of the New Colgate Powerhouse. The Water Board (preliminary 401 condition 8) specifies, and FWS (10(j) recommendation 13) and California DFW (10(j) recommendation 2.7) recommend that YCWA operate the New Colgate Power Tunnel upper intake during March through May and potentially during June through September, to provide a thermal regime to support greater growth and reproduction of both resident and anadromous salmonids. FWN also supports use of the upper intake. The Water Board (preliminary 401 condition 8) specifies that it would likely condition the operation and maintenance of the upper and lower intakes for New Colgate Powerhouse. YCWA comments that because of the higher elevation of the upper intake, that intake may not always be available at some reservoir levels.

Use of the upper intake is not expected to provide ecological benefit (i.e., improvement in water temperatures) because the frequency of sub-optimal daily mean temperature for salmonids (i.e., temperatures exceeding 20°C) and temperatures supporting salmonid growth (i.e., 12°C to 20°C) would be virtually the same as under YCWA's proposed operation (tables 3-39 and 3-40, respectively) and would not justify the estimated cost. The upper intake would also be unavailable for use a substantial period of time in March through May, and other months, particularly in dry water years.

Therefore, we conclude that use of the New Colgate Power Tunnel upper intake would not substantially benefit aquatic resources in the downstream Yuba River and is not worth the estimated levelized annual cost of $1,125,650. We do not recommend including this measure as part of any license issued for the project. However, we recognize that a coordinated operations plan is included in the Water Board preliminary 401 condition 8 and would be included as a mandatory condition in any license issued for the project if it is included in the final certification.

Adaptive Resolution Imaging Sonar-based Monitoring Program

As a component of its Lower Yuba River Aquatic Monitoring Plan (AR8), YCWA proposes to monitor Chinook salmon and steelhead in the lower Yuba River during periods when changes in flow releases could result in fish strandings. NMFS recommends (10(j) recommendation 6) that YCWA install an Adaptive Resolution Imaging Sonar underwater camera in the vicinity of Narrows 2 Powerhouse tailrace to further monitor interactions of anadromous fish with Narrows 2 facilities and operation. Based on our analysis in section 3.3.2.2, in the subsection *Lower Yuba River Aquatic Monitoring*, we find that, while NMFS's recommended monitoring program has the potential to provide additional data on stranding and/or interactions of anadromous fish with Narrows 2 facilities and operation, studies completed during project relicensing provided information to determine project effects on adult and juvenile salmonids. In addition, as a component of the proposed Lower Yuba River Aquatic Monitoring Plan, YCWA would continue to monitor fish stranding at the Narrows 2 facilities following specified flow reductions and dewatering events and would notify NMFS, California DFW, and the Commission of any fish mortality or stranding incidents. As part of the proposed plan, YCWA may apply for permission to rescue stranded fish or alert agency representatives for an opportunity to conduct a fish rescue. Finally, any adult salmon mortalities documented during the AR8 surveys could be examined in consultation with the resource agencies to determine if they resulted from interactions with the powerhouse structure (i.e., turbine strike) or from prolonged delay or dewatering. If there is evidence of harm caused by project facilities or operation, further study may be warranted. In the event NMFS decides to implement its section 18 authority, NMFS could require additional studies necessary to exercise its authority to require fishways. However, we find the evidence insufficient to require additional measures at this time. We conclude that the benefits of NMFS's recommended use of Adaptive Resolution Imaging Sonar to monitor salmonids are not worth the estimated levelized annual cost of $173,960. Therefore, we do not recommend including Adaptive Resolution Imaging Sonar monitoring as part of any new license issued for the project.

Sensitive Amphibians Management Plan

Several of YCWA's proposed plans and measures (Log Cabin and Our House Diversion Dams Sediment Management Plan [GS2], Water Temperature Monitoring Plan [WR7] (adopted in part in the staff alternative), spill cessation at our House Diversion Dam [AR2] and Log Cabin Diversion Dam [AR12], Aquatic Invasive Species Management Plan [AR5], Upper Yuba River Aquatic Monitoring Plan [AR7], Integrated Vegetation Management Plan [TR1], and Recreation Facilities Plan [RR1]), along with our recommended modifications to them, include components related to protection and habitat enhancement for sensitive frogs. These components include water temperature monitoring, schedules for minimum flows, habitat protection buffers, limited operation periods, management of drains at recreation facilities, development of

recreation resources to avoid effects on sensitive habitat, and education for recreational users to prevent inadvertent disturbance to frogs or their habitat.

FWS recommends (10(j) recommendation 8) that YCWA develop a sensitive amphibians management plan. The components of FWS's recommended plan are discussed below, as well as in 3.3.3.2, as related to foothill-yellow-legged frog, and section 3.3.4.2, as related to California red-legged frog.

Based on our analysis, we find the recommended components of FWS's recommended plan are either: (1) already incorporated into other plans we recommend be included in the license (recommended measures A(i)–A(iv), A(vi), and B(i)); (2) consist of consultation that would occur during finalization of proposed plans prior to Commission approval or during preparation of annual reports (recommended measures B(ii) and B(v)); (3) do not have a nexus to the project (recommended measure A(v)), or (4) do not provide sufficient detail to inform analysis of the benefits of the measure (recommended measures B(iii) and B(iv)). These recommendations and our associated findings are detailed as follows:

- A(i). Bullfrog suppression efforts in Moran Cove as proposed by the licensee, and additional efforts in Oregon Creek and Middle Yuba River in the event that foothill yellow-legged frog becomes federally listed. As discussed under the *Aquatic Invasive Species Management Plan* subsection in section 5.1.3, we do not support bullfrog suppression in Oregon Creek and Middle Yuba River.

- A(ii). Conservation of California red-legged frogs in the Woody Material Management Plan. This measure is addressed in the Integrated Vegetation Management Plan as it pertains to effects of LWM removal from New Bullards Bar Reservoir on bullfrog habitat. Additionally, consultation with FWS would occur during preparation of our recommended LWM enhancement plan and modifications to the Integrated Vegetation Management Plan prior to Commission approval of these plans.

- A(iii). Protection of potential California red-legged frog habitat along West Shoreline Trail. This measure is incorporated into our recommended modifications to the Recreation Facilities Plan.

- A(iv). Direction for formal consultation with FWS for any pesticides planned for use within the project area. Our recommended changes to the Integrated Vegetation Management Plan include additional buffers and BMPs to limit potential exposure of sensitive amphibians to pesticides. Consultation with FWS would occur during revisions to the Integrated Vegetation Management Plan prior to Commission approval.

- A(v). Evaluation of the status of chytrid fungus within the project area. We have not identified a mechanism through which the project influences the

spread of chytrid in the project area. Therefore we conclude there is no project nexus.

- A(vi). Establishment of decontamination protocols to ensure that any project activities that require movement from one waterbody to another have decontamination measures implemented. We recommend YCWA incorporate decontamination protocols identified in the Aquatic Invasive Species Monitoring Plan into all other project activities that require movement from one waterbody to another.

- B. Monitoring of foothill yellow-legged frog populations within the project area. YCWA would monitor foothill yellow-legged frog populations as a component of its Upper Yuba River Aquatic Monitoring Plan, which FWS supports in its comment letter filed August 25, 2017. Although we do not recommend this monitoring, as discussed above in the *Upper Yuba River Aquatic Monitoring Plan* subsection, it would be required by Forest Service 4(e) condition 43 and Water Board preliminary 401 condition 15.

- B(i). Provisions that any hazard tree removal or fuels reduction/slash that is to be cleared will be removed within 24 hours, or will be left in place and not removed, or removed the same day it is cut and not be stored within 1,000 feet of a wetland, riparian area, or critical habitat. YCWA's Integrated Vegetation Management Plan, with our recommended modifications, includes measures to protect sensitive amphibians from the effects of vegetation maintenance. The plan would include FWS's recommended protocols for removal of woody debris from terrestrial areas.

- B(ii). Provisions to work with the FWS, the Forest Service, and California DFW to develop additional minimization measures for when ground disturbance actions are planned within 300 feet of wetlands, riparian areas, and critical habitat. YCWA's Integrated Vegetation Management Plan, with our recommended modifications, includes limits to ground disturbance actions that are planned within 300 feet of wetlands, riparian areas, and critical habitat. Consultation with FWS would occur during revisions to the Integrated Vegetation Management Plan prior to Commission approval.

- B(iii). Consideration of actions within the Recovery Plan for the California Red-legged Frog appropriate for the project. These would include actions to protect wetlands within the watershed and reestablishing populations or supplementing existing populations with additional individuals.

- B(iv). Collaboration with the Forest Service and FWS in developing recovery actions for the California red-legged frog within the project boundary, including conservation actions at Cottage Creek Pond.

  The scope of measures B(iii) and B(iv) is not sufficiently defined to allow an analysis of the costs and benefits of these measures. The Integrated

Vegetation Management Plan includes measures to protect wetlands and aquatic habitat in the project area, but it is not clear what the nexus is to other wetlands in the watershed. FWS's recommendation to include reestablishing populations or supplementing existing populations with additional individuals, developing recovery actions, or implementing conservation actions at Cottage Creek would likely benefit California red-legged frog populations in the project area. However, FWS does not provide the details about how YCWA would contribute to these actions, where other California red-legged frog individuals would come from, what conservation actions are recommended at Cottage Creek Pond, or what the anticipated costs of these measures would be. Therefore, we do not recommend including these measures in any license issued for the project.

- B(v). Inclusion of California red-legged frog consultation during the annual meeting (added as an agenda item to YCWA's proposed condition GEN1). Through the annual consultation process, the Licensee shall ensure that the project is updated with any new or updated plans for the California red-legged frog and is following the most current conservation guidelines. Additionally, the Licensee shall conduct formal ESA consultation with the FWS for potential effects from the West Shoreline Trail to the frog, prior to the start of construction.

We provide our rationale for not recommending GEN1 be included in a license above. However, we recognize that because this is a Forest Service mandatory 4(e) condition, an annual meeting of an ecological group would occur. We expect any issues related to California red-legged frog would be covered during those meetings and do not think development of a separate plan to specify this measure is warranted. With regard to the West Shoreline Trail, the revised Recreation Facilities Plan includes footbridges over stream crossings and educational signs to limit effects of the trail on California red-legged frog habitat. Following YCWA's revisions to the Recreation Facilities Plan, FWS would have the opportunity to review and comment on the revisions prior to Commission approval of the plan. We do not find it necessary to develop an additional plan to address this concern.

Therefore, given that FWS's measures are largely incorporated into other plans, we conclude FWS's sensitive amphibian management plan would not provide additional benefits to foothill yellow-legged frog or California red-legged frog and is not worth the estimated levelized annual cost of $520. Therefore, we do not recommend including development of a sensitive amphibians management plan as part of any new license issued for the project.

Oregon Creek Day Use Area

To further support whitewater boating in the project area, FWN recommends YCWA provide funding to operate the Oregon Creek Day Use Area, a seasonal Forest

Service facility, from October 1 through June 30. YCWA does not adopt FWN's funding recommendation because it states that the day use area is a publicly owned facility managed by the Forest Service that is primarily used for non-project related recreation, and whitewater boating in the reach would occur regardless of project operation.

Based on our analysis in section 3.3.5.2, in the subsection *Recreation Facilities Rehabilitation and Enhancements*, we find the Oregon Creek Day Use Area is used as a take-out for boating the reach downstream of Our House Diversion Dam and as a put-in for boating downstream to New Colgate Powerhouse, but the facility is mainly used for non-project related recreation. Because the Forest Service only operates this facility during peak use periods and boating flows occur outside this period, this facility is not available to boaters. Scheduled boating releases (RR3) and improved flow information (RR2) would increase boating use of this reach; therefore, amenities should be provided to adequately support this use. Funding provided in YCWA's existing off-license agreement with Forest Service would ensure adequate amenities are provided and available for use at the take-out to accommodate whitewater boating needs and minimize potential environmental effects caused by improper sanitation and parking off hardened surfaces that would occur if the facility was not open during the boating use period. Therefore we conclude the benefits are not worth the estimated levelized annual cost of $5,500 and do not recommend including additional funding for the Oregon Creek Day Use Area as part of any new license issued for the project.

Recreation Access Below New Bullards Bar Dam

YCWA proposes to implement the Recreation Facilities Plan (RR1) containing measures that would be implemented over the license term, including: (1) rehabilitating and expanding capacity at existing campgrounds, day use areas, parking areas, and boat launches; (2) constructing new recreation facilities; (3) operating and maintaining (heavy and routine) project recreation facilities; (4) monitoring and reporting project recreation use and visitor preferences through the license term; (5) annually consulting with the Forest Service; and (6) periodically reviewing the plan for adequacy.

Agencies and stakeholders generally support YCWA's proposed Recreation Facilities Plan with a few recommended modifications. The Forest Service (10(a) recommendation 17), Water Board (preliminary 401 condition 22), California DFW (10(j) recommendation 2.22), and FWN all recommend YCWA provide vehicular access below New Bullards Bar Dam to support whitewater boating and recreational access. The agencies and stakeholders recommend constructing parking for five vehicles, developing a pedestrian trail leading from the proposed parking area to the existing gaging station, and, if necessary, installing a security gate and fencing to provide security and public safety near project infrastructure below the dam. The agencies and stakeholders note that the reach is appropriate for whitewater boating, and the new flow regime would provide more boating opportunities than current operations.

YCWA did not adopt this recommendation citing that: (1) difficult access for recreational use would exist irrespective of the project; (2) whitewater releases have not been recommended by YCWA or by any other entity for this reach; (3) the existing steep, narrow access road presents public safety concerns; and (4) there is a need to maintain security at project infrastructure. YCWA also filed a letter from the California DWR, Division of Dam Safety stating concerns with potential public access below the dam, including: potential for unauthorized access and vandalism, effects on operations, public safety associated with large-flow releases, effects of traffic and parking on day-to-day operations, and effects of road construction activities on dam integrity and access. Instead, YCWA proposes to improve access to the Middle Yuba River by developing a put-in trail downstream of Our House Diversion Dam, providing a temporary restroom, and providing a wheeled cart for transporting boats and other equipment from the parking area to the proposed river access trail.

Based on our analysis in section 3.3.5.2, we find YCWA's proposed measure to control spills (AR4) would provide some predictable 3-day flow events when spill flows are ramped down between May 1 and July 31. However, because these conditions would only occur about once every 5 years, and the reach is suited to highly skilled whitewater boaters, we expect few boaters would benefit from vehicular access to the base of the dam. Similarly, we expect few anglers would benefit from vehicular access because the steep canyon walls and predominance of private land along the river limit access for anglers up and down the river shoreline and quality of the fishery is expected to remain low. Further, whitewater boating study participants said hiking down the road for access was a manageable alternative compared to hiking down the canyon. Because boaters and other river users would still be able to hike down the road, river-based recreation opportunities would still be available when flows are within the ranges suitable for these activities.

Opening the road to public use is not necessary to allow recreational access to the river; however, it would make access easier and more convenient. Accordingly, we must evaluate the benefit of this ease and convenience compared with potential effects of allowing public vehicular access on public safety and project security as well as implementation cost. Considering the proximity of the access road to project infrastructure, including the spillway which delivers unexpected high spill events, and the need to maintain secure project infrastructure, we determined that the importance of these considerations together with the necessary high cost of improving the project access road to allow public use and install additional fencing outweigh the low expected benefit it would provide for the few expected number of visitors who would be served by allowing public vehicular access to the base of the dam.

We conclude that the benefits of providing public vehicular access below New Bullards Bar Dam are not worth the estimated levelized annual cost of $59,040. Therefore, we do not recommend including public vehicular access below New Bullards Bar Dam as part of any new license issued for the project.

5.2 UNAVOIDABLE ADVERSE EFFECTS

The continued operation of the Yuba River Development Project would result in some minor, unavoidable, adverse effects on geologic, soil, geomorphic, water quality, aquatic, and terrestrial resources. Effects on geologic and soil resources could include some minor continued erosion associated with project operation, the renovation of recreation facilities, and interruption of sediment transport at project reservoirs. Most of these effects would be reduced by recommended resource enhancement measures, including implementation of the following plans: (1) Erosion and Sediment Control Plan; (2) Log Cabin and Our House Diversion Dams Sediment Management Plan; (3) Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan; and (4) Hazardous Materials Management Plan.

Aquatic communities have developed and adapted to the high level of natural flow variability in western Sierra streams. Reduced flow variability as a result of historical project operation could have resulted in shifts in community composition, diversity, and resilience. Proposed minimum flow and spill cessation measures would improve seasonal and inter-annual flow variability to better mimic natural flow variability in some project-affected reaches; however, as discussed in section 3.3.2.3, inter-basin transfer of water via project facilities to meet water delivery commitments and contracts under legally established water rights would continue to reduce overall natural seasonal flow and variability in many project reaches.

Some fish entrained into project tunnels and powerhouses or stranded by flow reductions are subject to stress, injury, and mortality. Proposed tunnel closures, modified flow recession rates, and monitoring for fish strandings would limit these effects. However, some minor levels of mortality would still be likely to occur.

For terrestrial resources, unavoidable adverse effects could include loss of vegetation and wildlife habitat from the construction of new project facilities and recreation facilities that require permanent removal of vegetation and from project maintenance. Effects on vegetation and wildlife habitat would be reduced by implementation of the Integrated Vegetation Management Plan.

Under the proposed action, the continued operation of the project would continue to adversely affect some archaeological sites. Proposed construction activities, including recreational enhancements also have the potential for unavoidable adverse effects on cultural resources, particularly in areas that have not yet been surveyed. The execution of a PA and implementation of the final HPMP would ensure proper protection and management of significant cultural resources within the project's APE and would provide satisfactory resolution of any project-related adverse effects.

Activities associated with construction of the tailwater depression system at the New Colgate Powerhouse would occur within the fenced power plant area. No disturbance would occur in previously undisturbed areas. Construction would require about 30 trailer truck round trips to the site to deliver and remove construction

equipment. Unavoidable effects include noise disturbance and potential traffic effects associated with these deliveries.

Activities associated with construction of the construction of the New Bullards Dam auxiliary flood control outlet would include permanent disturbance to 2.4 acres of previously undisturbed area (1.7 acres of Douglas-fir and 0.7 acre of barren habitats). Temporary disturbance would also occur at staging, laydown, or disposal areas. The total disturbed area would encompass approximately 84 acres, of which 30 acres are currently barren; 26.9 acres are montane hardwood-conifer; 24 acres are Douglas-fir; 1.6 acres are urban; 0.6 acre are montane hardwood; and 0.4 acre are Sierran mixed conifer. These areas would be restored following construction, but there would be unavoidable loss in wildlife habitat during the 2-year construction period. Construction noise would also disturb wildlife in the immediate vicinity that would likely relocate to other areas.

Construction activities associated with the construction of the New Bullards Bar Dam auxiliary flood control outlet would require closing the Dam Overlook Observation Site for up to 2 years. In addition, construction of the auxiliary flood control outlet would have a short-term, temporary adverse effect on recreation resources on other nearby project recreation facilities (e.g., Sunset Vista Observation Point, Schoolhouse Campground, Hornswoggle Group Campground, and Dark Day complex). Construction traffic could affect use at these facilities that are accessed by vehicle via Marysville Road where the work would occur.

5.3 SUMMARY OF SECTION 10(j) RECOMMENDATIONS AND 4(e) CONDITIONS

5.3.1 Fish and Wildlife Agency Recommendations

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 June 26, 2017, 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 45 recommendations under section 10(j)

of the FPA.[134] We found 32 of the 45 recommendations to be within the scope of 10(j). Of these 31 recommendations, we determined that 10 may be 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.

We sent letters to NMFS, FWS, and California DFW on May 31, 2018, informing them of our preliminary determination of inconsistencies for their recommendations and requesting concurrence, comments, or alternative recommendations. By letters filed July 27, 2018, and July 30, 2018, NMFS, FWS, and California DFW requested a meeting to attempt to resolve inconsistencies.

To attempt to resolve the inconsistencies between the agencies' recommendations and the purposes and requirements of the FPA or other applicable law, Commission staff conducted a 10(j) meeting with NMFS, FWS, and California DFW on August 29, 2018, in Sacramento, California. In addition to addressing the section 10(j) recommendations, this meeting (which was publicly noticed and open to all interested parties) also served as a forum to discuss the recommendations we found to be outside the scope of section 10(j). Following is a summary of the meeting discussions and other section 10(j) process filings for each of the recommendations filed by NMFS, FWS, and California DFW that are within the scope of section 10(j) but found to be inconsistent or partially inconsistent with the purpose and requirements of the FPA or other applicable law.[135]

5.3.1.1 Riparian Habitat Improvement Measures for the Lower Yuba River

In the draft EIS, we did not adopt NMFS, FWS, and California DFW's recommendations that YCWA develop a plan to restore riparian vegetation and rearing habitat for juvenile salmonids to the lower Yuba River. The agencies' recommended

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[134] As shown in table 5-1, California DFW filed 38 recommendations on August 25, 2017; NMFS filed 7 recommendations on August 25, 2017; and FWS filed 18 recommendations on August 25, 2017. By emails dated April 26, 2018 (filed April 27, 2018), California DFW and FWS withdrew conditions 2.2 and 2.12 and 16 and 18, respectively. By letter filed April 30, 2018, FWS withdrew condition 7. Because several measures were identical between multiple agencies, we refer to the overall number of recommendations as 45.

[135] On November 2, 2018, YCWA filed responses to comments made during the 10(j) meeting. FWN and California DFW filed responses to YCWA's comments on November 23 and 29, 2018, respectively.

plan included removal of sediment to lower floodplain elevations and increase inundation acreages at flows provided by project operation. Specifically, the agencies recommended lowering 340 acres of floodplain currently inundated at flows over 5,000 cfs to be accessible to flows between 1,500 and 3,000 cfs. Additionally, the agencies recommended YCWA plant riparian vegetation on these 340 acres plus 251 acres currently inundated at flows between 3,000 and 21,000 cfs.

As discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, of the draft EIS, our analysis concludes that no nexus exists between the project and current floodplain elevations, which are largely the result of past mining activities. Additionally, staff found insufficient information to determine where these measures would be implemented or to evaluate how floodplain lowering would affect private property, infrastructure, water quality, traffic and noise.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, FWS's response to our request for additional information after the 10(j) meeting, and our attempts to resolve the inconsistencies, as discussed in section 5.1.2, *Additional Measures Recommended by Staff*, based on our revised analysis, we conclude the proposed project operation would reduce spring flows and associated acreages of floodplain inundation. Therefore we conclude that although there is a nexus for planting riparian vegetation in the lower Yuba River, the agency-recommended acreages for mitigation are not warranted pursuant to the substantial evidence standard of section 313(b) of the FPA. We also found that additional information provided during the 10(j) process identified potential recreation sites and addressed concerns associated with private property rights and infrastructure. However, we found the methods the agencies used to determine their recommended planting acreages overestimated project effects. Further, we continue to find there is no nexus for requiring YCWA to implement floodplain lowering measures because floodplain elevations are a result of past land use practice, and measures are not warranted pursuant to the substantial evidence standard of section 313(b) of the FPA. We now recommend YCWA develop a lower Yuba River riparian restoration plan that includes planting and monitoring 100 acres of woody riparian vegetation, spread across no less than four revegetation sites. The benefits of providing riparian vegetation and juvenile salmonid rearing habitat would justify the annual levelized cost of $246,580. However, we conclude the additional benefits of the agencies' recommendations would not be worth the additional annual levelized cost of $1,892,450. Therefore, inconsistencies with the agencies' recommendations for floodplain lowering and total acreages of enhancements and the substantial evidence standard of section 313(b) of the FPA remain unresolved.

5.3.1.2 Large Woody Debris Management

In the draft EIS, we did not adopt FWS, NMFS, and California DFW's recommendations that YCWA transport specific quantities of LWM from project reservoirs to the lower Yuba River. As discussed section 5.1.2. *Additional Measures*

Recommended by Staff, transporting LWM from New Bullards Bar Reservoir to the lower Yuba River would benefit habitat for salmonids, and we recommended YCWA develop a LWM enhancement plan; however, we did not adopt specific quantities included in the agencies' plans.

During the section 10(j) meeting, we discussed our recommended plan, noting the intent of the plan was to restore LWM transport from the North Yuba River to the lower Yuba River. Therefore, rather than define specific quantities based on other drainages, we recommend transporting all LWM of suitable size (to be defined during plan development) collected in New Bullards Bar Reservoir to the lower Yuba River. The agencies noted that following issuance of a new license, it could be 10 to 12 years before another wood flow event occurs in the system and reiterated their recommendation that initial placement occur using available wood either from NSF lands or stockpiles previously removed from the reservoir.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, and our attempts to resolve the inconsistencies, as discussed in section 5.1.2, *Additional Measures Recommended by Staff*, we modified our recommended LWM enhancement plan to clarify the input equals output approach and to identify additional sources for initial LWM installation. Therefore, inconsistencies with the agency 10(j) recommendation are resolved.

5.3.1.3 Minimum Streamflows Below Narrows 2 Powerhouse and Narrows 2 Full Bypass

In the draft EIS, we found that implementing FWS and California DFW's recommended winter and spring pulse flows would provide little benefit to rearing juvenile salmon without implementing the recommended floodplain lowering. As discussed in section 5.1.2, *Additional Measures Recommended by Staff*, we recommend YCWA develop and implement a plan to provide short-duration (up to 48 hours), moderate magnitude, spring pulse flows in the lower Yuba River to facilitate outmigration and increase the survival of juvenile salmon and steelhead. The draft EIS also recommends monitoring juvenile outmigration during these events to provide a measure of effectiveness and make recommendations regarding adjusting future spring pulse releases.

During the section 10(j) meeting, California DFW, FWS, and NMFS expressed concern that the duration of our recommended pulse flows would be too short to allow juvenile salmon to access rearing habitat outside the main channel. Staff clarified that the intent of the recommended pulse flow was to facilitate outmigration. However, the agencies stated the intent of their recommended pulse flows, in conjunction with floodplain lowering and riparian planting, is to increase the time juvenile salmon spend in the lower Yuba River and to provide access to rearing habitat so salmon smolts could reach larger sizes prior to outmigration.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, and our attempts to resolve the inconsistencies, as discussed in section 5.1.2, *Additional Measures Recommended by Staff*, we continue to find limited benefits of higher flows in the absence of floodplain lowering, for which we find no project nexus. We also find the agencies' recommendations for conditional winter pulse flows are not likely to benefit adult steelhead or spring-run Chinook salmon and are not warranted pursuant to sections 4(e) and 10(a) of the FPA. As a result, the inconsistencies with the agencies' recommendations for winter and spring flows below the Narrows 2 Powerhouse and full bypass and sections 4(e) and 10(a) of the FPA remain unresolved.

5.3.1.4 Minimum Streamflows Below New Bullards Bar Dam

In the draft EIS, we did not recommend adopting NMFS, FWS, and California DFW's recommendations for higher minimum flows below New Bullards Bar Dam based on analysis that the higher flows would draw down the reservoir and affect littoral habitat recreation. Instead, we recommended adopting YCWA's proposed minimum flows.

During the section 10(j) meeting discussions, the agencies made clear that their minimum flow releases at New Bullards Bar Dam would come from water that would otherwise go to the New Colgate Powerhouse, and our analysis that the higher minimum flows would affect reservoir levels was due to a misunderstanding of their recommendation. Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, and our attempts to resolve the inconsistencies, as discussed in section 5.1.2, *Additional Measures Recommended by Staff*, we now recommend modifying YCWA's proposed minimum flows at New Bullards Dam to include the NMFS, FWS, and California DFW recommended minimum flows from June through September. We determined that limiting the higher flows to the summer period would reduce the costs of the measure on lost generation resources, yet would still provide coldwater refuge habitat in the Yuba River between the North Yuba River and the New Colgate Powerhouse. We conclude that our recommended approach would balance fisheries management objectives with project costs, and the benefits of the higher summer flows would be worth our estimated levelized annual cost on generation ($226,790) plus the cost of upgrading the existing gage to record the higher flows ($255,830). Thus, the inconsistencies with summer temperatures in the Yuba River between the North Yuba confluence and new Colgate Powerhouse are resolved, but inconsistencies with fall, winter, and spring minimum flows and sections 4(e) and 10(a) of the FPA remain unresolved.

5.3.1.5 North Yuba River Large Woody Material and Sediment Enhancement and Management Plan

In the draft EIS, we did not adopt FWS, BLM, Forest Service, and California DFW's recommendations that YCWA develop and implement a North Yuba River LWM and sediment enhancement and management plan. As discussed in section 5.1.3, *Other Measures Not Recommended by Staff,* we determined that steep channel slope combined with high flows below New Bullards Bar Dam would mobilize sediment and LWM and limit the benefits of enhancement measures on aquatic resources.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, and our attempts to resolve the inconsistencies, as discussed in section 5.1.2, *Additional Measures Recommended by Staff*, we continue to find that the limited benefits of LWM and sediment augmentation below New Bullards Bar Dam would be outweighed by the costs (levelized annual cost of $722,100). As a result, the inconsistencies with the agencies' recommendations and sections 4(e) and 10(a) of the FPA remain unresolved.

5.3.1.6 Extending the Duration of the Lohman Ridge Diversion Tunnel Closures to Minimize Fish Entrainment

In the draft EIS, we did not adopt FWS and California DFW's recommendations for extending the period of Lohman Ridge Diversion Tunnel closures. Instead we adopted YCWA's proposed closures. As discussed in section 5.1.3, *Other Measures Not Recommended by Staff,* in the draft EIS, we determined that because of the low risk of entrainment and evidence of upstream movement through the tunnels, the agencies' extended closures would provide little additional benefit to fish populations in Oregon Creek and Middle Yuba River.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, and our attempts to resolve the inconsistencies, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, we continue to find that there would be limited effects of the extended closures on fish populations. Additionally, we analyzed the cost of the extended closures on generation. We determined, based on the current water record, the additional closures would have resulted in greater reductions in water through the tunnel than spill volumes at New Bullards Bar Dam. In other words, not all of the water diverted through the Lohman Ridge Diversion Tunnel would have spilled at New Bullards Bar Dam, so there would have been a loss in water available for generation. We estimate the levelized annual cost on generation to be $457,090 and determine the benefits are not worth the costs. As a result, the inconsistencies with the agencies' recommendations and sections 4(e) and 10(a) of the FPA remain unresolved.

5.3.1.7 Operate the Upper Intake for the Colgate Power Tunnel in March, April, and May to Control Downstream Water Temperature

In the draft EIS, we did not adopt the Water Board, FWS, and California DFW's recommendations that YCWA operate the New Colgate Power Tunnel upper intake to provide a thermal regime to support greater growth and reproduction of both resident and anadromous salmonids. As discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, in the draft EIS, we determined the agencies' recommendation would have minimal effects on water temperature, compared to YCWA's proposal.

During the section 10(j) meeting, California DFW presented analysis showing that while the effects may seem small over the course of the 40-year record, during some years, use of the upper intake in spring could allow lower stream temperature during late summer and fall spawning seasons, which would provide spawning habitat in more of the river. YCWA provided additional information about the status of the infrastructure for the upper intake, noting that extensive work would be needed to make the intake functional.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, and our attempts to resolve the inconsistencies, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, we continue to find that there would be limited effects of the use of the upper intake on water temperature and determine the effects would not be worth the levelized annual cost of $1,125,650. As a result, the inconsistencies with the agencies' recommendations and sections 4(e) and 10(a) of the FPA remain unresolved.

5.3.1.8 Monitor Anadromous Fish at Narrows 2 Tailrace

In the draft EIS, we did not adopt NMFS's recommendation to use Adaptive Resolution Imaging Sonar monitoring program to provide additional data on stranding and/or interactions of anadromous fish with Narrows 2 facilities and operation. As discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, in the draft EIS, we determined YCWA's proposed measures to monitor fish stranding at the Narrows 2 facilities following specified flow reductions and dewatering events and notifying NMFS, California DFW, and the Commission of any fish mortality or stranding incidents would protect fish from effects of stranding.

During the section 10(j) meeting, we discussed the anomalous conditions that occurred during YCWA's study to determine effects of the Narrows 1 and Narrows 2 outlet flows on fish attraction and stranding. NMFS commented that YCWA's proposed measures address issues with stranding during flow reductions; however, NMFS still has concerns that outlet flows may attract fish into the powerhouse. Fish entering the powerhouse create potential for turbine strikes.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EIS, and our attempts to resolve the inconsistencies, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, we continue to find limited benefit to implementing NMFS's recommended Adaptive Resolution Imaging Study. As a result, the inconsistencies with the agencies' recommendations and sections 4(e) and 10(a) of the FPA remain unresolved.

5.3.1.9 Water Temperature, Water Quality, and Aquatic Monitoring Plans

In the draft EIS, we did not recommend adopting agency-recommended monitoring plans for water temperature and water quality, nor did we recommend adopting YCWA's proposed Upper Yuba River Aquatic Monitoring Plan. As discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, in the draft EIS, we determined that based on temperature modelling, the staff alternative would improve water temperature over existing conditions and the benefits of monitoring to confirm the modelling results were not worth the associated costs. With regard to water quality monitoring, we determined there was little evidence to suggest the staff alternative would affect water quality, and monitoring was not necessary. Regarding biotic monitoring associated with YCWA's proposed Upper Yuba River Aquatic Monitoring Plan, we determined monitoring results were not likely to isolate project effects and were not tied to license requirements. We therefore did not recommend adopting the proposed monitoring plan.

During the section 10(j) meeting, we discussed the Commission's views on monitoring. Staff emphasized the need for monitoring to focus on project effects and to have a clear connection to license requirements. As discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, in the final EIS, we continue to determine the proposed and recommended monitoring measures do not meet these criteria. Therefore, the inconsistencies with the agencies' recommendations and sections 4(e) and 10(a) of the FPA remain unresolved.

5.3.1.10 Sensitive Amphibians Management Plan

In the draft EIS, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, we did not recommend adopting FWS's recommendation for a sensitive amphibians management plan. We determined that the measures included in the recommended plan were already included in other plans or were not necessary because of a lack of nexus (for chytrid control) or redundancies with other Commission policies (for additional consultation requirements). In the section 10(j) meeting, FWS stated that because the staff alternative includes measures to prevent the spread of chytrid and to control bullfrogs in Middle Yuba River and Oregon Creek, a separate sensitive amphibians management plan was not needed.

However, subsequent to the section 10(j) meeting, as discussed in section 5.1.2, *Additional Measures Recommended by Staff*, in the final EIS, we no longer recommend bullfrog control in the Middle Yuba River and Oregon Creek. We determine that

control efforts in open systems are rarely successful and that YCWA's proposed operation of the Our House and Log Cabin Diversion Dams, including increased minimum flows, sediment transport, and LWM transport would reduce habitat quality for bullfrog. We now conclude that bullfrog control would not be worth the estimated levelized annual cost of $11,710. Therefore inconsistencies with FWS's recommendation and sections 4(e) and 10(a) of the FPA remain unresolved.

Sections 5.1.2, *Additional Measures Recommended by Staff*, and 5.1.3, *Other Measures Not Recommended by Staff*, provide additional details on 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 reflects initial and modified section 10(j) recommendations made at the meeting and any agreements reached.

Table 5-1. Fish and wildlife agency recommendations for the Yuba River Development Project (Source: staff).

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
1. Organize an ecological group and host annual meetings.	California DFW (Recommendation 1.1)	No, not a specific measure to protect fish and wildlife	$26,120	No (see section 5.1.3)[a]
2. Provide environmental training for employees.	California DFW (Recommendation 1.3)	No, not a specific measure to protect fish and wildlife	$7,750	No (see section 5.1.3)[a]
3. Implement Hazardous Materials Management Plan.	California DFW (Recommendation 1.4)	Yes	$0	Yes
4. Determine water year types for conditions pertaining to Our House Diversion Dam, Log Cabin Diversion Dam, and New Bullards Bar Dam.	California DFW (Recommendation 2.1)	Yes	$1,020	Yes
5. Schedule 6 water year type summer minimum flows.	NMFS, California DFW, FWS (Recommendations 2, 2.6, 2)	Yes	$0	Yes

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
6. Maintain minimum streamflows below Our House Diversion Dam and Log Cabin Diversion Dam.	California DFW (Recommendation 2.3)	Yes	$137,330	Yes
7. Maintain minimum streamflows below New Bullards Bar Dam.	California DFW, FWS (Recommendations 2.4, 11)	Yes	$576,360	No (see section 5.1.2)[a]
8. Maintain minimum streamflows below Narrows 2 Powerhouse and Narrows 2 full bypass.	California DFW, FWS (Recommendations 2.5, 1)	Yes	$6.7M	No (see section 5.1.2)[a]
9. Moderate spring snowmelt pulse flow recession to support riparian vegetation.	NMFS (Recommendation 1)	Yes	$1.5M to $40M	No (see section 5.1.2)[a]
10. Operate the upper intake for the New Colgate Power Tunnel in March, April, and May.	California DFW, FWS (Recommendations 2.7, 13)	Yes	$1,125,650	No (see section 5.1.3)[a]

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
11. Develop and implement a coordinated operations plan for the Yuba River Development Project and the Narrows Project River development.	California DFW (Recommendation 2.8)	No, not a specific measure to protect fish and wildlife	$11,670	No (see section 5.1.3)[a]
12. Control project spills at Our House Diversion Dam.	California DFW (Recommendation 2.9)	Yes	$1,490	Yes
13. Control project spills at Log Cabin Diversion Dam.	California DFW (Recommendation 2.10)	Yes	$450	Yes
14. Control project spills at New Bullards Bar Dam.	California DFW, FWS (Recommendations 2.11, 12)	Yes	$0	Yes
15. Implement Water Temperature Monitoring Plan, filed October 27, 2016.	California DFW (Recommendation 2.24)	Yes	$46,560	No, however, we recommend targeted temperature monitoring (see sections 5.1.2 and 5.1.3)
16. Implement Water Quality Monitoring Plan, filed October 27, 2016.	California DFW (Recommendation 2.25)	Yes	$32,330	No (see section 5.1.3)[a]

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
17. Close Lohman Ridge Diversion Tunnel seasonally.	California DFW, FWS (Recommendation 2.13, 10)	Yes	$457,090	Yes, in part
18. Implement Streamflow and Reservoir Level Compliance Plan, filed June 5, 2017.	California DFW (Recommendation 2.14)	Yes	$79,000	Yes
19. Revise drought management plan.	California DFW, FWS (Recommendations 2.15, 14)	No, not a specific measure to protect fish and wildlife	$1,630	Yes, with modifications
20. Report unplanned flow reduction in a timely manner.	California DFW and FWS (Recommendations 2.28, 5)	No, not a specific measure to protect fish and wildlife	$0	Yes
21. Implement LWM augmentation program.	NMFS (Recommendation 3)	Yes	$722,100	No (see section 5.1.2)[a]
22. Develop and implement physical habitat improvement projects for juvenile salmonid rearing.	NMFS (Recommendation 4)	No, no nexus to project effects	$2,327,500	No (see section 5.1.2)[a]

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
23. Develop and implement Lower Yuba River habitat restoration LWM and sediment enhancement and management plan.	California DFW (Recommendation 2.29)	No, no nexus to project effects	$2,327,500	No (see section 5.1.2)[a]
24. Restore and enhance juvenile salmonid rearing habitat in the Lower Yuba River.	FWS (Recommendation 3)	Yes	$2,327,500	Yes, however we recommend 100 acres of riparian planting instead of 591 acres, and we do not recommend the 351 acres of floodplain lowering.[b]
25. Mitigate for loss of floodplain resulting from operation of the proposed flood control outlet.	FWS (Recommendation 15)	No, no nexus to project effects	Cost included in recommendation 26	No (see section 5.1.2)[a]
26. Develop and implement a Narrows Reach fish stranding prevention plan	NMFS (Recommendation 5)	Yes	$0	Yes

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
27. Develop and implement Narrows Reach fish stranding prevention plan.	California DFW, FWS (Recommendations 2.27, 4)	Yes	$520	Yes
28. Monitor anadromous fish	NMFS (Recommendation 6)	Yes	$173,960	No (see section 5.1.3)[a]
29. Implement Erosion and Sediment Control Plan, filed October 27, 2016.	California DFW (Recommendation 2.16)	Yes	$0	Yes
30. Implement the updated Log Cabin and Our House Diversion Dams Sediment Management Plan, filed July 27, 2018.	California DFW (Recommendation 2.17)	Yes	$60,320	Yes
31. Implement Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan, filed October 27, 2016.	California DFW (Recommendation 2.18)	Yes	$256,820	Yes, with modifications

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
32. Develop and implement North Yuba River LWM and sediment enhancement and management plan.	California DFW, FWS (Recommendations 2.19, 9)	Yes	$722,100	No (see section 5.1.3)[a]
33. Implement the Aquatics Invasive Species Management Plan, filed October 27, 2016.	California DFW (Recommendation 2.20)	Yes	$27,010	Yes
34. Implement Upper Yuba River Aquatic Monitoring Plan, filed on June 5, 2017.	California DFW (Recommendation 2.23)	No, not a specific measure to protect fish and wildlife because it includes general monitoring without triggers for mitigation	$181,310	No (see section 5.1.3)[a]

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
35. Implement Lower Yuba River Aquatic Monitoring Plan, filed on June 5, 2017.	California DFW (Recommendation 2.26)	No, not a specific measure to protect fish and wildlife because it includes general monitoring without triggers for mitigation	$446,890	Yes, in part
36. Implement New Bullards Bar Fish Stocking Plan, filed December 2, 2016.	California DFW (Recommendation 2.21)	Yes	$17,650	Yes
37. Implement Integrated Vegetation Management Plan, filed October 27, 2016.	California DFW (Recommendation 3.1)	Yes	$60,700	Yes
38. Control project ramping downstream of Englebright Dam to support riparian seedling survival.	FWS (Recommendation 17)	Yes	$0	Yes

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
39. Implement Bald Eagle and American Peregrine Falcon Management Plan, filed October 27, 2016.	California DFW (Recommendation 3.2)	Yes	$25,050	Yes
40. Implement Bat Management Plan, filed October 27, 2016.	California DFW (Recommendation 3.3)	Yes	$3,310	Yes
41. Implement Ringtail Management Plan, filed December 2, 2016.	California DFW (Recommendation 3.4)	Yes	$3,150	Yes
42. Annually consult with agencies regarding special-status species protection mitigation, host annual meeting to review species lists.	NMFS, California DFW (Recommendations 7, 1.2)	No, not a specific measure to protect fish and wildlife	$500	No (see section 5.1.3)[a]
43. Develop a sensitive amphibians management plan.	FWS (Recommendation 8)	Yes	$520	No (see section 5.1.3)[a]
44. Consult with FWS on effects on listed species.	FWS (Recommendation 6)	No, not a specific measure to protect fish and wildlife	$500	No (see section 5.1.3)[a]

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
45. Provide public angling access to the North Yuba River below New Bullards Bar Dam.	California DFW (Recommendation 2.22)	No, not a specific measure to protect fish and wildlife	$59,040	No

[a] Findings that recommendations 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.

[b] Preliminary findings that recommendations found to be within the scope of section 10(j) are inconsistent with the substantial evidence standards of section 313(b) of the FPA are based on lack of evidence to support the reasonableness of the recommendation or a lack of justification for the measure.

5.3.2 Land Management Agencies' Section 4(e) Conditions

In section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*, we list the 4(e) conditions submitted by the Forest Service and note that section 4(e) of the FPA provides that any license issued by the Commission "for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation." Thus, any 4(e) condition that meets the requirements of the law must be included in any license issued by the Commission, regardless of whether we include the condition in our staff alternative.

Of the Forest Service's 54 conditions, we consider 24 of the conditions (conditions 1, 3 through 20, and 23 through 27) to be administrative or legal in nature and not specific environmental measures. We therefore, do not analyze these conditions in this EIS. Table 5-2 summarizes our conclusions with respect to the 30 4(e) conditions that we consider to be environmental measures. We include in the staff alternative 18 conditions as specified by the agency, modify 5 conditions to adjust the scope of the measure, and do not recommend 7 conditions; the measures not adopted in total are discussed in more detail in section 5.1, *Comprehensive Development and Recommended Alternative.*

Table 5-2. Forest Service section 4(e) conditions for the Yuba River Development Project (Source: staff).

Condition	Annualized Cost	Adopted?
No. 2 Organize ecological group and host meetings.	$26,120	No
No. 21 Implement the Hazardous Materials Management Plan.	$260	Yes, with modifications for primary and secondary containment; protocol for addressing spills; spills on non-NFS lands; and FWS to the notification contact list
No. 22 Restrict the use of pesticides on public lands managed by the Forest Service.	$0	Yes
No. 28 Provide employee training.	$7,750	No
No. 29 Prepare a biological evaluation before constructing new project features.	$9,260	No

Condition	Annualized Cost	Adopted?
No. 30 Annually review special-status species.	$16,960	No
No. 31 Determine water year types pertaining to the Our House Diversion Dam, Log Cabin Diversion Dam, and New Bullards Bar Dam.	1,020	Yes
No. 32 Maintain minimum streamflows below Our House Diversion Dam and Log Cabin Diversion Dam.	$137,330	Yes
No. 33 Control project spills at Our House Diversion Dam.	$1,490	Yes
No. 34 Control project spills at Log Cabin Diversion Dam.	$450	Yes
No. 35 Periodically close Lohman Ridge Diversion Tunnel.	$295,110	Yes
No. 36 Implement the Streamflow and Reservoir Level Compliance Monitoring Plan.	$79,000	Yes
No. 37 Implement the Log Cabin and Our House Diversion Dams Sediment Management Plan.	$60,320	Yes
No. 38 Pass LWM at Our House and Log Cabin Diversion Dams.	$256,820	Yes
No. 39 Implement the Aquatic Invasive Species Management Plan.	$27,010	Yes, with modifications for Asian clam monitoring below Our House and Log Cabin Diversion Dams during some water years
No. 40 Implement the Integrated Vegetation Management Plan.	$60,700	Yes, with modification to extend measures to non-NFS lands

Condition	Annualized Cost	Adopted?
No. 41 Implement the Bald Eagle and American Peregrine Falcon Management Plan.	$25,050	Yes, with modifications to include surveys for American peregrine falcon eyries every year or until a new eyrie is documented.
No. 42 Implement the Bat Management Plan.	$3,310	Yes
No. 43 Implement the Upper Yuba River Aquatic Monitoring Plan.	$181, 310	No
No. 44 Implement the Water Temperature Monitoring Plan.	$46,560	No
No. 45 Implement the Water Quality Monitoring Plan.	$32,330	No
No. 46 Implement the proposed Recreation Facilities Plan.	$2,168,390	Yes
No. 47 Provide recreation flow information.	$5,120	Yes
No. 48 Provide whitewater boating below Our House Diversion Dam.	$1,800	Yes
No. 49 Implement the proposed Visual Resource Management Plan.	$113,140	Yes
No. 50 Implement the proposed HPMP.	$6,100	Yes, with modification to revise with new information and ethnography results
No. 51 Implement the proposed Transportation System Management Plan.	$834,490	Yes
No. 52 Implement the Erosion and Sediment Control Plan.	$0	Yes
No. 53 Implement the Fire Prevention and Response Plan.	$930	Yes
No. 54 Implement a drought management plan.	$1,630	Yes

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 24 comprehensive plans that are applicable to the Yuba River Development Project, located in California. No inconsistencies were found.

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Yuba County Resource Center
Yuba County Fish and Game Commission
Yuba County Local Agency Formation Committee

APPENDIX A

Simulated Water Temperatures under Various Project Operations.

Table A-1. Simulated monthly mean temperature (°C) in project-affected streams upstream of the New Colgate Powerhouse for existing conditions, YCWA proposed operations, and the differences under proposed operations, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c, as modified by staff).

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Existing Conditions										
Oct	11.0	15.0	13.1	13.5	13.7	13.9	6.7	11.4	13.4	14.5
Nov	6.4	7.8	7.2	7.2	7.3	7.3	6.0	8.2	7.4	7.9
Dec	4.4	3.9	4.6	4.2	4.1	4.0	5.6	6.4	4.2	3.5
Jan	4.2	4.1	4.4	4.1	4.1	4.0	5.6	6.6	4.2	3.5
Feb	5.3	7.0	5.2	5.6	5.9	6.0	5.9	8.1	6.1	6.2
Mar	7.0	10.6	6.7	7.9	8.6	8.9	6.4	9.8	8.8	9.4
Apr	8.7	14.7	8.2	10.2	11.2	11.8	6.9	12.2	11.8	13.0
May	11.4	19.6	10.7	13.3	14.5	15.4	7.6	14.4	15.1	16.6
Jun	16.3	25.2	15.6	18.6	19.9	20.9	8.3	16.6	19.9	20.6
Jul	21.6	28.2	21.8	24.0	24.7	25.4	8.3	18.5	24.2	23.5
Aug	19.7	25.7	21.6	22.9	23.3	23.8	8.0	17.3	22.5	22.4
Sep	15.8	21.4	18.8	19.5	19.8	20.1	7.5	14.8	19.0	19.5
All months	11.0	15.3	11.5	12.6	13.1	13.5	6.9	12.0	13.1	13.4
YCWA Proposed Operations										
Oct	9.6	14.9	13.1	13.5	13.7	13.9	7.1	10.4	13.0	14.3
Nov	5.0	7.5	7.2	7.2	7.3	7.3	7.0	8.5	7.4	7.7
Dec	3.7	3.8	4.6	4.3	4.2	4.1	6.9	7.4	4.5	3.8
Jan	3.9	4.0	4.4	4.1	4.1	4.0	6.7	7.4	4.4	3.8
Feb	5.1	6.6	5.2	5.5	5.8	5.9	6.7	8.3	6.1	6.1
Mar	6.9	9.8	6.7	7.7	8.2	8.5	6.8	9.3	8.4	9.1

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Apr	8.3	12.4	8.2	9.7	10.4	10.9	6.9	12.3	10.9	12.2
May	11.0	16.9	10.6	12.7	13.5	14.2	7.6	14.5	14.1	15.6
Jun	15.7	23.6	15.6	17.8	18.6	19.5	8.3	16.7	19.1	19.9
Jul	19.6	27.8	21.8	23.7	24.2	24.9	7.3	15.4	23.2	23.4
Aug	17.6	25.6	21.6	22.9	23.2	23.8	7.3	14.4	21.5	22.3
Sep	14.3	21.3	18.8	19.6	19.7	20.1	7.2	12.7	18.1	19.3
All months	10.1	14.6	11.5	12.4	12.8	13.1	7.2	11.5	12.6	13.2
Proposed—Existing Conditions										
Oct	*-1.4*	-0.1	0.0	0.0	0.0	0.0	**0.4**	*-1.0*	*-0.4*	-0.2
Nov	*-1.4*	*-0.3*	0.0	0.0	0.0	0.0	**1.0**	**0.3**	0.0	-0.2
Dec	*-0.7*	-0.1	0.0	0.1	0.1	0.1	**1.3**	**1.0**	**0.3**	**0.3**
Jan	*-0.3*	-0.1	0.0	0.0	0.0	0.0	**1.1**	**0.8**	0.2	**0.3**
Feb	-0.2	*-0.4*	0.0	-0.1	-0.1	-0.1	**0.8**	0.2	0.0	-0.1
Mar	-0.1	*-0.8*	0.0	-0.2	*-0.4*	*-0.4*	**0.4**	*-0.5*	*-0.4*	*-0.3*
Apr	*-0.4*	*-2.3*	0.0	*-0.5*	*-0.8*	*-0.9*	0.0	0.1	*-0.9*	*-0.8*
May	*-0.4*	*-2.7*	-0.1	*-0.6*	*-1.0*	*-1.2*	0.0	0.1	*-1.0*	*-1.0*
Jun	*-0.6*	*-1.6*	0.0	*-0.8*	*-1.3*	*-1.4*	0.0	0.1	*-0.8*	*-0.7*
Jul	*-2.0*	*-0.4*	0.0	*-0.3*	*-0.5*	*-0.5*	*-1.0*	*-3.1*	*-1.0*	-0.1
Aug	*-2.1*	-0.1	0.0	0.0	-0.1	0.0	*-0.7*	*-2.9*	*-1.0*	-0.1
Sep	*-1.5*	-0.1	0.0	0.1	-0.1	0.0	*-0.3*	*-2.1*	*-0.9*	-0.2
All months	*-0.9*	*-0.7*	0.0	-0.2	*-0.3*	*-0.4*	**0.3**	*-0.5*	*-0.5*	-0.2

Notes: Shading = temperature exceeding 20.0ºC. Bold = proposed temperature is more than measurement accuracy of 0.2ºC warmer than the existing conditions. Italics = proposed temperature is more than measurement accuracy of 0.2ºC cooler than the existing conditions.

Table A-2. Simulated monthly mean temperature (°C) in project-affected streams from the New Colgate Powerhouse to Feather River confluence for existing conditions, YCWA proposed operations, and the differences under proposed operations, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c, as modified by staff)

		Yuba River									
Month(s)	**New Colgate Powerhouse Discharge**	**RM 34.1**	**RM 23.9**	**RM 23.0**	**RM 17.7**	**RM 16.2**	**RM 13.8**	**RM 11.8**	**RM 11.6**	**RM 6.2**	**RM 0.7**
Existing Conditions											
Oct	9.4	9.8	12.2	12.3	12.8	13.1	13.5	13.7	13.8	14.9	16.6
Nov	9.7	9.4	10.6	10.6	10.8	10.9	11.0	11.1	11.2	11.8	12.6
Dec	8.8	7.8	8.2	8.2	8.3	8.4	8.5	8.5	8.5	8.9	9.3
Jan	7.8	6.8	7.1	7.2	7.3	7.3	7.5	7.5	7.5	7.8	8.1
Feb	7.2	6.9	7.5	7.6	7.8	7.9	8.1	8.2	8.2	8.5	9.0
Mar	7.0	7.6	8.5	8.7	9.1	9.2	9.6	9.7	9.8	10.3	11.0
Apr	7.0	8.2	9.9	10.1	10.7	10.9	11.3	11.5	11.6	12.4	13.5
May	7.3	8.2	10.5	10.6	11.2	11.4	11.8	12.1	12.1	13.2	14.5
Jun	7.7	8.5	11.0	11.1	11.9	12.2	12.7	13.0	13.1	14.7	16.7
Jul	8.2	8.7	11.7	11.8	12.8	13.1	13.7	14.2	14.3	16.4	19.3
Aug	8.7	9.1	12.1	12.2	13.2	13.6	14.1	14.6	14.7	16.7	19.5
Sep	9.1	9.7	12.6	12.8	13.8	14.2	14.8	15.2	15.3	17.0	19.5
All months	8.2	8.4	10.2	10.3	10.8	11.0	11.4	11.6	11.7	12.7	14.1
YCWA Proposed Operations											
Oct	9.3	9.8	12.2	12.3	12.8	13.1	13.5	13.7	13.8	14.9	16.6
Nov	9.6	9.2	10.5	10.5	10.7	10.8	11.0	11.1	11.1	11.7	12.6
Dec	8.7	7.4	8.1	8.1	8.2	8.2	8.4	8.4	8.4	8.7	9.1
Jan	7.8	6.7	7.0	7.1	7.2	7.3	7.4	7.4	7.4	7.7	8.0
Feb	7.2	6.8	7.5	7.5	7.7	7.8	8.0	8.1	8.1	8.5	9.0
Mar	7.0	7.7	8.5	8.7	9.1	9.2	9.6	9.7	9.8	10.3	11.0
Apr	7.0	8.3	10.0	10.2	10.7	10.9	11.3	11.5	11.6	12.4	13.5

Month(s)	New Colgate Powerhouse Discharge	Yuba River									
		RM 34.1	RM 23.9	RM 23.0	RM 17.7	RM 16.2	RM 13.8	RM 11.8	RM 11.6	RM 6.2	RM 0.7
May	7.3	8.4	10.6	10.7	11.3	11.5	11.9	12.2	12.3	13.3	14.7
Jun	7.7	8.8	11.2	11.4	12.1	12.4	12.9	13.2	13.4	14.9	17.0
Jul	8.1	8.9	11.9	12.0	13.0	13.3	13.9	14.3	14.5	16.5	19.3
Aug	8.6	9.2	12.1	12.3	13.2	13.6	14.2	14.6	14.7	16.7	19.4
Sep	9.0	9.7	12.6	12.8	13.7	14.2	14.7	15.1	15.2	16.9	19.3
All months	8.1	8.4	10.2	10.3	10.8	11.0	11.4	11.6	11.7	12.7	14.1
Proposed—Existing Conditions											
Oct	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0
Dec	-0.1	*-0.4*	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2
Jan	0.0	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
Feb	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0
Mar	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
Jun	0.0	**0.3**	0.2	**0.3**	0.2	0.2	0.2	0.2	**0.3**	0.2	**0.3**
Jul	-0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.0
Aug	-0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	-0.1
Sep	-0.1	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.2
All months	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes: Bold = proposed temperature is more than measurement accuracy of 0.2ºC warmer than the existing conditions. Italics = proposed temperature is more than measurement accuracy of 0.2ºC cooler than the existing conditions. No temperature exceedances of 20.0ºC.

Table A-3. Frequency of simulated daily mean temperature exceeding 20.0°C in project-affected streams upstream of the New Colgate Powerhouse for existing conditions, YCWA proposed operations, and the differences in these frequencies, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c, as modified by staff).

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Existing Conditions										
Oct	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Apr	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	47%	0%	1%	4%	8%	0%	1%	7%	15%
Jun	10%	95%	9%	33%	55%	68%	0%	4%	60%	75%
Jul	82%	100%	89%	99%	99%	100%	0%	14%	99%	99%
Aug	51%	100%	96%	99%	100%	100%	0%	2%	97%	99%
Sep	1%	77%	17%	38%	43%	52%	0%	0%	27%	42%
All months	12%	36%	18%	23%	25%	28%	0%	2%	24%	28%
YCWA Proposed Operations										
Oct	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	26%	0%	0%	2%	5%	0%	1%	4%	9%
Jun	2%	83%	9%	26%	37%	52%	0%	4%	48%	64%
Jul	35%	100%	89%	96%	98%	99%	0%	0%	98%	99%
Aug	3%	100%	96%	99%	100%	100%	0%	0%	89%	99%
Sep	0%	75%	17%	38%	43%	52%	0%	0%	11%	38%
All months	3%	32%	18%	22%	23%	26%	0%	0%	21%	26%
Proposed - Existing Conditions										
Oct	0%	*-1%*	0%	0%	0%	0%	0%	0%	0%	0%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Apr	0%	*-3%*	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	*-21%*	0%	*-1%*	*-2%*	*-3%*	0%	0%	*-3%*	*-6%*
Jun	*-8%*	*-12%*	0%	*-7%*	*-18%*	*-16%*	0%	0%	*-12%*	*-11%*
Jul	*-47%*	0%	0%	*-3%*	*-1%*	*-1%*	0%	*-14%*	*-1%*	0%
Aug	*-48%*	0%	0%	0%	0%	0%	0%	*-2%*	*-8%*	0%
Sep	*-1%*	*-2%*	0%	0%	0%	0%	0%	0%	*-16%*	*-4%*
All months	*-9%*	*-4%*	0%	*-1%*	*-2%*	*-2%*	0%	*-2%*	*-3%*	*-2%*

Notes: Shading = frequency is greater than 10 percent. Bold = more exceedances of 20ºC for proposed than the existing conditions. Italics = less exceedances of 20ºC for proposed than the existing conditions.

Table A-4. Frequency of simulated daily mean temperature exceeding 20.0°C in project-affected streams from the New Colgate Powerhouse to Feather River confluence for existing conditions, YCWA proposed operations, and the differences in these frequencies, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c, as modified by staff).

	New Colgate Powerhouse	**Yuba River**									
Month(s)	**Discharge**	**RM 34.1**	**RM 23.9**	**RM 23.0**	**RM 17.7**	**RM 16.2**	**RM 13.8**	**RM 11.8**	**RM 11.6**	**RM 6.2**	**RM 0.7**
Existing Conditions											
Oct	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
May	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Jun	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	18%
Jul	0%	0%	0%	0%	0%	0%	0%	0%	2%	2%	39%
Aug	0%	0%	0%	0%	0%	0%	1%	2%	2%	2%	37%
Sep	0%	0%	0%	0%	0%	1%	2%	2%	2%	3%	25%
All months	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	10%
YCWA Proposed Operations											
Oct	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Month(s)	New Colgate Powerhouse Discharge	Yuba River RM 34.1	RM 23.9	RM 23.0	RM 17.7	RM 16.2	RM 13.8	RM 11.8	RM 11.6	RM 6.2	RM 0.7
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
May	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
Jun	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	22%
Jul	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%	41%
Aug	0%	0%	0%	0%	0%	0%	0%	1%	2%	2%	39%
Sep	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	26%
All months	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	11%
Proposed - Existing Conditions											
Oct	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**1%**
Jun	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**4%**
Jul	0%	0%	0%	0%	0%	0%	0%	0%	*-1%*	**1%**	**2%**
Aug	0%	0%	0%	0%	0%	0%	*-1%*	*-1%*	0%	0%	**2%**
Sep	0%	0%	0%	0%	0%	*-1%*	*-2%*	*-2%*	*-2%*	0%	**1%**
All months	0%	0%	0%	0%	0%	0%	0%	0%	*-1%*	0%	**1%**

Notes: Shading = frequency is greater than 10 percent. Bold = more exceedances of 20ºC for proposed than the existing conditions. Italics = less exceedances of 20ºC for proposed than the existing conditions.

Table A-5. Frequency of simulated daily mean temperature of 12.0 to 20.0°C in project-affected streams upstream of the New Colgate powerhouse for existing conditions, YCWA proposed operations, and the differences in these frequencies, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c, as modified by staff).

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Existing Conditions										
Oct	38%	82%	74%	78%	80%	81%	0%	33%	77%	87%
Nov	0%	5%	0%	0%	0%	0%	0%	0%	0%	1%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	31%	0%	0%	1%	3%	0%	11%	3%	10%
Apr	3%	80%	0%	15%	35%	48%	0%	60%	49%	72%
May	32%	50%	29%	62%	75%	75%	1%	82%	75%	72%
Jun	82%	5%	72%	66%	44%	31%	4%	89%	34%	21%
Jul	18%	0%	11%	1%	1%	0%	1%	86%	1%	1%
Aug	49%	0%	4%	1%	0%	0%	0%	98%	3%	1%
Sep	96%	23%	83%	62%	57%	48%	0%	95%	73%	58%
All months	26%	23%	23%	24%	24%	24%	0%	46%	26%	27%
YCWA Proposed Operations										
Oct	14%	81%	74%	78%	80%	80%	0%	8%	71%	85%
Nov	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	14%	0%	0%	0%	1%	0%	0%	1%	5%

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Apr	1%	55%	0%	11%	18%	28%	0%	60%	29%	54%
May	30%	61%	29%	49%	61%	65%	1%	84%	66%	72%
Jun	88%	17%	72%	69%	60%	47%	3%	88%	47%	33%
Jul	65%	0%	11%	4%	2%	1%	0%	99%	2%	1%
Aug	97%	0%	4%	1%	0%	0%	0%	99%	11%	1%
Sep	94%	25%	83%	62%	57%	48%	0%	71%	89%	62%
All months	32%	22%	23%	23%	23%	23%	0%	43%	26%	26%
Proposed - Existing Conditions										
Oct	**-24%**	**-1%**	0%	0%	0%	**-1%**	0%	**-25%**	**-6%**	**-2%**
Nov	0%	**-2%**	0%	0%	0%	0%	0%	0%	0%	**-1%**
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	**-17%**	0%	0%	**-1%**	**-2%**	0%	**-11%**	**-2%**	**-5%**
Apr	**-2%**	**-25%**	0%	**-4%**	**-17%**	**-20%**	0%	0%	**-20%**	**-18%**
May	**-2%**	*11%*	0%	**-13%**	**-14%**	**-10%**	0%	*2%*	**-9%**	0%
Jun	*6%*	*12%*	0%	*3%*	*16%*	*16%*	**-1%**	**-1%**	*13%*	*12%*
Jul	*47%*	0%	0%	*3%*	*1%*	*1%*	**-1%**	*13%*	*1%*	0%
Aug	*48%*	0%	0%	0%	0%	0%	0%	*1%*	*8%*	0%
Sep	**-2%**	*2%*	0%	0%	0%	0%	0%	**-24%**	*16%*	*4%*
All months	*6%*	**-1%**	0%	**-1%**	**-1%**	**-1%**	0%	**-3%**	0%	**-1%**

Notes: Italics = more days with temperatures of 12.0 to 20ºC for proposed than the existing conditions. Bold = fewer days with temperatures of 12 to 20ºC for proposed than the existing conditions.

Table A-6. Frequency of simulated daily mean temperature of 12.0 to 20.0°C in project-affected streams from the New Colgate Powerhouse to Feather River confluence for existing conditions, YCWA proposed operations, and differences in these frequencies, water years 1970–2010 (Source: HDR and Grinnell, 2017b,c, as modified by staff).

		Yuba River									
Month(s)	**New Colgate Powerhouse Discharge**	**RM 34.1**	**RM 23.9**	**RM 23.0**	**RM 17.7**	**RM 16.2**	**RM 13.8**	**RM 11.8**	**RM 11.6**	**RM 6.2**	**RM 0.7**
Existing Conditions											
Oct	2%	3%	58%	64%	84%	89%	95%	96%	97%	99%	98%
Nov	2%	2%	5%	6%	11%	13%	17%	22%	23%	44%	65%
Dec	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	4%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Mar	0%	1%	0%	0%	1%	1%	3%	5%	6%	14%	25%
Apr	0%	2%	3%	4%	18%	25%	33%	38%	40%	54%	66%
May	0%	0%	5%	6%	19%	25%	36%	46%	48%	75%	89%
Jun	0%	0%	15%	17%	41%	48%	66%	77%	78%	92%	81%
Jul	0%	0%	31%	44%	78%	85%	93%	96%	95%	97%	61%
Aug	0%	0%	50%	58%	92%	97%	99%	98%	98%	98%	63%
Sep	0%	3%	83%	90%	100%	99%	98%	98%	98%	97%	75%
All months	0%	1%	21%	24%	37%	40%	45%	48%	49%	56%	53%
YCWA Proposed Operations											
Oct	2%	3%	57%	62%	83%	89%	94%	96%	97%	100%	98%
Nov	2%	2%	4%	4%	9%	11%	16%	20%	21%	43%	64%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Mar	0%	0%	0%	0%	1%	1%	3%	6%	6%	15%	26%

Month(s)	New Colgate Powerhouse Discharge	Yuba River RM 34.1	RM 23.9	RM 23.0	RM 17.7	RM 16.2	RM 13.8	RM 11.8	RM 11.6	RM 6.2	RM 0.7
Apr	0%	1%	3%	5%	20%	25%	33%	40%	41%	55%	67%
May	0%	0%	8%	9%	23%	29%	40%	50%	51%	79%	89%
Jun	0%	0%	16%	20%	48%	55%	75%	84%	85%	94%	78%
Jul	0%	0%	41%	54%	83%	89%	96%	98%	98%	97%	59%
Aug	0%	0%	56%	64%	93%	96%	99%	99%	98%	98%	61%
Sep	1%	2%	83%	90%	100%	100%	100%	100%	100%	97%	74%
All months	1%	1%	22%	26%	39%	42%	47%	50%	50%	57%	52%
Proposed - Existing Conditions											
Oct	0%	0%	**-1%**	**-2%**	**-1%**	0%	**-1%**	0%	0%	*1%*	0%
Nov	0%	0%	**-1%**	**-2%**	**-2%**	**-2%**	**-1%**	**-2%**	**-2%**	**-1%**	**-1%**
Dec	**-1%**	0%	0%	0%	0%	0%	0%	**-1%**	**-1%**	0%	**-1%**
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	**-1%**	0%	0%	0%	0%	0%	*1%*	0%	*1%*	*1%*
Apr	0%	**-1%**	0%	*1%*	*2%*	0%	0%	*2%*	*1%*	*1%*	*1%*
May	0%	0%	*3%*	*3%*	*4%*	*4%*	*4%*	*4%*	*3%*	*4%*	0%
Jun	0%	0%	*1%*	*3%*	*7%*	*7%*	*9%*	*7%*	*7%*	*2%*	**-3%**
Jul	0%	0%	*10%*	*10%*	*5%*	*4%*	*3%*	*2%*	*3%*	0%	**-2%**
Aug	0%	0%	*6%*	*6%*	*1%*	**-1%**	0%	*1%*	0%	0%	**-2%**
Sep	1%	**-1%**	0%	0%	0%	*1%*	*2%*	*2%*	*2%*	0%	**-1%**
All months	*1%*	0%	*1%*	*2%*	*2%*	*2%*	*2%*	*2%*	*1%*	*1%*	**-1%**

Notes: Italics = more days with temperatures of 12.0 to 20ºC for proposed than the existing conditions. Bold = fewer days with temperatures of 12 to 20ºC for proposed than the existing conditions.

Table A-7. Simulated monthly mean temperature (°C), frequency of daily mean temperature exceeding 20.0°C, and frequency of daily mean temperature of 12.0 to 20.0°C in project-affected streams upstream of the New Colgate powerhouse for agency-recommended flows, water years 1970–2010 (Source: HDR and Grinnell, 2017d, as modified by staff).

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Mean monthly temperature (°C)										
Oct	9.5	14.8	13.1	13.5	13.7	13.9	7.2	9.2	12.0	13.7
Nov	4.8	7.5	7.2	7.2	7.2	7.3	7.2	8.1	7.4	7.6
Dec	3.5	3.7	4.6	4.3	4.2	4.1	7.1	7.5	4.8	4.0
Jan	3.9	4.0	4.4	4.1	4.1	4.0	6.9	7.3	4.7	4.0
Feb	5.1	6.6	5.2	5.5	5.8	5.9	6.8	7.8	6.2	6.2
Mar	6.9	9.8	6.7	7.7	8.2	8.5	6.7	8.4	8.4	9.0
Apr	8.2	12.2	8.2	9.6	10.2	10.7	6.7	8.3	10.1	11.5
May	11.0	16.8	10.6	12.6	13.4	14.1	7.0	9.0	12.6	14.5
Jun	15.7	23.6	15.6	17.8	18.5	19.4	7.2	9.7	15.9	18.4
Jul	19.5	27.8	21.8	23.7	24.2	24.9	7.0	11.0	19.6	22.2
Aug	17.6	25.6	21.6	22.9	23.2	23.8	7.1	10.6	17.5	21.1
Sep	14.3	21.3	18.8	19.6	19.7	20.1	7.1	10.4	15.8	18.5
All months	10.0	14.5	11.5	12.4	12.7	13.1	7.0	8.9	11.3	12.6
Frequency of daily mean temperature exceeding 20.0°C										
Oct	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	26%	0%	0%	2%	5%	0%	0%	0%	1%
Jun	2%	83%	9%	26%	36%	51%	0%	0%	1%	31%
Jul	32%	100%	89%	96%	97%	98%	0%	0%	40%	97%
Aug	3%	100%	96%	99%	100%	100%	0%	0%	6%	88%
Sep	0%	75%	17%	38%	43%	52%	0%	0%	0%	15%
All months	3%	32%	18%	22%	23%	26%	0%	0%	4%	20%
Frequency of daily mean temperature of 12.0 to 20.0°C										
Oct	12%	81%	74%	78%	80%	80%	0%	0%	46%	79%
Nov	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	14%	0%	0%	0%	1%	0%	0%	0%	3%
Apr	1%	53%	0%	11%	18%	27%	0%	0%	14%	42%
May	30%	59%	29%	48%	59%	62%	1%	1%	60%	75%
Jun	89%	17%	72%	68%	60%	47%	1%	2%	94%	65%
Jul	68%	0%	11%	4%	3%	2%	0%	6%	60%	3%
Aug	97%	0%	4%	1%	0%	0%	0%	0%	94%	12%
Sep	94%	25%	83%	62%	57%	48%	0%	2%	100%	85%
All months	33%	21%	23%	23%	23%	22%	0%	1%	39%	30%

Notes: Simulated temperatures for flow regime recommended by California DFW, FWS, and FWN using the lower intake for New Colgate Powerhouse. Shaded = temperature exceeding 20.0ºC.

Table A-8. Simulated monthly mean temperature (°C), frequency of daily mean temperature exceeding 20.0°C, and frequency of daily mean temperature of 12.0 to 20.0°C in project-affected streams from the New Colgate Powerhouse to Feather River confluence for agency-recommended flows, water years 1970–2010 (Source: HDR and Grinnell, 2017d, as modified by staff).

	New Colgate Powerhouse	Yuba River									
Month(s)	**Discharge**	**RM 34.1**	**RM 23.9**	**RM 23.0**	**RM 17.7**	**RM 16.2**	**RM 13.8**	**RM 11.8**	**RM 11.6**	**RM 6.2**	**RM 0.7**
Mean monthly temperature (°C)											
Oct	9.6	10.0	12.5	12.6	13.1	13.4	13.8	14.0	14.1	15.2	16.8
Nov	9.8	9.3	10.6	10.6	10.9	11.0	11.1	11.2	11.2	11.8	12.7
Dec	9.0	7.5	8.1	8.1	8.2	8.2	8.4	8.4	8.4	8.7	9.1
Jan	7.9	6.7	7.0	7.1	7.2	7.2	7.4	7.4	7.4	7.7	8.0
Feb	7.3	6.8	7.5	7.5	7.7	7.8	8.0	8.1	8.1	8.5	9.0
Mar	7.0	7.8	8.6	8.8	9.1	9.3	9.7	9.8	9.9	10.4	11.1
Apr	7.0	8.1	9.7	9.9	10.3	10.5	10.8	11.0	11.1	11.8	12.8
May	7.3	8.7	10.7	10.8	11.3	11.6	12.0	12.3	12.3	13.4	14.7
Jun	7.7	9.1	11.5	11.6	12.4	12.7	13.2	13.6	13.7	15.3	17.4
Jul	8.2	9.2	12.2	12.4	13.3	13.7	14.2	14.7	14.8	16.9	19.7
Aug	8.7	9.5	12.5	12.6	13.6	14.0	14.5	15.0	15.1	17.0	19.8
Sep	9.2	10.1	12.9	13.1	14.0	14.5	15.0	15.4	15.5	17.2	19.6
All months	8.2	8.6	10.3	10.4	10.9	11.2	11.5	11.8	11.8	12.8	14.2
Frequency of daily mean temperature exceeding 20.0°C											
Oct	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	4%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Month(s)	New Colgate Powerhouse Discharge	Yuba River									
		RM 34.1	RM 23.9	RM 23.0	RM 17.7	RM 16.2	RM 13.8	RM 11.8	RM 11.6	RM 6.2	RM 0.7
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
Jun	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	26%
Jul	0%	0%	0%	0%	0%	0%	0%	1%	2%	3%	46%
Aug	0%	0%	0%	0%	0%	0%	1%	2%	2%	3%	46%
Sep	0%	0%	0%	0%	0%	0%	1%	2%	2%	3%	34%
All months	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	13%
Frequency of daily mean temperature of 12.0 to 20.0°C											
Oct	2%	3%	70%	75%	90%	94%	96%	98%	98%	99%	96%
Nov	2%	2%	6%	6%	12%	15%	22%	25%	27%	47%	66%
Dec	1%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Mar	0%	1%	0%	0%	1%	1%	5%	7%	7%	16%	27%
Apr	0%	0%	2%	2%	12%	16%	21%	24%	25%	37%	57%
May	0%	0%	8%	9%	23%	32%	48%	56%	57%	80%	88%
Jun	0%	1%	28%	32%	57%	66%	80%	86%	86%	94%	73%
Jul	0%	0%	59%	64%	88%	93%	97%	97%	96%	97%	54%
Aug	1%	2%	71%	75%	95%	97%	99%	98%	98%	97%	54%
Sep	2%	3%	93%	97%	100%	100%	99%	98%	98%	97%	66%
All months	1%	1%	28%	30%	40%	43%	47%	49%	50%	56%	49%

Notes: Simulated temperatures for flow regime recommended by California DFW, FWS, and FWN using the lower intake for New Colgate Powerhouse. No temperature exceedances of 20.0ºC.

Table A-9. Simulated monthly mean temperature (°C), frequency of daily mean temperature exceeding 20.0°C, and frequency of daily mean temperature of 12.0 to 20.0°C in project-affected streams upstream of the New Colgate Powerhouse for agency-recommended flows with use of the upper intake in March through May, water years 1970–2010 (Source: HDR and Grinnell, 2017d, as modified by staff).

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Mean monthly temperature (°C)										
Oct	9.5	14.8	13.1	13.5	13.7	13.9	6.9	9.0	11.9	13.7
Nov	4.8	7.5	7.2	7.2	7.2	7.3	7.0	7.9	7.4	7.6
Dec	3.5	3.7	4.6	4.3	4.2	4.1	6.9	7.2	4.8	4.0
Jan	3.9	4.0	4.4	4.1	4.1	4.0	6.7	7.1	4.6	4.0
Feb	5.1	6.6	5.2	5.5	5.8	5.9	6.6	7.6	6.2	6.2
Mar	6.9	9.8	6.7	7.7	8.2	8.5	6.6	8.2	8.4	9.0
Apr	8.2	12.2	8.2	9.6	10.2	10.7	6.6	8.2	10.1	11.4
May	11.0	16.8	10.6	12.6	13.4	14.1	6.9	8.9	12.6	14.5
Jun	15.7	23.6	15.6	17.8	18.5	19.4	7.1	9.6	15.9	18.3
Jul	19.5	27.8	21.8	23.7	24.2	24.9	6.9	10.9	19.6	22.2
Aug	17.6	25.6	21.6	22.9	23.2	23.8	6.9	10.4	17.4	21.1
Sep	14.3	21.3	18.8	19.6	19.7	20.1	6.9	10.2	15.7	18.5
All months	10.0	14.5	11.5	12.4	12.7	13.1	6.8	8.8	11.2	12.6
Frequency of daily mean temperature exceeding 20.0°C										
Oct	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Oregon Creek		Middle Yuba River				North Yuba River		Yuba River	
Month(s)	**RM 4.2**	**RM 0.1**	**RM 12.6**	**RM 4.8**	**RM 4.6**	**RM 0.1**	**RM 2.3**	**RM 0.1**	**RM 39.7**	**RM 34.4**
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	26%	0%	0%	2%	5%	0%	0%	0%	1%
Jun	2%	83%	9%	26%	36%	51%	0%	0%	1%	31%
Jul	32%	100%	89%	96%	97%	98%	0%	0%	39%	97%
Aug	3%	100%	96%	99%	100%	100%	0%	0%	6%	87%
Sep	0%	75%	17%	38%	43%	52%	0%	0%	0%	15%
All months	3%	32%	18%	22%	23%	26%	0%	0%	4%	19%
Frequency of daily mean temperature of 12.0 to 20.0°C										
Oct	12%	81%	74%	78%	80%	80%	0%	0%	44%	79%
Nov	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	14%	0%	0%	0%	1%	0%	0%	0%	3%
Apr	1%	53%	0%	11%	18%	27%	0%	0%	14%	42%
May	30%	59%	29%	48%	59%	62%	1%	1%	59%	75%
Jun	89%	17%	72%	68%	60%	47%	1%	2%	94%	66%
Jul	68%	0%	11%	4%	3%	2%	0%	3%	61%	3%
Aug	97%	0%	4%	1%	0%	0%	0%	0%	94%	13%
Sep	94%	25%	83%	62%	57%	48%	0%	1%	100%	85%
All months	33%	21%	23%	23%	23%	22%	0%	1%	39%	31%

Notes: Simulated temperatures for recommended flow regime with use of upper intakes for New Colgate Powerhouse in March through May by California DFW, FWS, and FWN. Shading = temperature exceeding 20.0ºC.

Table A-10. Simulated monthly mean temperature (°C), frequency of daily mean temperature exceeding 20.0°C, and frequency of daily mean temperature of 12.0 to 20.0°C in project-affected streams from the New Colgate Powerhouse to Feather River confluence for agency-recommended flows with use of the upper intake in March through May, water years 1970–2010 (Source: HDR and Grinnell, 2017d, as modified by staff).

		Yuba River									
Month(s)	**New Colgate Powerhouse Discharge**	**RM 34.1**	**RM 23.9**	**RM 23.0**	**RM 17.7**	**RM 16.2**	**RM 13.8**	**RM 11.8**	**RM 11.6**	**RM 6.2**	**RM 0.7**
Mean monthly temperature (°C)											
Oct	9.0	9.6	12.1	12.2	12.8	13.0	13.4	13.7	13.7	14.9	16.5
Nov	9.4	9.0	10.4	10.4	10.6	10.7	10.9	11.0	11.0	11.6	12.5
Dec	8.7	7.3	8.0	8.0	8.0	8.1	8.2	8.3	8.3	8.6	9.0
Jan	7.7	6.5	6.9	7.0	7.1	7.1	7.3	7.3	7.3	7.6	7.9
Feb	7.1	6.8	7.4	7.5	7.7	7.8	8.0	8.1	8.1	8.5	8.9
Mar	7.8	8.4	8.8	9.0	9.4	9.5	9.9	10.0	10.1	10.6	11.3
Apr	8.2	8.9	10.2	10.4	10.8	11.0	11.3	11.5	11.6	12.3	13.2
May	8.5	9.5	11.3	11.4	11.9	12.1	12.5	12.8	12.9	13.9	15.3
Jun	7.1	8.6	11.4	11.5	12.3	12.6	13.1	13.5	13.6	15.2	17.3
Jul	7.5	8.6	11.7	11.9	12.8	13.2	13.8	14.2	14.4	16.4	19.3
Aug	8.1	9.0	12.0	12.1	13.1	13.5	14.1	14.5	14.6	16.6	19.4
Sep	8.6	9.5	12.5	12.6	13.6	14.1	14.6	15.0	15.1	16.8	19.3
All months	8.2	8.5	10.2	10.3	10.9	11.1	11.4	11.7	11.7	12.8	14.2
Frequency of daily mean temperature exceeding 20.0°C											
Oct	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
Nov	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dec	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mar	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Month(s)	New Colgate Powerhouse Discharge	Yuba River RM 34.1	RM 23.9	RM 23.0	RM 17.7	RM 16.2	RM 13.8	RM 11.8	RM 11.6	RM 6.2	RM 0.7
Apr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%
Jun	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	26%
Jul	0%	0%	0%	0%	0%	0%	0%	1%	2%	3%	39%
Aug	0%	0%	0%	0%	0%	0%	1%	2%	2%	3%	39%
Sep	0%	0%	0%	0%	0%	0%	0%	1%	1%	2%	26%
All months	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	12%
Frequency of daily mean temperature of 12.0 to 20.0°C											
Oct	2%	3%	51%	55%	80%	86%	93%	94%	95%	99%	97%
Nov	2%	2%	4%	4%	9%	11%	15%	18%	19%	39%	61%
Dec	1%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%
Jan	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Feb	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Mar	0%	1%	0%	0%	1%	2%	6%	8%	8%	18%	31%
Apr	0%	0%	5%	7%	18%	22%	29%	35%	36%	53%	71%
May	0%	2%	22%	24%	47%	52%	63%	72%	73%	88%	91%
Jun	0%	0%	28%	32%	51%	59%	72%	80%	81%	93%	73%
Jul	0%	0%	35%	43%	75%	82%	91%	95%	94%	96%	61%
Aug	0%	2%	41%	51%	88%	92%	98%	98%	98%	97%	61%
Sep	2%	3%	71%	82%	100%	100%	100%	99%	99%	98%	74%
All months	1%	1%	21%	25%	39%	42%	47%	50%	51%	57%	52%

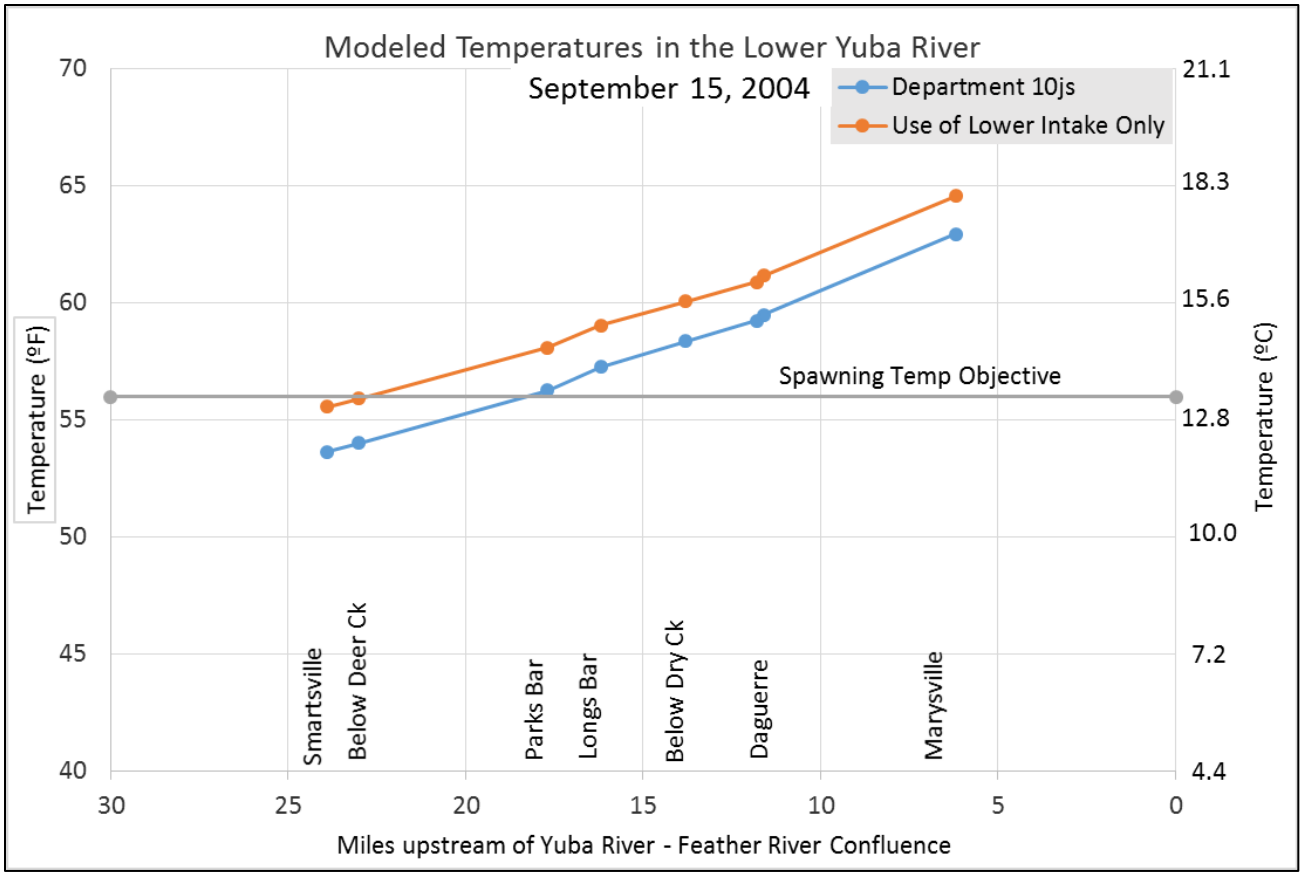
Notes: Simulated temperatures for recommended flow regime with use of upper intakes for New Colgate Powerhouse in March through May by California DFW, FWS, and FWN. No temperature exceedances of 20.0ºC.

Note: Use of only lower intake for New Colgate Powerhouse is represented a by green line for Smartsville and a blue line for Daguerre Point Dam. Use of both intakes is represented by a black line for Smartsville and a red line for Daguerre Point Dam.

Figure A-1. Simulated Lower Yuba River temperatures in 2004, a below normal year (Source: California DFW, 2018).

Note: Use of only lower intake for New Colgate Powerhouse is represented by a green line for Smartsville, a blue line for Daguerre Point Dam, and a pink line for Marysville. Use of both intakes is represented by a black line for Smartsville, a red line for Daguerre Point Dam, and a yellow line for Marysville.

Figure A-2. Simulated Lower Yuba River temperatures in 2004, a below normal year (Source: California DFW, 2018).



Note: Gray line indicates Lower Yuba River 56°F (13.3°C) spawning temperature objective (RMT, 2010). Habitat with suitable spawning temperatures would be available in about 6 miles under California DFW's 10(j) recommended use of upper and lower intake to New Colgate Powerhouse compared to 1 mile using only the lower intake.

Figure A-3. Simulated Lower Yuba River temperature on September 15, 2004, in a below normal year (Source: California DFW, 2018, as modified by staff).

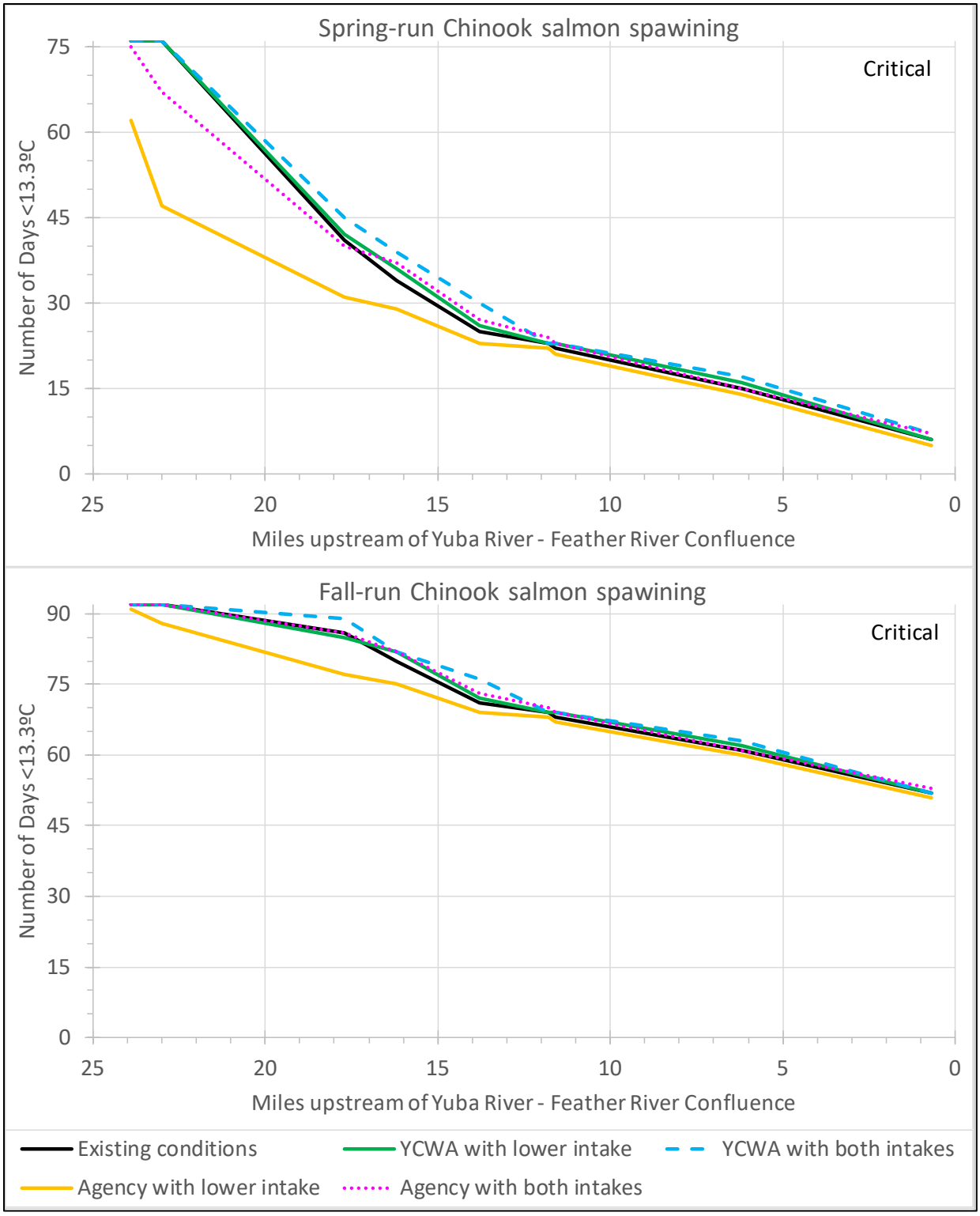


Figure A-4. Median number of days lower Yuba River simulated daily mean temperature meet RMT (2010) water temperature objective for spring-run and fall-run Chinook salmon spawning and incubation in critical water years (1970–2010) (Source: YCWA, 2017b,c,d).

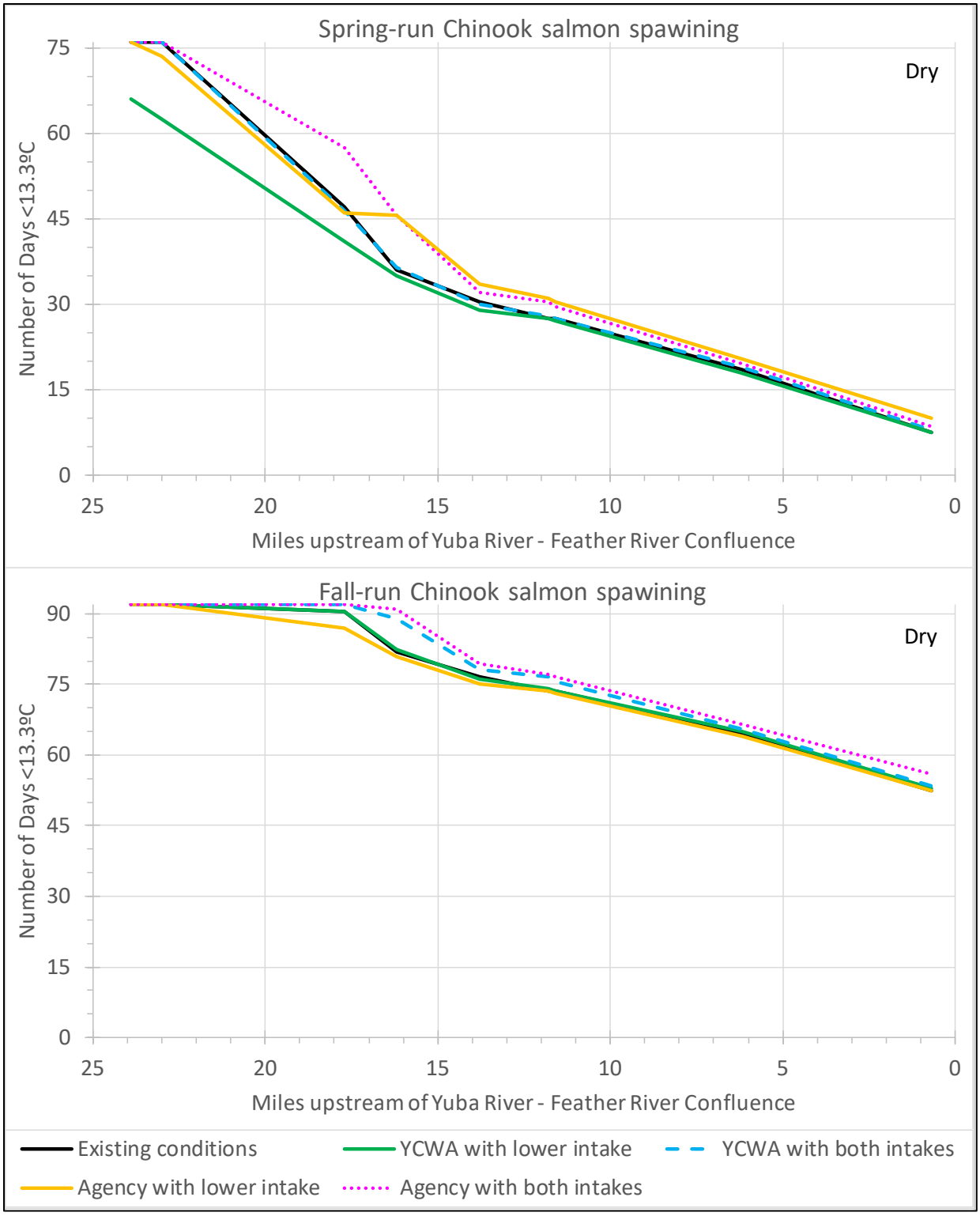


Figure A-5. Median number of days lower Yuba River simulated daily mean temperature meet RMT (2010) water temperature objective for spring-run and fall-run Chinook salmon spawning and incubation in dry water years (1970–2010) (Source: YCWA, 2017b,c,d).

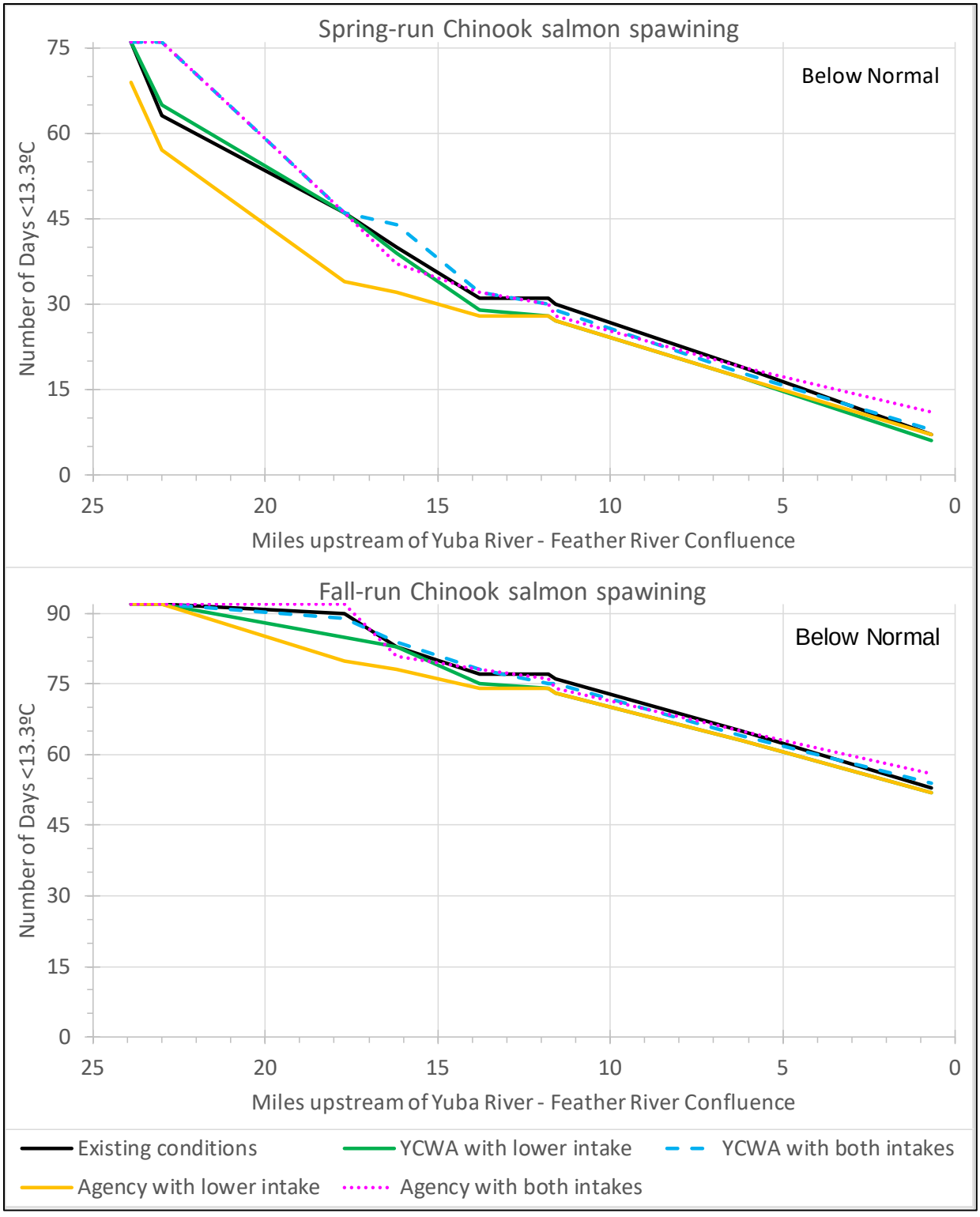


Figure A-6. Median number of days lower Yuba River simulated daily mean temperature meet RMT (2010) water temperature objective for spring-run and fall-run Chinook salmon spawning and incubation in below normal water years (1970–2010) (Source: YCWA, 2017b,c,d).

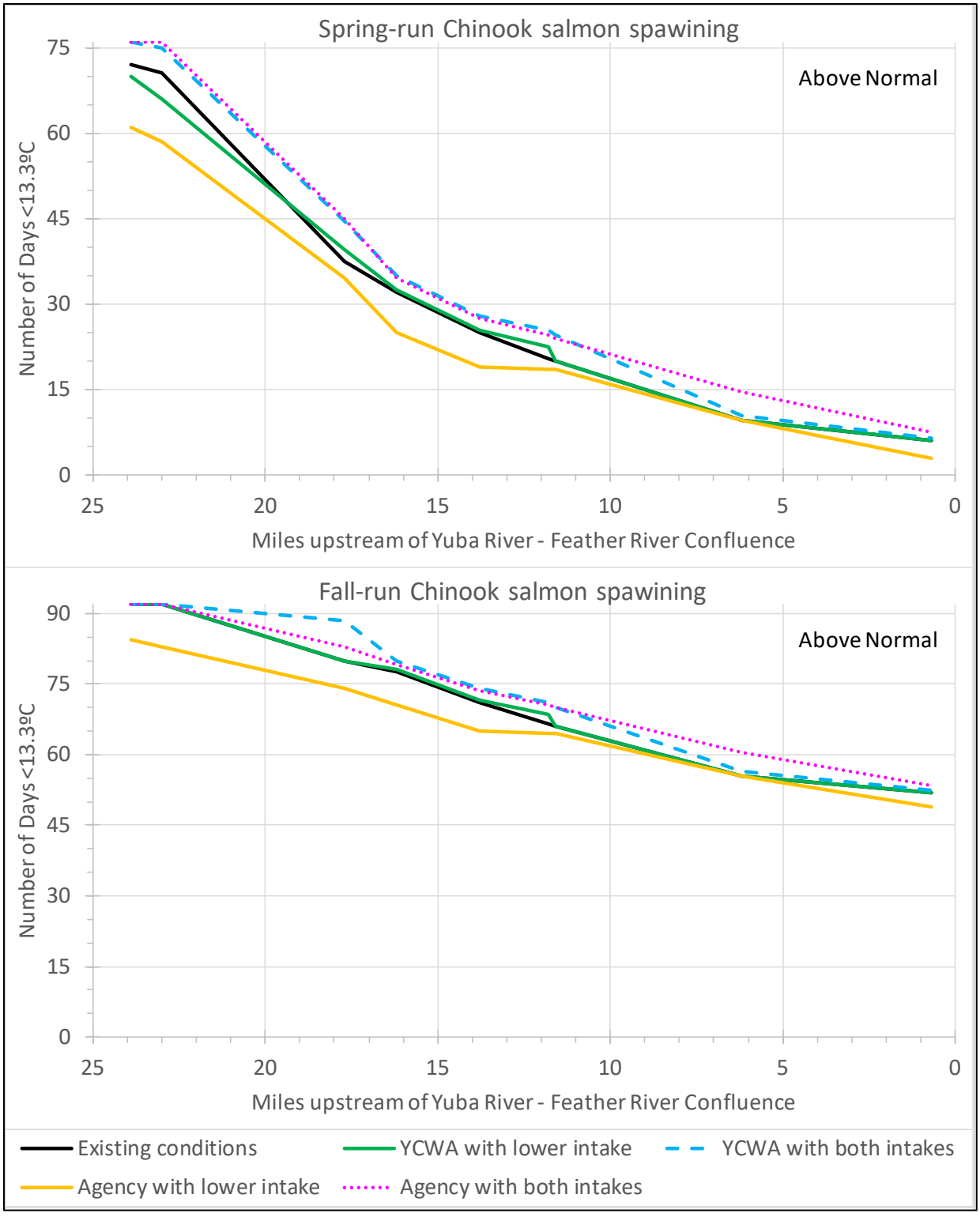


Figure A-7. Median number of days lower Yuba River simulated daily mean temperature meet RMT (2010) water temperature objective for spring-run and fall-run Chinook salmon spawning and incubation in above normal water years (1970–2010) (Source: YCWA, 2017b,c,d).

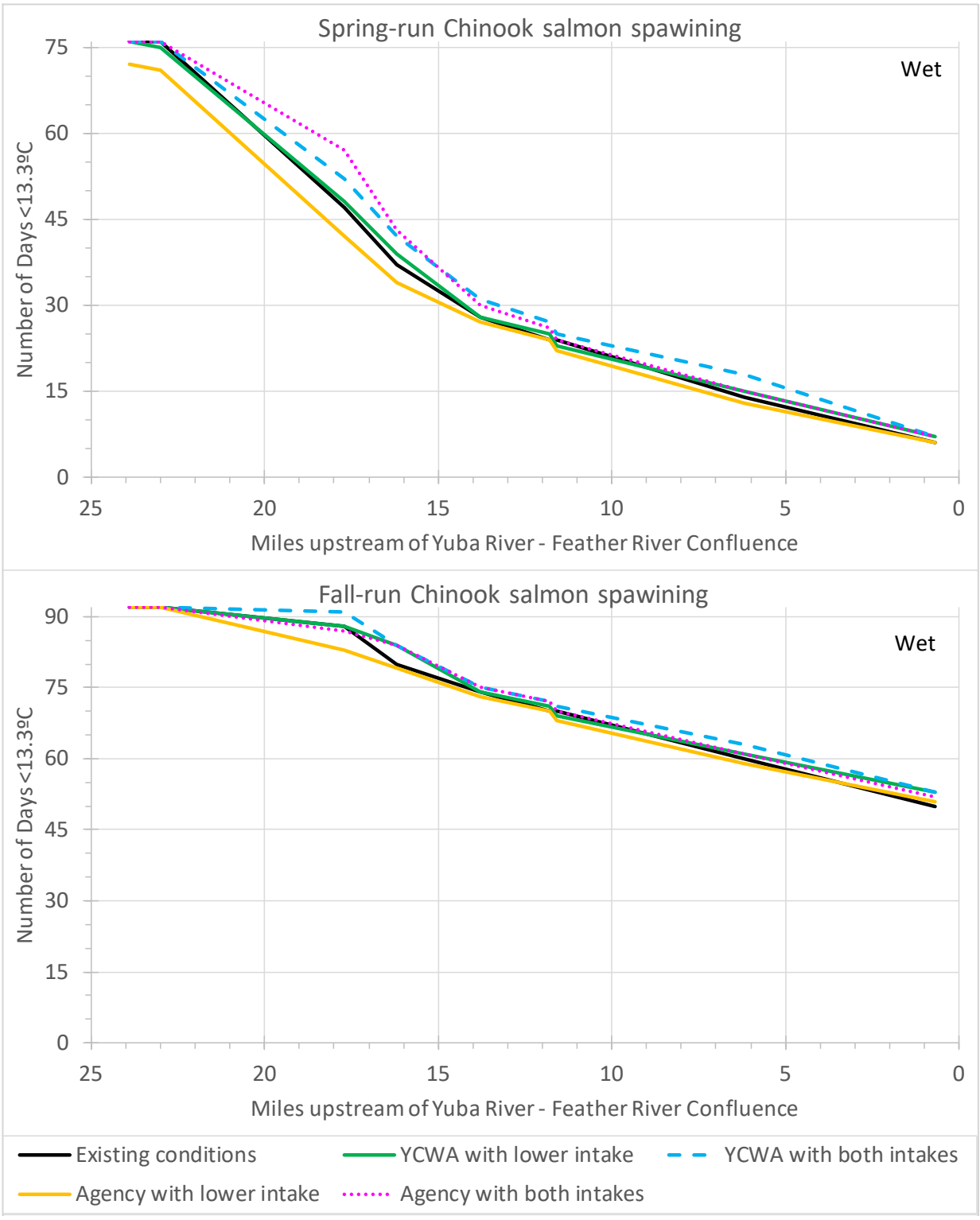


Figure A-8. Median number of days lower Yuba River simulated daily mean temperature meet RMT (2010) water temperature objective for spring-run and fall-run Chinook salmon spawning and incubation in wet water years (1970–2010) (Source: YCWA, 2017b,c,d).

APPENDIX B

Comments on Draft Environmental Impact Statement

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE YUBA RIVER DEVELOPMENT PROJECT

Yuba River Development Project—FERC Project No. 2246-065–California

The Federal Energy Regulatory Commission (Commission or FERC) issued a draft environmental impact statement (EIS) on the proposed relicensing of the Yuba River Development Project (project) on May 30, 2018. Comments were due by July 30, 2018. In addition, Commission staff conducted two public meetings in Marysville, California, on July 10, 2018, to take oral comments on the draft EIS. Statements made at the meetings were recorded by a court reporter and incorporated into the Commission's public record for the proceeding.[136]

In this appendix, we summarize the written and oral comments received on the draft EIS that pertain to our analysis; provide responses to those comments; and indicate, where appropriate, how we modified the final EIS. We group the comment summaries and responses by topic for convenience. Although we do not summarize comments that recommend minor revisions to the draft EIS in this appendix, we made those revisions in the final EIS. We also do not summarize comments that only express opinions either for or against the proposed project or the staff alternative or simply reiterate a stakeholder position or recommendation previously provided.

The following entities filed comments on the draft EIS:

Commenting Entity	Filing Date
U.S. Representative Doug LaMalfa	July 9, 2018
James Gallagher	July 10, 2018
Gerald Johns	July 12, 2018
Congressman James Garamendi	July 16, 2018
Charlie Hoppin	July 18, 2018
Jim Nielson	July 18, 2018
James Gallagher	July 18, 2018
Robert Bendorff	July 18, 2018
Steven Durfor	July 18, 2018
Ryan Broderick	July 18, 2018
Al Lassaga	July 18, 2018
Yuba County	July 18, 2018

[136] *See* transcripts of the July 10, 2018, scoping meetings and associated errata, eLibrary Accession Nos. 20180815-4001, 20180815-4002, 20180815-4003, 20180815-4004, and 20180905-4002.

Commenting Entity	Filing Date
Sarah Fennel	July 23, 2018
Neil Nikrik	July 24, 2018
Joseph Rand	July 24, 2018
Chris Tully	July 24, 2018
Nathan Corona	July 25, 2018
William Boyer	July 25, 2018
Jim Addington	July 25, 2018
Jeff Wasielewski	July 26, 2018
James Cantos	July 26, 2018
Grant Barbour	July 26, 2018
Jon Brommeland	July 26, 2018
Bruno Pitton	July 27, 2018
Keith Kishiyama	July 27, 2018
Ralph Shaffer	July 27, 2018
Ryan Spanke	July 27, 2018
National Marine Fisheries Service	July 27, 2018
U.S. Forest Service	July 27, 2018
California State Water Resources Control Board	July 30, 2018
South Yuba River Citizens League et al.[137]	July 30, 2018
Wendy Wyels	July 30, 2018
Haven Livingston	July 30, 2018
Chris Shehab	July 30, 2018
Scott Robertson	July 30, 2018
Heidi Howard	July 30, 2018
Keith Kugley	July 30, 2018
South Yuba River Citizens League and 212 stakeholders	July 30, 2018
Yuba County Water Agency	July 30, 2018
U.S. Department of the Interior	July 30, 2018
Foothills Water Network	July 30, 2018
U.S. Environmental Protection Agency	July 30, 2018
California Department of Fish and Wildlife	July 30, 2018
Eric Forsman	July 30, 2018
Foothill Conservancy	July 30, 2018
U.S. Army Corps of Engineers	July 31, 2018
Ambrose Tuscano	July 31, 2018
Richard Montgomery	July 31, 2018
George Fitz	August 1, 2018

[137] Includes Friends of the River, The Sierra Fund, Northern California Council International Federation of Fly Fishers, Native Fish Society, Pacific Coast Federation of Fishermen's Associations, Patagonia, and Stoecker Ecological.

1.1 GENERAL

Comment G1: The National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) comments that the analysis of the environmental impacts of the alternatives is inadequate under the National Environmental Policy Act (NEPA) and its implementing regulations. NMFS notes that most of the environmental analysis contained within the draft EIS, especially regarding the "no-action alternative," is insufficient under NEPA. In many places in the draft EIS, the Commission appears to conclude that if any alternative is similar to the no-action alternative, then no environmental analysis is required. This approach is not supported by NEPA regulations, which require analysis of the adverse environmental impacts of *all* alternatives, including the proposed alternative and the no-action alternative. In the draft EIS, the "no-action" alternative developed by the Commission consists of the project continuing to operate under the terms and conditions of the existing license and the flow regime associated with the Lower Yuba River Accord (Yuba Accord). The flow requirements of the Yuba Accord are significantly different from the requirements contained in Article 33 of the current license. Although the Yuba County Water Agency (YCWA) releases flows in accordance with the Yuba Accord, the Commission was not a party to this agreement, and the flow requirements are not contained in the current license. By including this third-party agreement in the no-action alternative, the Commission is adopting those flows without any environmental analysis.

Regardless of what set of flows are considered the "no action" alternative, NMFS contends that the environmental consequences of those flows must be analyzed as required by NEPA.

Response: In licensing proceedings, the Commission uses existing environmental conditions as the baseline against which to evaluate the environmental effects of an applicant's proposal and other reasonable alternatives. Throughout the draft EIS, the Commission describes and analyzes the affected environment, which is the existing condition and environmental baseline, and recognizes and discusses changes to project operation that have occurred during the current license, including the increased flows and environmental enhancements associated with the Yuba Accord. Under the "no action" alternative, these existing conditions would continue, without change. Although YCWA did not amend the current license to include the requirements in the Yuba Accord, YCWA has operated the project for more than 11 years consistent with the measures in the accord. These project operations have established existing environmental conditions and are therefore an appropriate baseline in this case for the Commission to evaluate proposed changes to the project under any new license.

Comment G2: NMFS comments that the Commission does not recommend specific, enforceable measures that can be implemented in a timely fashion. In many instances in the draft EIS, the Commission recommends development of a plan in consultation with the resource agencies, instead of analyzing specific, detailed plans that NMFS provided

in its 10(j) recommendations. NMFS requests that the Commission analyze NMFS's plans and the scientific rationale that supports them and then make a determination regarding the specifics of a plan. NMFS comments that the Commission recommends that YCWA develop plans, but NMFS believes that, without a framework or guidance from the Commission regarding the specifics of such a plan, this approach is likely to be unsuccessful and result in costly delays implementing protection and enhancement measures.

Response: We analyze the specific components of NMFS 10(j) recommendations in section 3 of the EIS. We do not recommend implementation of the specific plans that NMFS provided because we determined that the cost of these plans outweighed the benefit to the resource (i.e., they were not in the public interest). For example, implementation of NMFS's recommended LWM plan would result in a levelized annual cost of approximately $700,000. Whereas, staff's recommended LWM plan would have a levelized annual cost of approximately $100,000. NMFS's recommended physical habitat improvement projects for juvenile salmonid rearing in the lower Yuba River would have a levelized annual cost of approximately $2.3 million, while staff's recommended Lower Yuba River riparian restoration plan would have a levelized annual cost of approximately $250,000. Furthermore, we note that general monitoring of fish habitat and fish populations would not necessarily isolate any project-specific effects on the resources. Measures proposed by YCWA and recommended by staff should adequately protect aquatic habitat in the project affected reach of the Yuba River.

Comment G3: The U.S. Environmental Protection Agency (EPA) comments that it has concerns regarding potential effects on air quality from the construction activities associated with the project. EPA notes that the draft EIS does not evaluate existing air quality within the geographic scope of the project and does not examine the project's potential air pollutant emissions from construction activities. EPA contends this analysis is necessary to demonstrate compliance with state and federal air quality regulations and to disclose potential effects from temporary or cumulative degradation of air quality. Because the project area is currently classified as a nonattainment area for the federal 8-hour ozone National Ambient Air Quality Standard (NAAQS) and a maintenance area for the particulate matter with a diameter of less than 2.5 micrometers ($PM_{2.5}$) NAAQS, EPA comments that a conformity analysis is also needed.

Response: During scoping for the EIS, no stakeholder requested an analysis of project effects on air emissions. No major project-related construction and associated land-disturbing activities involving the use of heavy construction equipment are proposed or contemplated; therefore, there would be no significant air quality effects under any of the alternatives in the EIS.

Comment G4: EPA comments that environmental measures included in the plans listed under the applicant's proposal and staff alternative are inconsistently and not

thoroughly described in the draft EIS and should contain information regarding timing, responsibility for implementation and enforcement, and specific actions to be taken. The U.S. Department of Agriculture, Forest Service (Forest Service) also comments on the accuracy or completeness of the descriptions of proposed environmental measures, facility modifications, and project operations and questions whether they are appropriately analyzed.

Response: Any measures required by a license must be implemented by the licensee, with enforcement of any license conditions being conducted by the Commission's Division of Hydropower Administration and Compliance. YCWA's proposed operation and environmental measures and those recommended by the agencies are described in sufficient detail for our environmental review.

Comment G5: The Forest Service comments that the executive summary should include a summary of the effects analysis for the staff alternative with mandatory conditions.

Response: We modified the executive summary in the final EIS to include a summary of the effects of the staff alternative with mandatory conditions.

Comment G6: The Foothills Water Network (FWN) comments that the draft EIS does not analyze a reasonable range of alternatives and should include: (1) a California Department of Fish and Wildlife (California DFW)-U.S. Department of the Interior, Fish and Wildlife Service (FWS)-FWN joint recommendation alternative, (2) a Bay-Delta Water Quality Control Plan Alternative, and (3) an alternative in which the Narrows 1 development is included as part of the project.

Response: The alternatives evaluated in the EIS were proposed during scoping and reflect the range of environmental measures proposed by the applicant on federal and private land, as well as a multitude of measures recommended by agencies and stakeholders. While the EIS does not assign specific alternatives to multiple possible combinations of recommended measures, staff considered all recommended measures in its analysis. The staff alternative considers developmental and non-developmental values, including environmental, recreational, and socioeconomic effects of any new license issued for the project, as well as alternatives not involving issuance of a new license. We do not evaluate an alternative that includes the downstream Narrows 1 Project as a project development because that project is a separately licensed project that will be subject to the relicensing process starting in 2021. Coordination of the two projects, however, is addressed in the EIS. We do not consider a Bay-Delta Water Quality Control Plan alternative because the Sacramento/Delta Update to the plan is still under development.

1.2 GEOLOGY AND SOILS

Comment GS1: The Forest Service, California DFW, and the California State Water Resources Control Board (Water Board) comment that the description in the draft EIS of sediment availability and transport is not accurate. The Forest Service reports that all of the stream reaches studied upstream of Englebright Reservoir have gradients less than 3 percent, and stream channels with gradients less than 3 percent are considered to be transport-limited. The Forest Service contends the lack of sediment found in the reaches below the two diversion dams and below New Bullards Bar Reservoir is more likely due to the reduction in sediment supply from project operations, and not due to geologic processes.

Response: A transport-dominated reach, as defined in our analysis, is the part of the river characterized as having the ability to convey the incoming sediment through the reach with only limited storage and additional erosion. Conversely, response reaches are characterized as parts of the river where stream energy drops, creating areas of deposition. The gradient in transport-dominated channels is usually high enough to supply the energy to transport sediment. As a result, sediment does not generally accumulate in such reaches but is transported through them over time.

According to this definition, a few response reaches in the project area and most of the channels are transport-dominated. However, several factors affect sediment transport versus sediment deposition in a reach, including, but not limited to, flow velocity, sediment supply, and channel morphology.

Montgomery and Buffington (1997) broadly classify channel-reach morphology into distinct reach types. They note that it appears that, in part, local flow hydraulics influence the general distribution of channel types in a watershed. According to the study, "specific responses depend on the nature, magnitude, and persistence of disturbance, as well as on local conditions, including riparian vegetation, in-channel large woody debris, bank materials, and the history of catastrophic events. Furthermore, concurrent multiple perturbations can cause opposing or constructive response, depending on both channel type and the direction and magnitude of change." Therefore, typical gradients of river reaches are one of several considerations.

In the final EIS, we modified the definition of transport-dominated streams and included sediment supply as one of the factors. We also list the actual range of gradients in the streams (i.e., 1 to 3 percent). Further, we provide a rough estimate of total sediment trapped behind the dam (350,000 tons per year), using the drainage area at the dam of 489 square miles and an average sediment yield of 250 metric tons/square kilometer/year based on Snyder et al. (2004). Assuming that 15 percent of the total sediment load constitutes bedload, a rough estimate of the trapped bedload volume is 52,000 tons per year. We consider it unlikely that enhancing the sediment supply by 5,000 tons (with intermittent replenishments as needed) below New Bullards Bar Dam

would substantially change the existing transport-dominated conditions in the North Yuba River.

Comment GS2: The Water Board requests clarification on staff's determination that large flood events transport most sediment and function as a "reset" mechanism in project-affected reaches. The Forest Service comments that large amounts of sediment had to be removed from behind Our House and Log Cabin Dams following flood events in 1986 and 1997. YCWA states that it filed a revised Our House and Log Cabin Diversion Dams Sediment Management Plan for proposed condition GS2.

Response: In the final EIS, we removed the text referencing a "reset" mechanism. Most sediment transport does occur during large flood events, which includes disturbing and reworking floodplain deposits, mid-channel bars, and historical mining material in project affected reaches, as well as scouring some (but not all) sediment from the impoundments of the diversion dams. We also analyze YCWA's revised Our House and Log Cabin Diversion Dams Sediment Management Plan in the final EIS.

Comment GS3: The Forest Service questions the draft EIS description (page 3-16) of the North Yuba River as having a steep gradient, with sections as steep as 5.5 percent, and being transport-dominated. The Forest Service believes that the river has a 1 to 2 percent gradient between short stretches of the river and contends that the reason that this section of river is transport-dominated is because of the lack of sediment supply. The Forest Service also contends this not an accurate characterization with regard to suitability of large woody material (LWM) placement (draft EIS, page 3-179). FWN similarly comments that the draft EIS applies an average rise-over-run metric for the entire 2.4-mile reach below New Bullards Bar Dam, finding as a result that placement of large wood and gravel would be ineffective. However, the slope of much of this reach is largely flat, broken up by several steep drop-offs. The flat areas could retain sediment and large wood for a longer period than the draft EIS suggests.

Response: Staff used information presented in YCWA's 2017 amended final license application and its response to Ready for Environmental Analysis (REA) comments, filed October 10, 2017, to describe the North Yuba River gradient. For the 1,000-foot-long longitudinal profile at Site 7 along the North Yuba River, YCWA (2013a) measured a decrease in elevation by 29 feet, which translates into an average slope of 2.9 percent. YCWA reports an overall gradient of 2 percent for the 2-mile-long North Yuba River reach between New Bullards Bar Dam and the confluence of the North Yuba River with the Middle Yuba River, with a maximum gradient of approximately 5.5 percent at RM 1. Using elevations available on Google Earth, we also estimate an average gradient of approximately 2 percent for the 2-mile-long North Yuba River reach below the dam.

Although the reservoir clearly captures the sediment that flows into it, some very limited sources of sediment are below New Bullards Bar Dam. These sources include

erosion of side-cast material from a quarry on Marysville Road and stormwater runoff and mass-wasting processes along the slopes. However, YCWA (2013b) only found rare accumulations of trout spawning-sized gravel (total of 511 square feet) along a distance of 1.1 miles of the North Yuba River below the dam.

Large flow events would continue to occur in the North Yuba River, although peak flow velocities may decrease slightly during some of these events because of the new auxiliary flood control outlet and the periodic closure of the Lohman Ridge Diversion Tunnel. YCWA modeled that the new outlet additional release capacity (and release capacity at a lower water-surface elevation) would only be needed during very large storm events, or in roughly 8 of 41 years. Preemptive releases associated with the forecasted coordinated operations program would likely be made using the auxiliary flood control outlet in even fewer occurrences than the 8 in 41 years. For example, for the 1986 spill event, the peak flow in the North Yuba River below the dam was approximately 50,000 cubic feet per second (cfs); with the new outlet, YCWA (2014) modeled that the peak flow for this event would have been approximately 40,000 cfs. For the even larger 1997 spill event, the peak flow in the North Yuba River below the dam was approximately 54,000 cfs; for this event, the modeled peak flow with the new outlet would have been similar.

Also, the reduction in water volume in New Bullards Bar Reservoir from closures of the Lohman Ridge Diversion Tunnel under YCWA's proposed measure AR11 and Forest Service preliminary section 4(e) condition 35 would be limited (see a more detailed discussion in the response to comment AQ13).

Therefore, considering that spawning-sized gravel would be mobilized at river flow velocities between 60 and 700 cfs (Kondolf and Wolman, 1993), and that peak flow events in the North Yuba River would continue to be substantially higher, most of the augmented sediment would eventually be transported from this reach.

Comment GS4: The Forest Service, Water Board, and FWN suggest that there may be ways to reduce the cost of sediment enhancement, including using staging areas closer to the site, using or enhancing alternative access routes to allow gravel and LWM delivery, or using a gravel injection approach similar to the approach used in the lower Yuba River.

Response: Augmented sediment would be retained for a period in the North Yuba River. The length of time that the material would be retained would be a function of the peak flow velocity frequency and flow rate and the volume of sediment placed. However, as discussed in the response to comment GS3, considering the comparatively low velocities needed to mobilize spawning-sized gravel and the comparatively high velocities during peak flow events, any augmented sediment would eventually be transported from the reach, which would limit its effectiveness. Regardless of the delivery method used for sediment augmentation (e.g., by helicopter, by truck via an

extended river access road on either side of the river, or a modified version of the gravel injection method currently implemented in the lower Yuba River), benefits to fish habitat would be limited. A description of the additional methods suggested by the Forest Services was added to the final EIS.

1.3 WATER RESOURCES

Comment WR1: The Water Board requests clarification of how the U.S. Army Corps of Engineers (Corps) operates Englebright Dam and Reservoir. NMFS and FWN comment that the Corps does not "operate" Englebright Dam and Reservoir when it comes to water storage and release; they note that YCWA, not the Corps, decides how and when to release water from the reservoir via the Narrows complex. NMFS contends that the Yuba Accord contains operations rules that YCWA must follow to maintain certain elevations in Englebright Reservoir. YCWA rather than the Corps has discretion to release water from the Narrows complex and to some extent prevent or encourage "spills" from Englebright Reservoir. South Yuba River Citizen's League et al. comments that Englebright Dam operations should be considered in the final EIS because it is closely tied to the operation of the Yuba River Development Project.

Response: We modified section 2.1.3 in the EIS to provide a detailed description of the operation of Englebright Dam. As noted in section 2.1.4.2, *Lower Yuba River Accord*, YCWA has been operating the project to implement the Yuba Accord according to the authorizations and requirements in the Water Board's corrected order Water Right (WR) 2008-0014. The Water Board's corrected order WR 2008-0014 does not outline certain elevations in Englebright Reservoir that YCWA must follow as NMFS suggests. We modified section 2.1.4.2, *Lower Yuba River Accord*, in the final EIS to reflect this clarification.

Comment WR2: The Water Board states that the draft EIS appears to have grouped the agency flow-related recommendations for all project reaches together and grouped YCWA's flow-related proposals for all project reaches together in the analysis. This includes minimum flows and ramping rates for Oregon Creek below Log Cabin Diversion Dam, Middle Yuba River below Our House Diversion Dam, North Yuba River below New Bullards Bar Dam (New Bullards Bar Reach), and the Yuba River below Englebright Dam (lower Yuba River). The Water Board requests that the Commission identify how each proposed/recommended flow-related measure affects water surface elevations in New Bullards Bar Reservoir independently. After the Commission analyzes each measure independently, the Commission should group YCWA's proposed measures that were not agreed to by the agencies and the agencies' recommended measures that were not agreed to by YCWA to identify the effects of each entities' measures on water surface elevation in New Bullards Bar Reservoir.

YCWA requests that the final EIS evaluate its revised AR3 proposal, filed on October 10, 2017, for minimum instream flows downstream of Narrows 2 Powerhouse and Narrows 2 full bypass.

Response: We added analysis to section 3.3.5.2, *Environmental Effects*, *Effects of Proposed Operation and Maintenance*, *Minimum Streamflows below New Bullards Bar Dam*, to analyze YCWA's revised AR3. As discussed in these sections of the final EIS, the effects of each entities' measures on water surface elevation in New Bullards Bar Reservoir vary based on the proposed minimum flow from New Bullards Bar Dam. The higher minimum flows recommended by the agencies would lower the water surface elevation in New Bullards Bar Reservoir at a faster rate over time than YCWA's proposed minimum flows. We added figures 3-50 through 3-54 to the final EIS to show the effect of each measure on the water surface elevation of New Bullards Bar Reservoir in all water year types.

Comment WR3: FWN comments that in April 2018, relicensing participants resolved a disagreement regarding the reevaluation of water year types for the lower Yuba River in the month of February following schedule 5, 6, and 7 years.[138] YCWA filed a description of this agreement with the Commission on April 27, 2018. FWN recommends that the final EIS analyze this measure as agreed to.

Response: Section 3.3.2.2 of the final EIS, in the subsection *Water Year Type Determination*, includes analysis regarding this agreement among YCWA and the commenting agencies.

Comment WR4: EPA states it is not clear what effect proposed construction activity (i.e., the proposed auxiliary flood control outlet) and operational changes would have on mercury concentrations and bioavailability of methylmercury in water. EPA requests that the final EIS disclose the health impacts of consuming fish that contain elevated concentrations of mercury based on Clean Water Act section 303(d) listings for mercury and mercury-based ingestion advisories in the project area (draft EIS, page 3-31). EPA also requests that staff consider including a license condition to continue monitoring mercury in fish that are annually stocked, as proposed by YCWA, to inform decision making regarding fish stocking and project operation.

Response: In the final EIS, we revised section 3.3.1.2, *Erosion during Construction and Project Operation*, to clarify the effects of construction-related erosion on mercury and methylmercury. We also revised section 3.3.1.2, *Sediment Transport in Middle*

[138] The Yuba Accord defines schedule 1 through 6 and conference year water years. We assume the FWN reference to schedule 7 water years refers to conference years.

Yuba River and Oregon Creek, to include YCWA's proposed testing of sediments for metal contamination. As discussed in these sections of the final EIS, YCWA's proposed construction and sediment management measures include commonly used practices to limit the spread of contaminants (which include mercury), such as limiting instream construction to low-flow periods, silt fencing, and revegetation of areas after ground-disturbing activities. As discussed in section 3.3.2.2, *Water Quality Monitoring*, in the draft and final EIS, proposed project operation is expected to result in water quality that is as good as or better than existing conditions. We are not aware of an YCWA proposal to monitor mercury in fish to be stocked in project waters. Furthermore, we do not support adding it as a measure because project waters already have human consumption advisories in place, and we do not expect future stocking of fish to change this.

In addition, in section 3.3.2.1, *Water Quality*, of the final EIS, we include a brief description of the mercury-caused health risks to humans and cite documents that provide additional information on these risks and limiting exposure to them.

Comment WR5: NMFS comments that staff does not provide an analysis for determining what is an "acceptable" or "*de minimus*" increase in temperature in the analysis of temperature changes downstream of the New Colgate Powerhouse under proposed operation (draft EIS, page 3-112). NMFS comments that it appears staff believes that a 0.5 degree Celsius (°C) increase in temperature is acceptable. NMFS contends that this is not consistent with the standard applied to flow recommendations made by NMFS and other agencies. NMFS states that there is no analysis on acceptable temperature thresholds for species during the appropriate lifestage or any analysis of environmental effects of the temperature increase.

Response: The paragraph referenced by NMFS provides the general pattern of changes in simulated monthly mean temperatures. As indicated in table A-2 in appendix A of the draft and final EIS, the maximum increase in monthly mean temperature in the lower Yuba River is 0.3ºC in June, which is the only month that the simulated monthly mean temperature increases by more than the measurement accuracy of 0.2ºC. Staff selected the temperature range of 12.0°C to 20.0°C (Interior, 2017) based on criteria previously used by FWS, other resources agencies, the Commission, and YCWA as noted in the draft EIS, section 3.3.2.2, in the subsection *Effects of Proposed Operation on Water Temperature*, page 3-112.

Comment WR6: The Water Board requests that data from 2012 through 2016 be included in the evaluation of how use of the upper intake for New Colgate Powerhouse may influence lower Yuba River temperatures during a series of drier water year types.

Response: We acknowledge the value of analyzing the 2012–2016 data, which includes a series of dry years, to provide further insight into the limitations and benefits of using the upper intake. Therefore, we revised section 3.3.2.2, *Use of the*

Upper Intake for New Colgate Powerhouse to Control Downstream Water Temperatures, of the final EIS by adding a discussion of the 2012–2016 period and clarifying that the New Bullards Bar Reservoir coldwater pool is sometimes depleted during sequential low-flow years. We also added a column to table 3-31 to show the frequency of reservoir levels that would prevent use of the upper intake and added figure 3-30 to show the timing of simulated reservoir levels that would prevent operating the upper intake.

Comment WR7: The Water Board comments that table 3-38 in the draft EIS (table 3-39 in the final EIS)is unclear if water temperature would regularly exceed 20°C every year or primarily during drier water year types and requests that staff evaluate the number of years and the water year types during which 20°C exceedances would occur.

The Water Board also comments that improvements to water temperature from using the upper intake in combination with the lower intake may occur in drier water year types. The Water Board contends that an analysis that combines the average monthly water temperature across all water year types to estimate average temperature exceedance in a certain month, as presented in the draft EIS, does not distinguish potential benefits that may be regularly obtained in drier water year types. The Water Board requests an analysis of simulated water temperatures based on water year type.

Response: Including water year types in the evaluation of temperature effects is appropriate to provide additional insight into differences between water year types. We added an evaluation of water year types to our temperature analysis in the final EIS in section 3.3.2.2, *Effects of Flow Regulation on Aquatic Habitat Upstream of Englebright Dam*, which includes four new figures (3-31, 3-32, 3-35, and 3-36), and additional footnotes to table 3-41.

Comment WR8: California DFW requests that staff reevaluate its water temperature analysis for the Upper New Colgate Power Tunnel Intake based on YCWA's modeling and more recent monitoring data. In addition, it recommends using the temperature objectives associated with RMT 2010, which were included as Attachment 7.2A in the FERC-approved Study Plan 7-2 for this project.

Response: As discussed in the responses for comments WR5 and WR6, we revised the final EIS to evaluate (1) the 2012–2016 period, (2) annual variability in simulated New Bullards Bar Reservoir levels limiting use of the upper intake, (3) frequencies of simulated daily mean temperature exceeding 20°C by water year and water year type, and (4) frequencies of simulated daily mean temperatures between 12°C and 20°C by water year and water year type.

Comment WR9: The Forest Service comments that it does not appear from the discussion and references in the draft EIS that staff reviewed its comment document on the drought management plan. The Forest Service proposes three modifications to the

plan: (1) appropriate definition of drought; (2) process for engaging agencies and the public; and (3) mandatory agency conditioning approval.

Response: The Forest Service filed final 4(e) conditions on September 27, 2018, including a new condition for a drought management plan. We modified section 3.3.2.2, in the subsection *Drought Management*, to include an analysis of this condition. We conclude the Forest Service condition is consistent with the drought management plan we recommend in the draft EIS. While the Forest Service condition specifies the plan include components detailing agency consultation requirements and consistency with 4(e) conditions, such consultation would be required as part of the Commission's plan review and approval process. The Commission would also evaluate consistency with 4(e) conditions prior to plan approval.

Comment WR10: The Water Board comments that the draft EIS references the Water Board's preliminary conditions but often states that some preliminary conditions are not adequately specific to analyze environmental effects (e.g., specific minimum instream flows are not identified). In a July 10, 2018, meeting to solicit comments on the draft EIS, documented in accession no. 20180815-4002, the Water Board explained that its descriptions of preliminary conditions have limited detail because they were pre-decisional, and stated that it provided more specificity in the REA comments. The Water Board suggests that staff consider and analyze the preliminary terms and conditions in the context of the Water Board's REA comments, which provide additional specificity regarding the preliminary terms and conditions.

Response: As discussed in the meeting to solicit comments on the draft EIS referenced above, staff attempted to define the Water Board's preliminary conditions based on Water Board comments filed with the preliminary 401 conditions while also avoiding misrepresenting the Water Board's intention. Reevaluation of the Water Board's comments on the REA reveals that it suggests that staff:

- evaluate flow releases over the range of flow proposals made for the North Yuba River below New Bullards Bar Dam during relicensing negotiations and provide a table of these ranges;
- evaluate flow releases over a range of flows for the lower Yuba River at the Marysville gage specified in two tables; and
- consider a minimum of two flow regimes within the range of 35 percent to 75 percent unimpaired flow year-round measured at the Marysville gage.

We evaluate these flows in section 3.3.2.2 of the final EIS. We address the North Yuba River flows in the subsection *Effects of Flow Regulation on Aquatic Habitat Upstream of Englebright Dam* and address the lower Yuba River flows in the subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*.

1.4 AQUATIC RESOURCES

Comment AQ1: FWS and California DFW request a more detailed analysis of effects on green sturgeon in the EIS. FWS states that California DFW recently collected approximately 270 green sturgeon eggs downstream of Daguerre Point Dam and recommends that this confirmation of spawning be added to the 2011 observed spawning behavior in the flow curtain at Daguerre Point Dam. FWS states that both types of observations indicate that green sturgeon spawning conditions downstream of Daguerre Point Dam exist in wet and above normal water years. YCWA comments that there is no evidence to suggest that green sturgeon historically migrated above the current location of Englebright Dam and Reservoir, and that green sturgeon do not currently migrate upstream past Daguerre Point Dam.

Response: We were made aware of the additional information regarding the collection of green sturgeon eggs in the lower Yuba River at the draft EIS meeting on July 10, 2018, and have included a more detailed analysis of the effects of the project on green sturgeon spawning and early rearing in section 3.3.4.2 of the final EIS. We also clarified our description of green sturgeon distribution in the lower Yuba River.

Comment AQ2: NMFS requests staff provide additional details for the staff-recommended juvenile outmigration monitoring program in the lower Yuba River (draft EIS, page 3-156) that would be sufficient to judge the effectiveness of the staff-recommended 48-hour spring pulse flow (pulse flow). NMFS contends that the already difficult task of juvenile salmonid monitoring is further compounded by the short duration (48-hours) in which to collect data and attempt to validate the effectiveness of the measure. NMFS believes that it is unlikely that the monitoring program recommended by staff can demonstrate the effects of such a short duration pulse flow in the short term and that monitoring would have to occur over a range of variable water years with previously observed variable conditions to separate the effects of the pulse flow from other environmental variables.

NMFS also comments that the staff-recommended pulse flows (draft EIS, page 3-156) appear arbitrary, unsupported by scientific rationale, and are unlikely to provide detectable benefits to juvenile salmonids. Similarly, YCWA adds the draft EIS does not provide an explanation of why a pulse flow of up to 3,500 cfs is important to initiate downstream movement and outmigration of juvenile anadromous salmonids in the lower Yuba River, nor does it provide any evidence that a flow of this magnitude would increase survival. The Water Board requests that the EIS include references that support the expectation that the pulse flows are effective at increasing juvenile salmonid survival. NMFS contends that the EIS does not analyze NMFS or other agencies' springtime flow recommendations.

The Water Board further requests clarification as to how YCWA would implement the pulse flow, given that the project has limited control of flows during the spring in wetter

year types. The Water Board asks how the project would incorporate flow inputs from the South Yuba River and Deer Creek (non-project controllable factors), and provide the pulse flow while Englebright is spilling. YCWA also requests that staff consider the influence of Deer Creek inflows. The Water Board asks that staff identify the number of pulse flows that would be required each year.

FWN comments that the staff-recommended pulse flows for schedule 1 and 2 years do not target the most limiting lifestage of salmonids (juvenile) in the lower Yuba River. FWN also expresses confusion about the staff measure and comments that staff's proposed measure provides no guidance about how planning entities would determine the volume of the proposed pulse flows that corresponds to the term "up to." To the degree that staff retains this measure, more guidance is necessary.

YCWA comments that previously conducted analyses do not support the need for the pulse flows. Nine years of rotary screw trap (RST) data collected in the lower Yuba River at a downstream location (near Hallwood Boulevard) found that:

- Juvenile Chinook salmon generally outmigrate at flows of less than 2,000 cfs during most years (based on mean weekly flow at the Marysville streamflow gage).
- Emigration occurs at relatively stable flows of about 1,000 cfs or less (e.g., water years 2000, 2001, and 2009).
- There was no consistent positive correlation between outmigration and pulse flows.

YCWA also points out the proposed Article 405 would require YCWA to provide a pulse flow of up to 3,500 cfs from "the Narrows 2 powerhouse/Narrows 2 Full Bypass . . . " However, the maximum hydraulic operational capacity of the Narrows 2 Powerhouse is 3,400 cfs, and the Narrows 2 full bypass has a maximum operational capacity of 3,000 cfs.

Response: During the August 24, 2018, 10(j) meeting, we were informed that our recommended pulse flows may result in the outmigration of undersized juvenile salmonids, which would likely decrease their survival in the lower Yuba and Feather Rivers. We were also told that the intent of the agency flow recommendation was to engage the floodplain to provide rearing habitat needed to increase the size of juveniles before their migration to improve survival. Based on these discussions, we agree that size at emigration is an important factor that influences juvenile salmonid survival. We also agree that both aquatic and riparian ecosystems benefit from dynamic connectivity between rivers and their floodplains, and that restoration of floodplains and other off-channel habitats is potentially important for increasing production of juvenile salmonids in California's Central Valley. Consequently, we no longer recommend implementing the 48-hour spring pulse flow described in the draft EIS.

Comment AQ3: FWN comments that in April 2018, relicensing participants resolved a disagreement regarding the duration of the recession rate downstream of Englebright Dam. YCWA filed a description of this agreement with the Commission on April 27, 2018. FWN recommends that the final EIS analyze the agreed upon revised measure. The Water Board also comments that this revised version of proposed AR9 was agreed to by California DFW, FWS, and FWN, and that the Water Board staff generally supports the revised proposed condition AR9, dated April 27, 2018.

Response: We are aware of the revision to YCWA's proposed measure AR9 and analyze this revision in the final EIS, section 3.3.2.2, in the subsections *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam* and *Ramping Rates Downstream of Englebright Dam.*

Comment AQ4: Regarding staff's finding that the agencies' recommended higher floodplain inundation flows (a maximum of 3,500 cfs) would not substantially increase floodplain inundation (because bankfull discharge was reported to be approximately 5,000 cfs in the Yuba River downstream of Englebright Dam) (draft EIS, page 3-156), NMFS comments that this statement appears to completely ignore the spring flow reduction caused by New Bullards Bar Reservoir and the operation of the project. NMFS contends that merely stating that there were other past environmental effects does not obviate the need to protect, mitigate, and enhance the lower Yuba River as a result of project facilities and operations.

California DFW comments that FWS demonstrated a project nexus and quantified project impacts to the adjacent floodplain by comparing how much of the bank edge, side channels, and off-channel areas (including floodplain) would be inundated during project flows versus without-project flows and that the project flows reduce median inundation by 29 to 89 percent.

Response: We agree that the project has altered the natural hydrograph and floodplain in the Yuba River, primarily by reducing the magnitude and duration of the snowmelt flows in some water years and continuing to provide higher flow into the summer months compared to the natural hydrograph. Our finding in the EIS is based on our understanding that flows of 5,000 cfs or more are needed to inundate portions of the floodplain without significant floodplain modifications.

Comment AQ5: NMFS questions the analysis of the agencies' recommended spring pulse and floodplain inundation flows (draft EIS, page 3-156) and encourages staff to analyze YCWA's daily flow and water temperature models. NMFS also requests that staff include the water temperature thresholds that were considered to be acceptable versus unacceptable, and for which lifestages and water years these conditions occur.

Response: In the final EIS, we provide a more thorough analysis of YCWA's daily flow and water temperature models in section 3.3.2.2, in the subsection *Effects of*

Proposed Operations on Water Temperature, and in appendix A. Our analysis includes the threshold at which we consider a water temperature increase to be acceptable versus unacceptable (i.e., less than 20.0°C for summer rearing and less than both 12.0°C [YCWA threshold] and 13.3°C [Lower Yuba Accord River Management Team threshold] for Chinook salmon spawning), and we identify for which lifestages and water years these conditions occur.

Comment AQ6: NMFS contends that the discussion of fish passage and the Yuba Salmon Partnership Initiative's anadromous fish introduction program (draft EIS, page 3-173) does not constitute an environmental analysis of the project's effects on fish passage. Instead of analyzing the fish passage effects of the project and recommending mitigation and enhancement actions, staff appears to be relying on third-party actions to mitigate the project's effects. NMFS believes the EIS should include a complete analysis of fish passage effects of the project, including connected structures for all anadromous fish lifestages. South Yuba River Citizen's League et al. also comments the draft EIS fails to adequately analyze fish passage and mitigate for impacts to endangered anadromous salmonids.

Response: We respectfully disagree with NMFS and the South Yuba River Citizen's League. We analyze the effects of the project on fish passage beginning on page 3-172 of the draft EIS. This analysis indicates that project facilities and operation have caused habitat fragmentation and loss, created upstream fish migration barriers, and impeded downstream passage throughout the Yuba River project area. The analysis also describes the current effects on fish passage of each of the project facilities. This analysis is found in section 3.3.2.2, *Fish Passage and Anadromous Fish Restoration,* of the final EIS.

Comment AQ7: NMFS believes that the discussion of historical activities in the lower Yuba River (draft EIS, page 3-186) appears to compare the current state of the lower Yuba River to pre-project conditions. This is not consistent with how staff analyzes hydrology or fish passage effects of the project. NMFS contends that staff should consistently analyze the environmental effects of the proposed action and the no-action alternative.

Response: We respectfully disagree. Our discussion of historical activities in the lower Yuba River is intended to give the reader a better understanding of the multiple anthropogenic factors that have contributed to the river's existing degraded condition. Ignoring these non-project, pre-project-related impacts would produce an incomplete description of baseline conditions and would confound our examination of the effects of the proposed action and no-action alternatives on these existing baseline conditions.

Comment AQ8: NMFS questions why outside sourcing of LWM (i.e. outside the project area; draft EIS, page 3-188) would not be appropriate and asks for an analysis of its LWM plan. NMFS also corrects our description of its 10(j) recommendation 3. In addition, NMFS comments that the draft EIS provides no guidance or details as to what

the actual LWM plan should contain. NMFS believes that without a specific plan from staff, YCWA and the agencies are likely to continue to disagree on the details of a LWM plan.

YCWA generally accepts staff's conclusions and recommendations regarding development of a LWM enhancement plan.

Response: Using locally sourced (within the project area) LWM as part of any enhancement plan included in a license would be the most appropriate means of mitigating project effects on this component of aquatic habitat because there is a direct nexus between LWM availability in the lower Yuba River and project operations. While LWM sourced from outside the project area (i.e., existing burn areas) could be used to "jump-start" the program on a one-time basis (pending the availability of LWM in New Bullards Bar Reservoir), we continue to recommend use of sourced LWM from New Bullards Bar Reservoir to mitigate project effects on LWM. Regarding NMFS's request for an analysis of its recommended LWM plan, we note that section 3.3.2.2, in the subsection *Lower Yuba River Habitat Restoration and Large Woody Material Management*, staff provides an analysis of NMFS's LWM plan. We also note that section 5.1, *Large Woody Material Enhancement in the Lower Yuba River*, contains staff's specific provisions for a LWM plan that it recommends be included in any license issued for the project.

Comment AQ9: NMFS comments that an analysis of the project's effects on threatened and endangered species as presented in the draft EIS is insufficient for the purposes of a jeopardy or adverse modification analysis. The jeopardy analysis does not rely on a comparative or incremental analysis such as what is presented in the draft EIS (page 3-282). NMFS also lists its priority actions for the 2014 Recovery Plan for the Yuba River and notes that none of those priority actions are proposed by YCWA or recommended by staff. NMFS recommends that staff review those priority actions and adopt the NMFS 10(j) recommendations to achieve consistency with the Recovery Plan.

Response: We include a more detailed evaluation of the effects of the project on threatened and endangered species in the final EIS (section 3.3.4.2). We acknowledge, however, that additional information may be needed to initiate formal consultation for the Yuba River Development Project, in combination with the upstream Yuba-Bear and Drum-Spaulding Projects (FERC Nos. 2266, 2310, 14530, and 14531). We intend to have further discussions with NMFS prior to initiating formal consultation.

Comment AQ10: The Forest Service comments on the effects of flow regulations on aquatic habitat in the North Yuba River downstream of New Bullards Bar Dam (draft EIS, pages 3-139 and 3-141). The Forest Service states that it and other resource agencies contend their recommended flows balance the benefit of higher releases, which would provide more stream habitat, with the need to keep biologically appropriate temperatures in the North Yuba River reach and downstream of the confluence of the North Yuba River and Middle Yuba River to the New Colgate Powerhouse. The Forest Service states that it reached a balance between making temperatures too cold in the

North Yuba River while still providing enough cold water through the North Yuba River reach to provide a benefit to the bypassed reach downstream of the North Yuba River and Middle Yuba River confluence.

Response: In the draft EIS, we find that the Forest Service's recommendation to provide an increased frequency of colder water temperatures in the North Yuba River would result in temperatures that are too cold for rainbow trout (less than 12°C) relative to the minimum flows proposed by YCWA. Specifically, figures 3-33 through 3-36 show that in the North Yuba River, just upstream of its confluence with the Middle Yuba River, the resource agencies' recommended minimum flows would result in water temperatures that are outside the 12 to 20°C suitability range for rainbow trout for about the entire calendar year across all water year types, while YCWA's proposal would result in suitable temperatures for about 5 to 6 months a year, across all water year types.

Comment AQ11: The Water Board requests that staff determine and analyze the specific and quantifiable amount of littoral habitat and terrestrial food resources available to reservoir fishes that would be reduced as a result of each recommended/proposed minimum flow.

Response: We revised the final EIS in section 3.3.2.2, in the subsection *Effects of Flow Regulation on Aquatic Habitat Upstream of Englebright Dam*, to clarify that the resource agencies' recommended minimum flows downstream of New Bullards Bar Dam alone would not lower the water surface elevation in New Bullards Bar Reservoir at a faster rate over time than the minimum flows proposed by YCWA. However, the addition of the resources agencies' recommended minimum flows for the Yuba River downstream of Englebright Dam, in combination with all their other flow requirements (i.e. their complete flow recommendation), *would* lower New Bullards Bar Reservoir faster than the combined minimum flows recommended by YCWA. We also revised section 3.3.5.2, in the subsection *Minimum Streamflows below New Bullards Bar Dam,* to include additional analyses of the effects of changing water surface elevations on boat launches in New Bullards Bar Reservoir. The changes in littoral habitat in the reservoir as a result of each recommended/proposed minimum flow can be inferred from this analysis and particularly from figures 3-50 through 3-54.

Comment AQ12: The Forest Service disagrees with the analyses in the draft EIS (page 3-176) that dismisses project impacts associated with entrainment at the Lohman Ridge and Camptonville Diversion Tunnels. The Forest Service states that one of the main objectives for tunnel closures, as a way to reduce impacts associated with entrainment, is to maintain fish and other aquatic organism biomass in their native streams. From the fish entrainment and passive integrated transponder device (PIT) tagging data collected during the relicensing studies, the Forest Service determined that test fish were entrained at a rate greater than 30 percent into the project's tunnel system. The Forest Service contends that rainbow trout populations upstream and downstream of Our House Diversion Dam are not in good condition.

Response: The Forest Service correctly notes a 30 percent entrainment rate into the Lohman Ridge Diversion Tunnel. However, as staff describe in section 3.3.2.2, in the subsection *Fish Entrainment*, this is 30 percent of the *tagged fish* (161 tagged fish, 49 detections in the tunnels) that were entrained into the non-power tunnels (i.e., no turbines that could cause mortality), and entrained fish were documented to swim back the opposite way through the tunnels, after being entrained. This does not mean that 30 percent of the fish community upstream of the diversion dams are regularly entrained into the diversion tunnels. YCWA only tagged rainbow trout and brown trout during the entrainment study; other species that inhabit Oregon Creek and the Middle Yuba River upstream of the diversion dams may or may not be entrained at the same rate. Regarding the condition of rainbow trout populations in the Middle Yuba River and Oregon Creek, YCWA staff observed multiple age-classes of rainbow trout upstream and downstream of both diversion dams, suggesting successful reproduction and population sustainability, in spite of the diversion tunnels. Additionally, rainbow trout collected by YCWA upstream and downstream of both diversion dams had an average relative condition factor of 0.99 in 2012 and 2013, which indicates that rainbow trout were generally in good condition.

Comment AQ13: Regarding staff's statement in section 3.3.2.2, in the subsection *Fish Entrainment*, that no evidence supports mass fall movements of rainbow trout in the project area, the Water Board requests that staff consider the graph presented in its comment letter that shows entrainment rates in the Lohman Ridge Diversion Tunnel. The Water Board comments that entrainment appears to be concentrated during both the spring and fall. The Water Board also requests that staff consider the economic impact on YCWA from closing the Lohman Ridge Diversion Tunnel in the fall, as recommended by California DFW and FWS, and notes that California DFW provides an economic analysis in its 10(j) filing on pages 150–156 that suggests water diverted through the Lohman Ridge Diversion Tunnel in fall is often spilled at New Bullards Bar Dam.

Response: The graph presented in Water Board's comment letter is also included in YCWA's final 2013 entrainment study report, which we analyzed during the preparation of the draft EIS. This report also presents a similar graph for PIT tag detections and diversion rates at the Camptonville Diversion Tunnel. Based on additional review of these graphs and YCWA's entrainment study report, we revised our statement in section 3.3.2.2, in the subsection *Fish Entrainment*, to state that the data indicate some fall and spring movement of rainbow trout. We revised section 3.3.2.2, in the subsection *Ramping Rate and Controlling Project Spills Upstream of Englebright Dam*, to analyze the quantity of water that would not be diverted to New Bullard Bar Reservoir during the additional tunnel closures under California DFW and FWS's recommendation.

Comment AQ14: The Forest Service states that staff does not analyze how YCWA's proposed measure AR11 and Forest Service preliminary 4(e) condition No. 35 would reduce the magnitude of spill events in the North Yuba River downstream of New

Bullards Bar Dam. Proposed recession rates (YCWA's proposed measure AR4 and Forest Service preliminary 10(a) recommendation 3) should also be analyzed to determine how they would affect LWM movement downstream of New Bullards Bar Dam.

Response: We added analysis of YCWA's proposed measure AR 11 to the final EIS. We revised section 3.3.2.2, *Ramping Rates and Controlling Project Spills Upstream of Englebright Dam*, to include a description of the quantity of water that would not be diverted to the New Bullards Bar Reservoir in the spring and fall under YCWA's proposed condition AR11, and under the agencies' recommendations. Regarding the potential effects of YCWA's proposed measure AR4 and Forest Service 10(a) recommendation 3, figure 3-33 shows that the spill recession rates proposed by YCWA and supported by the Forest Service, would not differ from existing operations until flows are less than 2,000 cfs. Flows less than 2,000 cfs would recede slower under YCWA's proposed measure and the Forest Service's recommendation than under existing conditions. That is to say, flows would be higher for a longer period under YCWA's proposed measure and the Forest Service's recommendation, thus LWM is expected to be transported from the bypassed reach more quickly than under existing conditions.

Comment AQ15: The Water Board comments that the draft EIS references 13 years of empirical data that suggest a conditional winter pulse flow is not needed to facilitate adult steelhead (upstream) passage. As an alternative to analyzing 13 years of information cumulatively, the Water Board requests that staff analyze appropriate years of data (schedule 5, 6, and conference year) specific to the winter pulse flow recommendation.

Response: We completed a more detailed analysis of the effects of winter pulse flows on steelhead passage in the Yuba River and described the results of this analysis in the final EIS, section 3.3.2.2, in the subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*. Based on these analyses, we conclude that adult steelhead upstream passage through Daguerre Point Dam has occurred during a variety of flow conditions, including ascending hydrographs, descending hydrographs, and extended periods of stable flow conditions and during "drier" conditions. In addition, a pulse flow release would provide the potential for steelhead redds constructed during the higher flow conditions to become dewatered when flows are reduced after the pulse event.

Comment AQ16: YCWA requests that the draft EIS discuss the potential for incidental take associated with Narrows 2 operation that may occur through anadromous salmonid redd dewatering and fry and juvenile stranding and isolation. Although incidental take associated with Narrows 2 operation is anticipated to occur with minimal frequency, the potential for such incidental take does exist.

Response: We added a discussion regarding the potential for incidental take associated with Narrows 2 project operation (as defined under the Endangered Species Act [ESA]) in section 3.3.4.2 of the final EIS.

Comment AQ17: YCWA comments that it appears that staff is relying on the draft EIS as the basis for its Essential Fish Habitat (EFH) assessment and may be contradictory. The draft EIS indicates that staff will prepare an EFH assessment, which the Commission will provide to NMFS; however, the text also states that the EFH assessment is contained within the draft EIS. Additionally, YCWA comments that the draft EIS does not include a sufficient EFH assessment.

Response: The final EIS, section 3.3.4.2, in the subsection *Essential Fish Habitat Analysis and Determination*, includes a more detailed assessment of the projects effects on EFH and serves as our EFH assessment pursuant to the Magnuson-Stevens Fishery Conservation and Management Act.

Comment AQ18: The Water Board and FWN request that staff analyze appropriate measures to address past, current, and future project effects on aquatic habitat from shot rock.

Response: We recognize that the construction and operation of hydroelectric projects can contribute to the abundance of shot rock in the area and, in turn, affect aquatic habitat. Therefore, we added an analysis to address project effects on aquatic habitat from shot rock to the final EIS in section 3.3.2.2, *Lower Yuba River Habitat Restoration and Large Woody Material Management.*

Comment AQ19: California DFW and FWN comment that land parcels of suitable size and location exist for floodplain restoration actions in the lower Yuba River, and they provide references for Corps' publications that provide additional information on riparian floodplain restoration potential along the lower Yuba River.

Response: As a result of discussions during the August 29, 2018, section 10(j) meeting, we are now aware of several parcels of land that could be made available for restoration activities in the lower Yuba River. We modified the final EIS, section 3.3.3.2, *Riparian Vegetation*, to describe these sites and explain how floodplain restoration activities there may enhance aquatic and riparian habitat conditions in the lower river.

Comment AQ20: FWN comments that the draft EIS acknowledges that the project is affecting both the flows and riparian habitat in the lower Yuba River yet requires no mitigation for these effects. The rationale for this lack of mitigation is that there are also "other" causes of impacts in the watershed. Staff's rejection of measures proposed for the lower Yuba River does not meet the Commission's responsibility under NEPA and the Federal Power Act to mitigate direct, indirect, and cumulative project effects.

Response: We respectfully disagree with FWN's comment regarding a lack of recommended mitigation for project effects on flows and riparian habitat. We also disagree with FWN's belief that our rationale for not adopting all of its recommended measures is based solely on the presence of other impacts on aquatic and riparian habitat

in the watershed. The draft and final EISs include several measures designed to address the project's effects on aquatic resources, including a modified flow regime to better mimic the natural hydrograph during the spring, and LWM enhancement to improve aquatic and riparian habitat in the lower Yuba River. We also note that the Federal Power Act does not require that all project effects on aquatic resources be mitigated.

Comment AQ21: The Forest Service comments that its measures for the North Yuba River downstream of New Bullards Bar Dam and the Yuba River reach downstream of the North Yuba/Middle Yuba confluence are dismissed without full analysis. The Forest Service recommends that staff consider the following in the final EIS: (1) the original Yuba River Development Project's construction and operation has resulted in degradation of aquatic habitats; (2) large woody material and sediment (fish spawning gravels) have been substantially reduced from the presence of New Bullards Bar Dam; (3) existing minimum streamflows and spills with no managed flow recession do not support stream geomorphic processes or provide suitable habitat for aquatic species; (4) water temperatures are cold at point of release (base of New Bullards Bar Dam) but quickly warm above the confluence with the Middle Yuba River because of low minimum flows; (5) the Forest Service and other resource agencies proposed reasonable measures to synergistically restore aquatic habitats through increases in streamflows and placement of woody material and sediment/spawning gravel; and (6) other proposed measures support aquatic habitat restoration by reducing the frequency and magnitude of spills at New Bullards Bar and controlling spill recession downstream of New Bullards Bar Dam.

Response: We revised section 3.3.2.3, *Aquatic Resources*, to include an analysis of the effects of the original Yuba River Development Projects construction on aquatic habitat, as part of the cumulative effects analysis. We agree with the Forest Service that the New Bullards Bar Dam blocks recruitment of LWM and deposition of sediment in the downstream river and note this effect in section 3.3.1.2, in the subsection *Sediment Transport in North Yuba River*; in section 3.3.2.3, in the subsection *Managing Sediment and Large Woody Material in the North and Middle Yuba River and Oregon Creek*; and in section 3.3.2.3, in the subsection *Aquatic Resources.* Additionally, we agree with the Forest Service on the importance of recession flows and note our analyses of recession flows and ramping rates in section 3.3.2.2, in the subsections *Ramping Rates and Controlling Project Spill Upstream of Englebright Dam* and *Ramping Rates Downstream of Englebright Dam*. Regarding water temperatures in the North Yuba River, we revised section 3.3.2.2, subsection *Effects of Flow Regulations on Aquatic Habitat Upstream of Englebright Dam*, to include additional analyses of the frequency of suitable water temperatures for rainbow trout. Figures 3-33 and 3-36 show that in the North Yuba River just upstream of its confluence with the Middle Yuba River, the resource agencies' recommended minimum flows would result in water temperatures that are outside of the 12 to 20°C suitability range for rainbow trout for about the entire calendar year across all water year types, while YCWA's proposal would result in suitable temperatures for about 5 to 6 months a year, across all water year types.

Comment AQ22: The Water Board comments that the draft EIS does not analyze schedule 6 water year type summer minimum flow and requests analysis and associated costs of the measure.

Response: We include an analysis of schedule 6 water year type summer minimum instream flows on aquatic resources and their associated costs in the final EIS, section 3.3.2.2, subsection *Effects of Flow Regulation on Aquatic Habitat Downstream of Englebright Dam*. Based on our review of YCWA's modeling data over the period of record from 1970 through 2010, no water years were classified as schedule 6. Therefore, we selected the schedule 5 water year that was closest to a schedule 6 water year for analysis (calendar year 1988). All three alternative flow regimes (i.e., existing, proposed, and agency recommended) resulted in similar summer (June through August) water temperatures at Smartsville and Marysville that would differ from one another by no more 0.6°C. However, the agencies' recommended summer flows are, at times, more than twice that of YCWA's proposed summer flows and would have a greater effect on project economics.

Comment AQ23: YCWA comments that it agrees with some of the staff-recommended modifications in the draft EIS for the New Bullard Bar Reservoir Fish Stocking Plan but indicates that some modifications are not necessary. YCWA comments that the additional provisions for: (1) a list of, and numbers of, each species to be stocked; (2) frequency of stocking efforts; (3) an implementation schedule; and (4) plan updates are not necessary because they are either already included in the plan or would be addressed by the other provisions included in the plan. YCWA additionally comments that staff's estimated cost for its recommended modifications only includes annual consultation, not implementation. The modification proposed by the draft EIS (i.e., consultation regarding level of stocking) could result in any level of stocking in any year and would result in an entirely open-ended condition. YCWA comments that the final EIS should place some limits on the level of stocking.

Response: Based on our review of the YCWA's New Bullards Bar Fish Stocking Plan and its comment letter, we recognize that additional provisions for frequency of stocking efforts, an implementation schedule, and plan updates are not necessary because they are either already included in the plan or would be addressed by other provisions included in the plan. However, it is unclear why YCWA concludes that not including a stocking limit leaves the plan open-ended. YCWA's plan states that the stocked amounts would be average annual targets that may fluctuate from year to year and notes that the plan will be reviewed, updated, and/or revised as needed. Therefore, we find that our recommendation to consult on the species and number of fish to be stocked is fully consistent with the plan as proposed by YCWA.

Comment AQ24: California DFW recommends YCWA develop a Yuba River Adaptive Management Plan that would include: (1) annual review by the Ecological Group of the biological, water quality, and water temperature monitoring results from the previous year, including impacts from this project and possible cumulative impacts

from other projects in the watershed; (2) annual discussion of the effectiveness of habitat mitigation projects in the lower Yuba River and opportunities for developing restoration partnerships; (3) annual discussion of the sediment passage, wood and gravel restoration projects effectiveness in the Yuba River above Englebright dam; (4) annual discussion of the water temperature management and biological response to water temperature conditions, including recommended annual operation of the two intakes to Colgate Powerhouse; and (5) a structured decision-making process that allows (every 5 years) for members of the Ecological Group to collaboratively recommend changes to the timing of spring inundation flows, pulse flows, wood supplementation, gravel supplementation, and habitat mitigation measures to FERC and the Water Board.

Response: As discussed in section 5.1.3, *Other Measures Not Recommended by Staff*, in the draft EIS, we determined that the Commission's regulations provide for agency review and comment on new plans and annual reports. The standard license reopener also provides a procedure through which agencies can recommend the Commission evaluate new information and make changes to license articles as warranted. Therefore, while we do not contest the value of annual meetings to discuss project effects on environmental resources, we do not recommend making these meetings a condition of any license issued for the project. Similarly, as discussed in section 5.1.2, *Additional Measures Recommended by Staff,* in the final EIS, our recommendation for riparian plantings along the lower Yuba River includes a monitoring and reporting component. For the reasons discussed above, we find a separate plan for incorporating annual discussion of the effectiveness of habitat mitigation projects in the lower Yuba River and opportunities for developing restoration partnerships is not warranted. With regard to the need for annual discussions about sediment passage and wood and gravel restoration project effectiveness in the Yuba River above Englebright Dam, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff,* in the final EIS, we continue to find that our recommendations for operations at the Our House and Log Cabin Diversion Dams would restore natural sediment and woody material transport in Oregon Creek and the Middle Yuba River. Because monitoring results would not isolate project effects, we do not recommend monitoring channel geometry or substrate in these reaches. Therefore, a license requirement for annual discussions of the effectiveness of these measures is not warranted. We also find annual discussions about temperature effects, including operation of the two intakes to the Colgate Powerhouse is not warranted because, as discussed in section 5.1.3, *Other Measures Not Recommended by Staff,* in the final EIS, we do not recommend restoring functionality to the upper intake. Therefore, we do not recommend a Yuba River Adaptive Management Plan.

1.5 TERRESTRIAL RESOURCES

Comment T1: The Forest Service comments that the analysis in the draft EIS of effects on special-status species is incomplete because proposals for new recreation facilities, facility expansions, and modifications were not fully developed at the time that

relicensing studies were planned and implemented, and surveys for many special-status species were not conducted. The Forest Service requests that staff clarify the extent to which staff's analysis for special-status wildlife species is intended to cover construction of new facilities and project boundary adjustments.

Response: We address the effects of proposed project facilities based on available species and habitat information. However, we modified section 3.3.3.2, *Special-status Wildlife,* to more fully evaluate potential effects from future construction activities on special-status wildlife species to the extent practicable. We specifically discuss comments relevant to the peregrine falcon and bald eagle under comment T4.

We did not require pre-application surveys for proposed facilities for all species because species presence or absence can change through time, particularly given the time between relicensing studies and proposed construction activities. It was anticipated that necessary surveys would be conducted prior to construction activities, and necessary protective measures, such as limited construction periods and buffers, would be developed after consultation with resource agencies. Accordingly, agency consultation during the planning phase for constructing new facilities would identify resource surveys necessary to identify the presence of special-status species, any changes to baseline conditions, and conservation measures to be incorporated into facility design and operation to mitigate potential effects of constructing project facilities. We acknowledge the need for future surveys and protective measures in the final EIS.

Comment T2: The Forest Service comments that the date range provided for water temperature monitoring for foothill yellow-legged frogs (April 1 through July 31) does not fully encompass the period during which foothill yellow-legged frog egg masses and tadpoles would be present. The Forest Service contends that the July through August/early September period is the most critical for tadpole development and is the appropriate timeframe to focus on for temperature threshold analyses.

Response: We agree that water temperature monitoring is important for understanding project effects on the development of foothill yellow-legged frog egg masses and tadpoles. Research by Wheeler et al. (2015), Kupferberg et al. (2011), and Catenazzi and Kupferberg (2013) has found that water temperature influences the development of vulnerable embryonic and larval lifestages of foothill yellow-legged frogs. In the draft EIS, we recommend July 31 as the end date for water temperature monitoring based on Catenazzi and Kupferberg (2013), which reports that water temperature during July was most indicative of a stream's habitat thermal quality for foothill yellow-legged frog. However, we recognize that the entire period from August through early September is critical for tadpole development and should be included for water temperature monitoring. We have revised our recommendation in the final EIS to extend water temperature monitoring from April 1 through September 15.

Comment T3: The Forest Service comments that staff's interpretation of section 4(e) condition 29–Special-Status Species, which in a footnote read "we interpret Forest Service 4(e) condition 9 to mean any new features not included in the current proposal" was incorrect. The Forest Service states it may require a biological evaluation for constructing project features on NFS lands that are included in YCWA's amended final license application. Such a requirement may result from a situation where: (1) special-status species lists have changed; (2) substantial time has passed since surveys of special-status species have been done; or (3) in response to specific design elements that were not discussed (or analyzed) during relicensing.

Response: The Forest Service is correct that we inadvertently referred to the 4(e) condition as 9, rather than 29. Based on the Forest Service's description of situations when its 4(e) condition 29 would apply, we deleted the footnote because it was not accurate. The staff alternative with mandatory conditions includes the Forest Service condition regarding the need for biological evaluations prior to constructing project features on NFS lands.

Comment T4: The Forest Service reports that it has recorded numerous sightings of peregrine falcon at New Bullards Bar Dam and expresses concern that construction of a new auxiliary flood control outlet and development of public access below the dam could have the potential to remove nest sites or disturb nesting peregrine falcon. The Forest Service also comments that the proposed West Shoreline Trail may be developed beneath a bald eagle nest near Milk Ranch and requests that staff analyze potential direct effects on bald eagles.

Response: We updated the affected environment discussion in the final EIS to include new evidence presented by the Forest Service about the presence of a potential peregrine falcon eyrie near New Bullards Bar Dam. This evidence includes observations of a pair of falcons flying at the dam and perching for long periods within a hole near the top of its south side between April and June 2018. We also revised the environmental effects analysis section to discuss potential effects of the construction of a new auxiliary flood control outlet on New Bullards Bar Dam, and development of public access below the dam on peregrine falcon. We revised the final EIS with a staff recommendation to modify YCWA's proposed *Bald Eagle and Peregrine Falcon Management Plan*, filed with the Commission by YCWA on October 27, 2016 (Accession #20161027-5175), to increase the likelihood that the unknown peregrine falcon nest near New Bullards Bar Dam be identified and protected. This modification would include surveys for new eyries every year for the term of the license or until a new one is documented, rather than as proposed "during the first year, and once every 5 years for the term of the license or until a new eyrie is documented." In the plan, YCWA committed to use any information provided by California DFW, the Forest Service, or FWS regarding previously unidentified or existing American peregrine

falcon nests to inform the establishment of nest buffers and limited operating periods. The plan otherwise provides adequate protections for peregrine falcons.

We revised section 3.3.3.2, in the subsection *Special-status Wildlife, Birds*, of the final EIS to include the new information provided by the Forest Service that the proposed West Shoreline Trail may be developed beneath a bald eagle nest near Milk Ranch. The existence of this nest does not affect our analysis, however, because YCWA proposes adequate protective measures for bald eagle nests in its Bald Eagle and American Peregrine Falcon Management Plan. We find that YCWA's commitment to protect nesting bald eagles, and to consult with the resource agencies, would adequately avoid or minimize any potential effects of the West Shoreline Trail on bald eagles. Annual surveys would document year-round bald eagle activity on New Bullards Bar Reservoir (including nesting). YCWA's bald eagle management plan also includes protective measures that would reduce any adverse effects to this nest, including a limited operating period for occupied nests, water and land barriers and appropriate signage to delineate a buffer of restricted activity. Additionally, YCWA would arrange to meet with the Forest Service, FWS, and California DFW to discuss implementation of its Bald Eagle and American Peregrine Falcon Management Plan and provide an annual report describing all project activities related to both species.

Comment T5: The Forest Service comments that reference materials used in staff's analyses are not cited, especially pertaining to foothill yellow-legged frogs.

Response: We revised the affected environment and environmental effects sections in 3.3.3, *Terrestrial Resources,* of the final EIS to include citations regarding foothill yellow-legged frog life history, where necessary. These references do not affect the results of our analysis because the information was accurately presented in the draft EIS.

Comment T6: To assess potential project effects on the foothill yellow-legged frog, the Forest Service recommends staff evaluate flow regimes in additional specified reaches that are within the elevational range, contain suitable habitat, and are hydrologically connected to existing populations. The Forest Service also comments that water temperatures are suitable for foothill yellow-legged frog downstream of the North Yuba and Middle Yuba confluence and reiterated the benefits of its recommended flow regime to reduce the bullfrog population and allow yellow-legged frogs to recolonize these areas.

Response: We reviewed the historic records of foothill yellow-legged frogs provided in the Forest Service comments; all were included in YCWA's *Technical memorandum 3-4, special-status amphibians–foothill yellow-legged frog surveys*. We revised the final EIS to more clearly present the known historic and recent foothill yellow-legged frog occurrences in the project area, under section 3.3.3.1, in the subsection *Foothill Yellow-legged Frog*.

The draft EIS acknowledges that the North Yuba River downstream of New Bullards Bar Dam provides potentially suitable habitat for the foothill yellow-legged frog. We revised section 3.3.3.1, in the subsection *Foothill Yellow-legged Frog*, in the final EIS to state that foothill yellow-legged frogs are not currently known to be present in either the North Yuba River downstream of New Bullards Bar Dam or the Yuba River downstream of the North Yuba/Middle Yuba Rivers confluence. We reviewed the simulated water temperatures of the Yuba River downstream of New Bullards Bar Dam and agree that water temperatures downstream of the North Yuba/Middle Yuba Rivers confluence could be suitable for foothill yellow-legged frogs. However, because foothill yellow-legged are not currently known to be present in the reaches below New Bullards Bar Dam, we focused our analysis on providing flows and a range of water temperatures that would potentially benefit coldwater fish species. While the presence of bullfrogs may preclude the recovery of foothill yellow-legged frogs in the Yuba River below New Bullards Bar Dam, we find that the Forest Service' recommendation for increasing minimum flows in the river would not necessarily lead to a decrease in bullfrogs. Further, the Forest Service recommendation would adversely affect other aquatic and recreational resources by decreasing the New Bullards Bar Reservoir water surface elevation and providing suitable temperatures for salmonids for a lesser percentage of the time, compared to YCWA's proposed flows. Therefore, we have not changed our recommendation regarding minimum flows below New Bullards Bar Dam. We reviewed our analysis of woody debris management and LWM in the North and Middle Yuba Rivers and Oregon Creek and find that YCWA's proposed measures and our recommendation to develop an LWM enhancement plan would provide net benefits to aquatic resources in the Middle Yuba River and Oregon Creek. Lastly, YCWA's proposed measure AR4 would also minimize the frequency and magnitude of spill flow changes that have the potential to adversely affect foothill yellow-legged frogs if they were to recolonize the lower Yuba River.

In summary, YCWA's proposed flow measures analyzed in the draft EIS would make the operational changes suggested by the Forest Service to benefit foothill yellow-legged frogs in the Yuba River below the North Yuba/Middle Yuba Rivers confluence, except for greater instream flows that we find unfeasible. Furthermore, YCWA's proposed operation of the Our House and Log Cabin Diversion Dams would improve aquatic habitat conditions and stream channel morphology compared to existing operations, which include providing higher instream flows and slower spill recession rates, periodically closing the diversion tunnel, and passing LWM and sediment.

Comment T7: The Forest Service comments that the foothill yellow-legged frog and western pond turtle are inconsistently categorized, sometimes covered under aquatic resources and sometimes under terrestrial, throughout the draft EIS.

Response: The Forest Service is correct to note that the foothill yellow-legged frog and western pond turtle are both aquatic species but are discussed under section 3.3.3, *Terrestrial Resources*, of the draft EIS. Where these species are mentioned in the aquatic resources sections, it is only in the context of describing agency comments or recommendations. We added footnotes in these areas to direct the reader to the terrestrial resources sections for discussions of project effects on these species. This is generally consistent with staff practice of addressing all reptiles and amphibian under terrestrial resources. We do not believe that such categorization of the species is consequential to the results of our analysis. We revised the section 3.3.1.2, in the subsection *Special-status Wildlife*, to acknowledge this fact and provide better cross-references to appropriate sections dealing with river flows, water temperatures, and reservoir water levels.

Comment T8: The Forest Service comments that the draft EIS does not address agency comments on the western pond turtle. The Forest Service also notes that the conclusion that pond turtles are not known to nest in the project area is inaccurate. Based on the presence of juvenile, sub-adult, and adults found during relicensing studies, the Forest Service believes that the species nest in the project area.

Response: We did not intend to suggest that western pond turtle nesting does not occur in the project area but were suggesting that no nests were found. We modified section 3.3.3.2, in the subsection *Western Pond Turtle*, to clarify that "nests were not found during relicensing surveys." The resource agencies provide information about the species' life history, comment on the species management in YCWA's proposed resource management plans, and discuss the species in the rationale for their 10(j) recommendations and 4(e) conditions. However, they do not provide recommendations or conditions specifically intended to benefit the species. Thus, we modified the text to clarify this issue.

Comment T9: The Forest Service notes that the definition of the purpose of a protected activity center for the northern goshawk is incorrect and is not intended to be a buffer but rather a land allocation.

Response: We modified section 3.3.3.1, *Special-status Wildlife*, to better reflect the definition of a protected activity center.

Comment T10: The Forest Service expresses concern that the revision of the project boundary to include additional national forest system (NFS) lands would not include appropriate best management practices for sensitive resources.

Response: YCWA's proposed Integrated Vegetation Management Plan and other proposed resource protection plans would apply to all NFS lands within the project boundary. These protections include conducting surveys for noxious weeds, special-status species, and other sensitive resources prior to ground-disturbing activities.

The implementation of YCWA's proposed Integrated Vegetation Management Plan, including best management practices to minimize disturbance and direct use of pesticides, would reduce project-related effects on terrestrial vegetation and associated wildlife.

Comment T11: YCWA comments that the staff-recommended measure to modify the Integrated Vegetation Management Plan to "include treatment plans for target non-native invasive plants on all lands in the project boundary" is unnecessary because the proposed plan includes measures to treat non-native invasive plants on non-NFS lands.

Response: On page 2-5 of YCWA's proposed Integrated Vegetation Management Plan, YCWA states, "On non-NFS land, YCWA will develop an internal management strategy consistent with state and county directions for [non-native invasive plant] management, for treating target [non-native invasive plants] within the FERC Project Boundary." We concur that the intent of YCWA's proposed "internal management strategy" of non-native invasive plants on non-NFS lands would be to serve in a way similar to the "Target [non-native invasive plants] Treatment Strategy" for NFS lands, as outlined for NFS lands in the plan. However, YCWA's response does not provide any additional detail about what the internal management strategy would include. We updated our analysis in section 3.3.3.2, *Non-native Invasive Plants*, to provide additional information about how YCWA proposes to manage non-native invasive plants on NFS versus non-NFS lands. We provide further justification for why we find it unnecessary to differentiate the treatment and monitoring of non-native invasive plants based on land ownership. We also revised our staff recommendation to "include treatment and monitoring plans," rather than "treatment plans for target non-native invasive species on all lands in the project boundary."

Comment T12: YCWA comments that the staff-recommended measure to modify the Integrated Vegetation Management Plan to "apply revegetation measures to all lands in the project boundary" should be revised to stipulate that the Forest Service will not be involved in any way with revegetation work on non-NFS lands.

Response: We agree that the Forest Service has no jurisdiction on non-NFS lands. The revision proposed by YCWA on page 4-l of the Integrated Vegetation Management Plan is acceptable.

Comment T13: YCWA comments that the staff-recommended measure to modify the Integrated Vegetation Management Plan to "define protocols for any pesticide use. . . within 500 feet of known locations of foothill yellow legged frog. . ." is not necessary.

Response: We agree with YCWA that it would be difficult to define specific protocols for pesticide use until a project requiring the use of pesticides within 500 feet of foothill yellow-legged frogs has been defined. Thus, we revised our staff recommendation to

"define ~~protocols~~ ***BMPs*** for any pesticide use that is deemed necessary in the project boundary and within 500 feet of known locations of foothill yellow-legged frog to avoid adverse effects on individuals and their habitats."

Comment T14: YCWA comments that the staff-recommended measure to modify the Integrated Vegetation Management Plan to "prohibit the use of pesticides in a 260-foot buffer around the mean high water mark of aquatic features" would limit the ability to control nuisance vegetation and animals that can threaten the integrity of project facilities (e.g., dams).

Response: We understand that the recommended measure could unnecessarily prohibit pesticide use around dams and other project infrastructure. We acknowledge that pesticides could be essential for controlling nuisance animals that can destabilize dam structures, such as ground squirrels, and vegetation that would obstruct visual inspections of the dam conditions. Thus, we revised our analysis in section 3.3.4.2, *California Red-legged Frog*, and modified the recommended measure to include a stipulation that pesticides would be prohibited "within a 260-foot buffer around the mean high water mark of aquatic features***, unless necessary to ensure project safety***." Otherwise, YCWA would follow all federal and state regulations for the use of pesticides on project lands, including within 260 feet of aquatic features.

1.6 THREATENED AND ENDANGERED SPECIES

Comment TE1: NMFS comments that the environmental analysis included in the draft EIS is insufficient for purposes of ESA consultation. The regulations that define an environmental analysis under NEPA differ markedly from the regulations that govern the analysis that NMFS must undertake during formal section 7 ESA consultation between agencies.

In addition, to conduct an efficient ESA consultation, NMFS and the Commission need to have a shared understanding of the effects of the "environmental baseline" under the ESA. In describing the relicensing of ongoing projects, the ESA consultation handbook (USFWS, 1998) states a section 7 analysis of the project's effects on listed species is done in the same way as new projects (page 4-30):

- The total effects of all past activities, including effects of the past operation of the project, current non-Federal activities, and Federal projects with completed section 7 consultations, form the environmental baseline.
- To this baseline, future direct and indirect impacts of the operation over the new license or contract period, including effects of any interrelated and interdependent activities, and any reasonably certain future non-Federal activities (cumulative effects), are added to determine the total effect on listed species and their habitat).

Because the effects of the new license would be added to the environmental baseline to determine the total effect on listed species, it is crucial to understand the effects of all past activities (including effects of the past operation and construction of the project), and the current, ongoing effects of the project that form the environmental baseline. Only then can the effects of the proposed licensing action be evaluated during ESA consultation.

The jeopardy analysis NMFS must undertake during formal ESA consultation does not rely on a comparative or incremental analysis such as what is presented in the draft EIS. An analysis of the project's effects on threatened and endangered species as presented in the draft EIS is insufficient for the purposes of a jeopardy or adverse modification analysis.

Response: Consistent with FERC's NEPA guidelines, the draft EIS serves as our biological assessment to facilitate consultation under the ESA. As such, it contains information on federally listed or proposed threatened and endangered species, candidate species, and designated and proposed critical habitats present in the proposed action area. It also includes information describing the direct and indirect effects of the proposed action (the staff alternative) on these listed species and their designated or proposed critical habitats relative to existing conditions.

We modified the final EIS, section 3.3.4.2, *Aquatic Species*, to contain additional analyses of the effects of the proposed action relative to existing conditions. Our NEPA analysis also examines cumulative effects on the resources, including the effects of all past activities (including effects of the past operation and construction of the project), the current, ongoing effects of the project, and the potential for future effects. Specifically, the final EIS analyzes the effects of the proposed action on the physical or biological features (PBFs) of critical habitat that are essential to the conservation of these species. NMFS defines these PBFs as "the features that support the life history needs of the species, including but not limited to water characteristics, soil type, geological features, sites, prey, vegetation, symbiotic species, or other features. A feature may be a single habitat characteristic or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity."

The overall value of critical habitat for the conservation of a listed species is the sum of the quantity, quality, and availability of the PBFs. Therefore, reductions in the quantity, quality, or availability of one or more PBFs reduce the value of the PBF, which in turn reduces the function of the overall critical habitat. The PBFs used in this analysis include:

- **Freshwater spawning sites** with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.
- **Freshwater rearing sites** with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- **Freshwater migration corridors** free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
- **Estuarine areas** free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
- **Nearshore marine areas** free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
- **Offshore marine areas** with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The effects of the proposed action are evaluated with respect to whether they impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of the impaired habitat toward properly functioning conditions (64 FR 50394).

1.7 RECREATION RESOURCES

Comment RR1: The U.S. Department of the Interior, National Park Service (National Park Service) supports the Commission's recommendation that YCWA provide for public vehicular access and parking below New Bullards Bar Dam. However, the National Park Service notes that the Commission does not recommend building a trail for pedestrian access from the proposed parking area to the road leading to the gaging station downstream of the dam in the draft EIS analysis. The National Park Service states that boaters would need to use the gaging station road to carry their gear from the parking lot to the river near the gaging station, which is where they would put in for the whitewater boating stretch below the dam. The National Park Service contends this trail

would be necessary if the gate and fence from the proposed parking area to the base of the dam were constructed as proposed in the National Park Service's 10(a) recommendation, which would also preclude access to the entry of the gaging station road. Thus, the National Park Service maintains the pedestrian trail would be required to allow boaters to reach the gaging station road below the gate/fence. In addition, a trail around the gaging station is also needed for boaters to access the river because of the heavy vegetation in the put-in area.

Water Board staff requests that the Commission consider boater access to the whitewater boating flows originating from the New Bullards Bar Dam spillway. The Water Board comments that it is unclear whether boaters could safely float down the North Yuba River from the parking area to where the whitewater boating flows begin. A pedestrian access trail from the proposed parking area to the North Yuba River downstream from where the spillway flows enter the North Yuba River may be warranted.

Response: The staff alternative presented in the draft EIS focuses on whether to provide public vehicular access on the project road where public vehicular use is not currently allowed. The National Park Service is correct that if public vehicular access were provided, the scope of such a measure should also include providing access between the parking area and river. However, in light of the low recreational benefit of this measure compared with concerns about public safety, project security, and the implementation cost, we modified the staff alternative to no longer recommend providing public vehicular access below New Bullards Bar Dam. If there is not a public parking area, there would be no need for providing a route of public access to the river.

Comment RR2: YCWA requests that staff reconsider opening the project road to the base of New Bullards Bar Dam to public access. YCWA states the road is steep and narrow, with poor sightlines, no guardrails, and is routinely subject to rockslides. YCWA states that given the public safety concerns, limited recreational whitewater resources, and project security concerns, the road should remain closed to public access. YCWA is opposed to allowing public access on the road to the base of New Bullards Bar Dam because of the cost to improve the existing steep, narrow access road for safe public access and because allowing public access near the base of the dam could compromise security at project infrastructure.

Response: The benefits of providing public vehicular access below New Bullards Bar Dam are low compared with the concerns about public safety, project security, and implementation cost. Therefore, we modified the staff alternative and no longer recommend providing such access.

Comment RR3: The National Park Service understands YCWA's security concerns for the project infrastructure at the base of New Bullards Bar Dam and suggests other possible options for public access below the dam. It notes that the EIS states YCWA's

proposed measure to control spills (AR4) would only provide 3-day boating opportunities about once every 5 years (draft EIS, page 3-324). As such, the National Park Service states public access for whitewater boating would only be necessary during these few boatable days, and not year-round, if YCWA can make boaters aware in advance of when the boatable flows would occur. The National Park Service contends that if access were limited to only the mornings of boatable days, whitewater boaters could be escorted by YCWA personnel as they drive down to the put-in site or be shuttled with their boating equipment by YCWA personnel/outfitters from the parking lot above the dam to the put-in area. Such options, the National Park Service concludes, would preclude the need to build a fence/gate from the parking area to the base of the dam because the gate at the top of the access road could be locked when whitewater boaters are not being escorted/shuttled. The pedestrian trail would also not be needed under such options. The National Park Service comments that while angling opportunities below New Bullards Bar Dam may be limited, those opportunities should still be considered, especially if the fishery improves in that reach.

Response: The National Park Service's suggestion attempts to address YCWA's concerns about the suitability of the road for public use and project infrastructure security by limiting public access in terms of the day, time of day, and by controlling the means of travel to the river. The suggestion addresses some, but not all, of the concerns and potential effects of allowing public vehicular access below New Bullards Bar Dam. For example, the suggestion does not address concerns about providing for public safety in the vicinity of project infrastructure, including unexpected high flow events, providing project security, and incurring additional costs for fencing project infrastructure and to upgrade and maintain the road for transporting the public via multi-passenger vehicles. For these reasons we conclude the benefits of providing public vehicular access below New Bullards Bar Dam are low compared with serious and valid concerns. Therefore, we modified the staff alternative and no longer recommend providing such access.

Comment RR4: YCWA comments that its responsibility for the Oregon Creek Day Use Area should not be included in the staff-recommended recreation facilities plan. The Oregon Creek Day Use Area is a non-project facility, and YCWA and the Forest Service have entered into an outside-the-license agreement executed on April 20, 2017, in which YCWA will provide funding to the Forest Service for public access to Oregon Creek Day Use Area facilities during the off-peak season when whitewater boating is most common.

Response: Despite the increased use of this site related to the proposed whitewater boating flows, this day use area mainly supports non-project recreation use, and the day use area should not be considered a project facility or included within the project boundary. Therefore, we removed funding support for the Oregon Creek Day Use Area from the staff alternative and revised the related analysis text in the final EIS.

Comment RR5: YCWA disagrees with the conclusion in the draft EIS about YCWA providing short- and long-term flow forecasts on a real-time basis for flows that are not within YCWA's control. YCWA states that it obtains forecasts of runoff and flows within and into the project area from various, often conflicting, sources and must make operational decisions based on this information. Given the nature of seasonal flow changes, the range of uncertainty of flow magnitudes, the constant variability and the unpredictability of flows, a monthly schedule of forecast updates is all that is necessary. For these reasons, YCWA suggests modifying the staff alternative to adopt RR3 with additional text as specified in the comment.

Response: Our analysis on providing public flow forecast information in the draft EIS recognizes the difficulties YCWA presents in its comment, and the staff alternative description includes a caveat that the information provided would represent expected, rather than guaranteed, flows or conditions that would be provided in the future. However, YCWA's proposed text revision to RR3 appears to meet the intent of improving the level of public information about flows in project-affected reaches while properly characterizing the uncertainty around the nature of the flow information that would be provided. We modified the staff alternative in the final EIS to be consistent with YCWA's suggested wording addition to its proposed measure.

Comment RR6: The Forest Service, FWN, and California DFW express confusion regarding staff's analysis of proposed streamflow regimes below New Bullards Bar Dam. The Forest Service requests that staff provide quantitative analyses of reservoir levels, water surface area, and boat ramp availability. The Water Board comments on the statement "In May through September, the agency flow recommendations [for minimum streamflows below New Bullards Bar Dam] would reduce the amount of usable water surface area by five times more than the YCWA proposal in wet water years, 10 to 15 times more in above normal water years, 12 to 29 times more in below normal water years, and 34 to 39 times more in dry water years" (page 3-334 of the draft EIS). The Water Board indicates that the metric of comparison is inappropriate and misleading because it does not identify the specific impacts of each scenario and suggests that staff analyze specific impacts to resources (e.g., days of boat ramp accessibility)

Response: We added analysis and graphs showing the modeled reservoir levels for the various operational scenarios occurring in different water year types to section 3.3.5.2, in the subsection *Effects of Proposed Operation and Maintenance, Minimum Streamflows below New Bullards Bar Dam*. The analysis shows very little difference in boat launch availability between the various operational scenarios in wet, above normal, and below normal water year types during the peak recreation season. The modeled reservoir levels show greater differences between scenarios in dry and critically dry water year types with Cottage Creek boat ramp generally being the least available in these water year types under the agency flow scenario.

Comment RR7: The Yuba County Sheriff's Department comments that the Sheriff's Department plays a key role in emergency response and is concerned that increasing public access below New Bullards Bar Dam for recreational whitewater activities will increase the costs associated with search and rescue efforts.

Response: As noted above, we modified the staff alternative and no longer recommend providing such access.

1.8 CUMULATIVE EFFECTS

Comment CE1: EPA comments that the Commission's action should be consistent with reasonably foreseeable long-term ecological restoration efforts, such as reintroduction of anadromous salmonids along the Yuba River. EPA believes the final EIS should describe the status of proposals to reintroduce these fish and discuss the extent to which the project could support such reintroduction efforts.

Response: We added analysis to the final EIS, section 3.3.2.3, in the subsection *Anadromous Fish and Essential Fish Habitat*, to address cumulative effects of the project on salmonid reintroductions in the Yuba River. We conclude that YCWA's proposed minimum instream flow releases, ramping rate requirements, Water Quality Monitoring Plan, Upper Yuba River Aquatic Monitoring Plan, and Lower Yuba River Aquatic Monitoring Plan, as modified by staff, are expected to help maintain the existing aquatic habitat diversity and mimic the natural hydrograph of the lower Yuba River more accurately over the duration of any license issued for the project. Therefore, operation of the Yuba River Development Project would help mitigate these cumulative effects on fishery resources in the lower Yuba River.

Comment CE2: The Water Board comments that the Commission issued the final EIS for the Yuba-Bear/Drum Spaulding Projects, which includes recommendations for increased streamflow requirements that would "allow more water to be available for YCWA to provide proposed minimum instream flows downstream of Englebright Reservoir" (draft EIS, page 3-204). These changes are therefore reasonably foreseeable. The Water Board requests an analysis of the effects and potential reduced costs that the Yuba-Bear/Drum Spaulding Projects' recommended flows would have on the project, including proposed project environmental protection, mitigation, and enhancement measures and project-affected aquatic resources.

Response: In YCWA's amended final license application, it states that its models incorporated the future effects of upstream projects on the inflows available to the Yuba River Development Project. Our analysis presented in the draft EIS was based on the results of these models, and therefore includes the effects of upstream projects on YCWA's Yuba River Development Project. As described in section 3.3.2.2, we define the water balance/operation models YCWA developed to predict inflows and outflows at project facilities. We modified this section to provide additional clarity about model

assumptions, including the model that describes effects of upstream projects on the inflows to the Yuba River Development Project.

Comment CE3: The Water Board recommends the Commission extend the cumulative geographic scope for all water and aquatic resources to include the Yuba River Watershed downstream to the confluence with the Feather River, the lower Feather River to the lower Sacramento River, and through the Sacramento-San Joaquin Delta to the San Francisco Bay.

Response: As described in section 3.2.1, we define the geographic scope for cumulative effects for water and aquatic resources (with the exception of anadromous fish), riparian vegetation, and geology and soils to encompass: the North Yuba River extending downstream from the confluence of Slate Creek, the Middle Yuba River extending downstream from the high water line of Our House Diversion Dam impoundment, Oregon Creek extending downstream from the Lohman Ridge Diversion Tunnel, and the entire mainstem Yuba River extending downstream to the mixing zone of the Yuba River and the Feather River.

We determined a cumulative geographic scope for anadromous fish and EFH that includes the Yuba River Basin downstream to the confluence with the Feather River, the lower Feather River to the lower Sacramento River, and through the Sacramento-San Joaquin Delta to the San Francisco Bay.

Comment CE4: FWN comments that the draft EIS does not adequately analyze cumulative effects and should include (1) analysis of cumulative effects of fish passage to the upper Yuba Watershed, (2) analysis of cumulative effects of Feather River operation on Yuba River fisheries, and (3) the proposed California WaterFix, if implemented. South Yuba River Citizen's League et al. comments that the final EIS should incorporate climate change considerations.

Response: We added analysis to the final EIS, section 3.3.2.3, *Aquatic Resources, Cumulative Effects,* to address cumulative effects of the Yuba River Development Project and Feather River Project on fish passage and fisheries in the Yuba River and to address potential cumulative effects associated with the WaterFix project. We conclude that implementation of the measures included in the Oroville Project's final Habitat Expansion Plan and California WaterFix programs, in combination with those included in the staff alternative, would likely increase the spatial distribution and abundance of anadromous fish populations, improve aquatic habitat, and reduce risks to these population related to catastrophic events. As to the comment on the need for climate change considerations, our analysis in section 3 includes average unimpaired flows since 1922 (table 3-1). This information shows that the unimpaired flow in the Basin, as represented by the Smartsville gage data, has remained unchanged since 1922 suggesting that there is no long-term effect, including a climate change effect, on the unimpaired average volume of flow. With regard to future climate change effects, we

are not aware of any climate models for the region that provide suitable and reliable predictions of climate change effects on flows at the scale of the Yuba River Watershed to inform our analysis. If extreme conditions associated with global climate change become apparent at some point in the future, and such changes potentially warrant changes to license conditions, licenses include a standard fish and wildlife reopener condition whereby appropriate entities would be able to petition the Commission to reopen the license to determine the need for license article modifications or additional license conditions. The information referenced here is the best available information that we have regarding the effects of climate change on area flow volumes.

1.9 DEVELOPMENTAL RESOURCES

Comment DR1: California DFW questions how staff obtained the cost estimate for recommendation 2.5 under recommendation 8 (Maintain minimum streamflows below Narrows 2 Powerhouse and Narrows 2 full bypass) in table 5-1 for "Levelized Annual Cost" of $3 million to $50 million.

Response: In its comments on the REA notice filed on October 12, 2017, YCWA discusses the anticipated effects due to the agency recommendations for flows downstream of the Narrows 2 Powerhouse in the lower Yuba River (pages 27–35). YCWA's comments pertain directly to (section a) spring floodplain inundation flows; (section b) spring pulse flows; and (section c) conditional winter pulse flows. YCWA summarizes the hydrological effects (section d) and effects on hydroelectric project power generation value (section d) and estimates that the flow requirements would have resulted in the loss of about $2.5 million in water-transfer revenues in 2013 and about $40 million in 2014. In addition, YCWA notes that the shift in timing of releases from months of higher electricity demand, and therefore, higher energy prices, to March and April, when prices are typically lower, results in an average annual energy loss worth about $375,740.

Although YCWA did not provide average annual water transfer revenues, the two years cited reflect that potentially significant revenue losses could occur. To address the concern regarding overstatement of the value, we show the energy loss in table 4.3 of the final EIS with a footnote that the value does not include water transfer revenue losses that could be potentially significant in a given year (e.g., YCWA estimated losses of $2,500,000 for 2013 and $40,000,000 in 2014).

Comment DR2: The Water Board requests that staff determine the estimated cost to repair, maintain, and operate the upper intake. The Water Board comments that YCWA's estimate of $1,100,000 per year appears high and no cost breakdown is provided.

Response: In appendix 11 of REA response comments (page 6), YCWA provides the following background information for its cost estimate:

> At the direction of CDFW, YCWA has released all water from New Bullards Bar Reservoir for generation at the New Colgate Powerhouse through the New Colgate Power Tunnel lower intake, and has not used the upper intake since 1993. As a result, the upper intake has remained closed by its bulkhead for over 25 years and currently is not in working condition. Consequently, YCWA has not used the systems to routinely shift reservoir withdrawals to the powerhouse between the upper and lower intakes, and restoring the upper intake into operation and restoring the operational flexibility to switch between intakes on a monthly basis, as proposed by CDFW and FWS, would require substantial repairs and refurbishment. Changing between the lower and upper intakes on a monthly basis also would substantially increase annual operation and maintenance costs. Neither the CDFW nor the FWS rationale statement has any cost estimates and their statements only briefly discuss some of the safety inspection and equipment activities that YCWA would have [to] undertake to implement their recommendation. YCWA's high level estimate is that the initial refurbishments, repair and replacements and annual operation and maintenance would cost approximately $33,000,000 over 30 years ($1,100,000/yr).

As far as providing the details of its estimate, we acknowledge that YCWA does not separate the capital costs related to the initial refurbishment, repair, and replacements from the annual O&M cost, and that it states that the estimate is a "high level" estimate. However, we think YMCA's estimate is reasonable enough to approximate the cost of the work needed to return the tunnel to operating condition and maintain it annually.

Comment DR3: The Water Board and California DFW request that staff consider the economic impact to YCWA from closing the Lohman Ridge Diversion Tunnel in the fall, as recommended by California DFW and FWS. The Water Board notes that California DFW provides an economic analysis in its 10(j) filing on pages 150–156 that suggests water diverted through the Lohman Ridge Diversion Tunnel in fall is often spilled at New Bullards Bar Dam. The Water Board also notes that it is evaluating whether diverting water from Middle Yuba River and Oregon Creek to New Bullards Bar Reservoir and spilling water in the same season at the diversion is an unreasonable use of diverted water (California Constitution Article X, sec. 2), and if that water may be put to greater beneficial use if allowed to flow down the source stream.

California DFW and FWN suggest that YCWA overstates the value of the water associated with the tunnel closures. FWN argues that the installation of large-scale solar projects in recent years may lower the value of hydroelectric generation and increase the value of ancillary services, and that this trend will continue into the future.

Response: The perceived intent of the FWS, California DFW, and FWN's additional tunnel closure recommendation (i.e., spring tunnel closures in wet and above normal water years and fall tunnel closures in ALL water years) is to avoid diverting water from the Middle Yuba River only to spill it at New Bullards Bar Dam. In its reply comments, YCWA agrees with the commenting agencies that diverting water from one tributary only to spill it at another is not a valuable use of water. The intent of YCWA/Forest Service's measure is to provide a reasonable balance between environmental and financial benefits of the project. As discussed under comment AQ14, section 3.3.2.2, the subsection *Ramping Rates and Controlling Project Spills Upstream of Englebright Dam*, includes a description of the quantity of water that would not be diverted to the New Bullards Bar Reservoir in the spring and fall under YCWA/Forest Service's condition AR11, and under the agencies' recommendations.

We reviewed the arguments put forth by California DFW, FWS, and FWN in reference to the cost of providing additional closures of the Lohman Ridge Diversion Tunnel in the spring and fall, as well as the original analysis performed by YCWA in the amended final license application and its reply to comments on the draft EIS. The agencies' recommended tunnel closures, if implemented over the last 40 years, would have resulted in net reductions in water available for generation. YCWA estimates that over the 30-year term of the license, the additional closures in spring would cost about $10.4 million and additional closures in fall would cost $4.1 million in lost generation value.

We also reviewed YCWA's basis for its estimate of the potential cost of the loss in generation from providing additional tunnel closures. YCWA used the operational model developed in consultation with, and approved by, the stakeholders to value any changes in generation resulting from its proposal and for the agencies' recommendation. We find the cost per megawatt hour (MWh) to be reasonable and appropriate (approximately $23/MWh).

In response to comments regarding the addition solar projects, the electric market in California is beginning to evolve. While energy rates have remained fairly constant, ancillary services values have increased somewhat in the last 2 years. Solar energy is still a volatile resource that depends on direct sunlight and is affected by cloud cover and storm events. With regard to the future power market, Commission staff does not speculate on how power values might change.

We note in section 5.1.3, in the subsection *Extending Lohman Ridge Diversion Tunnel Closure Periods*, that cost was not the only factor considered in making our recommendation. Our analysis also weighs the environmental benefits, the effect on available water, and the cost of potential lost energy in concluding to adopt YCWA's proposal over the agencies' recommendation.

Comment DR4: The Water Board comments that staff estimates a levelized annual cost of $591,390 to provide spring pulse flows and that the benefits to anadromous fish would be worth the cost (draft EIS, page 5-14). The Water Board requests clarification of how this cost was estimated.

Response: The cost was presented in item 6 under Water Resources in table 4-3 of the draft EIS, and the cost is explained in footnote "m" at the bottom of table 4-3.

Comment DR5: FWN comments that the draft EIS overstates the water cost to local irrigators of the California DFW, FWS, and FWN flow recommendations. FWN contends that YCWA misunderstands footnote 2 for the schedule 1 flow proposal recommended by the agencies, which it states would address the potential adverse effect YCWA cites to support its position that the flow proposal should not be included in a new license.

Response: As referenced by FWN in its comment letter on the draft EIS, California DFW, in its 10(j) recommendation 2.5 (i.e., minimum instream flows below Narrows 2 Powerhouse/Narrows 2 Full Bypass), provides the following option (footnote 2 to table 2.5-1 in California DFW's 10(j) recommendations) where YCWA would be considered to be in compliance with the California DFW recommended minimum instream flows from March 23 to April 30 (3,500 cfs at Marysville U.S. Department of the Interior, Geological Survey [USGS] gage). The footnote reads:

> Because diversions at Daguerre Point Dam are not controlled by Licensee, Licensee will be considered to be in compliance with the specified minimum instream flows when the combined release from the Narrows 1 Powerhouse (FERC Project No. 1403) and Narrows 2 Facilities, as measured at the Smartsville - USGS Streamflows Gage 11421000 is at or above 4,120 cfs (the combined capacity of Narrows 1 Powerhouse and Narrows 2 Facilities) and Englebright Dam is not spilling.

In its reply comments on the draft EIS, YCWA notes that the release capacity of Narrows 2 Powerhouse is only 3,400 cfs, which is less than the California DFW recommended flow rate of 3,500 cfs at Marysville and less than the 4,120 cfs flow rate requirement at the Smartsville gage. YCWA comments that it has a coordinated operations agreement with PG&E for operation of the Narrows 1 Powerhouse, but that agreement does not mean the Narrows 1 Powerhouse would always be available when the downstream flow would be required. Therefore, we stand by the costs presented in the draft EIS

Comment DR6: FWN comments that the draft EIS likely overstates the economic impacts of proposed flows downstream of New Bullards Bar Dam based on a comparison of 2016 energy rates with the 2012 values used by YCWA.

Response: We reviewed the energy rates used by YCWA and compared them to recent data. Although there has been some fluctuation in energy rates, the rates used by YCWA are fairly comparable and do not overstate the economic impacts of proposed flows downstream of New Bullards Bar Dam.

Comment DR7: FWN comments that the draft EIS relies on YCWA's valuations of water transfers without independent analysis or citation adequate to reconstruct essential assumptions.

Response: The operation model was developed in response to a Commission study request; staff and stakeholder participants reviewed the assumptions and study reports during the pre-filing process. Staff finds that the assumptions in the model and the valuations from the results are reasonable and appropriate.

Comment DR8: FWN comments that the draft EIS overstates the impact to YCWA from the loss of water sales due to instream flow requirements because it does not account for the likelihood of increasing demand for transfer water and reduced supply from other sources.

FWN states that, in the future, as more water is dedicated to Delta inflow and outflow, there will likely be an increasing demand for transfer water and a decreasing supply. This, in turn, may affect the water transfer price structure, and may increase the value of transfer water per acre-foot over time. FWN argues that this would theoretically decrease the value of any lost water for generation.

Response: As stated in response to comment DR3, the Commission staff does not speculate on how project operations may change in the future.

Comment DR9: California DFW comments that staff analysis of restoration costs in the lower Yuba River is overstated.

Response: We revised our estimated costs for restoration efforts in the lower Yuba River based on information provided in comments on the draft EIS and at the 10(j) meeting. Based on costs of recent restoration efforts, we estimate riparian planting, without floodplain lowering would cost $75,000 per acre and planting with floodplain lowering would cost about $150,000 per acre. We modified section 4.3, *Cost of Environmental Measures*, to reflect this revised estimate.

Comment DR10: FWN comments that it is unclear if the estimated cost of developing and implementing a large woody material plan is accurate because the draft EIS does not provide guidance on the level of effort that staff anticipates. FWN notes that the final EIS should provide guidance on staff's expected range of the number of pieces, size and characteristics of wood, and geographic focus. FWN suggests that it is not

advisable to approach development of a plan when there may be widely differing visions of both need and expectations.

Response: The cost estimated by staff includes $30,000 for plan development, and an annual cost of $10,000 per truckload of LWM, delivered to the river 10 times per year. Given the uncertainties associated with annual wood loading in the reservoir, Staff considers that this was a reasonable cost to include in our draft EIS. We are confident the FWN, the resource agencies, and YCWA can come to an agreement on a plan that: (1) identifies sources of LWM in the project reservoirs; (2) includes viable options for storing and transporting collected LWM; (3) identifies suitable LWM size classes for placement; (4) identifies locations for placement in the lower Yuba River; (5) details a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests; and (6) contains a monitoring and mapping process to provide an indication of the stability of these enhancements and inform the need for future placement activities for the project. In the final EIS, we determine the benefits of these measures would be worth our estimated levelized annual cost of $101,560.

Comment DR11: YCWA comments that staff's cost estimate is low for implementing bullfrog suppression measures under the proposed Aquatic Invasive Species Plan. YCWA also comments that bullfrog suppression would likely be ineffective because of the potential for recolonization.

Response: We agree that our estimate of the annualized cost for bullfrog control on Oregon Creek and the Middle Yuba River, below Our House and Log Cabin Diversion Dams, is too low. We reviewed the literature and spoke to wildlife biologists to further investigate bullfrog control methods and costs. Based on this research, we determined that the recommended staff measure to revise the Aquatic Invasive Species Management Plan to include bullfrog monitoring and suppression was unnecessary. No studies of efforts to control invasive bullfrogs within riverine systems have been published, and evidence suggests that managing habitat rather than directly controlling bullfrogs may be a more effective way to reduce the effects of bullfrogs on foothill yellow-legged frog.

Comment DR12: YCWA comments that staff cost estimates to upgrade the access road to the North Yuba River below New Bullards Bar Dam are inaccurate.

Response: Upon review of YCWA's comment regarding the upgrade to the access road below New Bullards Bar Dam, we first noted some slight typographical errors in the costs presented on page 5-29 of the draft EIS but also see the need for further explanation. With regard to the cost of the upgrade, on page 5-29 of the draft EIS, the cost to implement YCWA's Proposed RR1 (Implement the Recreation Facilities Plan, provide recreation flow information, and provide boating flows below Our House Diversion Dam) should have been $2,175,850. The cost of our recommended revisions to the plan (RR1) should have been $18,770.

Our estimate for the upgrade the access road was $250,000, which is based on an average cost to upgrade such a road. However, the benefits of providing public vehicular access below New Bullards Bar Dam are low compared with serious and valid concerns about public safety, project security, and implementation cost. Therefore, we modified the staff alternative and no longer recommend providing such access.

Comment DR13: YCWA comments that the capital cost to implement its proposed measure RR1 (Recreation Facilities Plan) are provided in the amended final license application and would be substantially higher than the $555,300 cost included in the draft EIS.

Response: Exhibit D in the amended license application provides costs to implement the plan as if all of the capital costs would be implemented in year 1 of the license. However, the plan itself provides a schedule for implementation of the various capital enhancement expenditures that shows in which years over the course of the project license the costs would be incurred. In the draft EIS, we applied those costs in the years in which the plan shows they would occur and computed the combined present worth of those expenditures. This accounts for the difference in cost between the license application and the draft EIS.

Comment DR14: The Water Board requests the Commission consider the current energy market in California when estimating costs to a licensee from implementation of license measures.

Response: We reviewed the energy rates used by YCWA and compared them to recent data. Although there has been some fluctuation in energy rates, the rates used by YCWA are fairly comparable and do not overstate the economic impacts of proposed measures that affect energy output.

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APPENDIX C

License Conditions Recommended by Staff

I. MANDATORY CONDITIONS

On September 27, 2018, the U.S. Department of Agriculture, Forest Service (Forest Service) filed 54 final 4(e) conditions (appendix C). These conditions are described in section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*, of the environmental impact statement (EIS). We consider preliminary conditions 1, 3 through 20, and 23 through 27 to be administrative or legal in nature and not specific environmental measures. Of the 30 conditions we consider to be environmental measures applicable to the Yuba River Development Project, we include in the staff alternative 18 conditions as specified by the agency, modify 5 conditions to adjust the scope of the measure, and do not recommend 7 conditions. We recognize, however, that the Commission is required to include valid 4(e) conditions in any license issued for the project. As such, the Forest Service conditions that we do not recommend would be included in a new license.

On August 25, 2017, the California State Water Resources Control Board filed 47 preliminary conditions under section 401 of the Clean Water Act (appendix D). These conditions are described in section 2.2.5, *Modifications to Applicant's Proposal— Mandatory Conditions*, of the EIS. We consider preliminary conditions 9 and 29 through 47 to be administrative. We anticipate that all valid section 401 conditions will be included in any new license issued for the project.

II. ADDITIONAL LICENSE ARTICLES RECOMMENDED BY COMMISSION STAFF

We recommend including the following license articles in any license issued for the project in addition to the preliminary mandatory conditions.

Article 401. *Commission Approval, Reporting, and Filing of Amendments.*

(a) Requirement to File Plans for Commission Approval

Various conditions found in the California State Water Resources Control Board (Water Board's) preliminary section 401 water quality certification (certification) require the licensee to prepare plans in consultation with other entities for approval by the Water Board for submittal to the Commission and to implement specific measures without prior Commission approval. Each such plan must also be submitted to the Commission for approval. These plans are listed below.

Certification Condition No.	Plan Name	Due Date
3	Restoration Plan	Within one year of license issuance

Certification Condition No.	Plan Name	Due Date
6	Streamflow and Reservoir Level Compliance Monitoring Plan	Within one year of license issuance
28	Coordinated Operations Plan with Narrows Project	Within one year of license issuance

The licensee must include with each plan filed with the Commission documentation that the licensee developed the plan in consultation with, and has received approval from, the Water Board. The Commission reserves the right to make changes to any plan filed. Upon Commission approval, the plan becomes a requirement of the license, and the licensee must implement the plan or changes in project operations or facilities, including any changes required by the Commission.

(b) Requirement to File Reports

Certain conditions of the Water Board's 401 certification require the licensee to file reports with other entities. Because these reports relate to compliance with the requirements of this license, each such report must also be submitted to the Commission. These reports are listed in the following table:

Certification Condition No.	Description	Due Date
11	Reports that document the implementation and effectiveness of the large woody material augmentation in the North Yuba River downstream of New Bullards Bar Dam must be submitted to the California State Water Board Deputy Director.	One year after completion of each large woody material monitoring period.
12	Reports that document the implementation and effectiveness of the sediment augmentation in the North Yuba River downstream of New Bullards Bar Dam must be submitted to the California State Water Board Deputy Director.	One year after completion of each sediment monitoring period.

The licensee must submit to the Commission documentation of any consultation, and copies of any comments and recommendations made by any consulted entity in connection with each report. The Commission reserves the right to require changes to project operations or facilities based on the information contained in the report and any other available information.

(c) Requirement to File Amendment Applications

Certain certification conditions in Appendix E contemplate unspecified long-term changes to project operations or facilities for the purpose of mitigating environmental impacts (e.g., Certification Condition No. 15 provides that the Water Board may supplement the Upper Yuba River Aquatic Monitoring Plan in the future). These changes may not be implemented without prior Commission authorization granted after the filing of an application to amend the license.

Article 402. *Reservation of Authority to Prescribe Fishways.* Authority is reserved to the Commission to require the licensee to construct and maintain, or to provide for the construction, operation, and maintenance of, such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce, pursuant to section 18 of the Federal Power Act.

Article 403. *Approval of Implementation Plans*. The following plans are approved and made part of the license: (1) Streamflow and Reservoir Level Compliance Monitoring Plan, filed June 5, 2017; (2) Erosion and Sediment Control Plan, filed October 27, 2016; (3) Log Cabin and Our House Diversion Dams Sediment Management Plan, filed July 27, 2018; (4) Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan, filed April 12, 2018; (5) Water Temperature Monitoring Plan, filed October 27, 2016; (6) Water Quality Monitoring Plan, filed October 27, 2016; (7) Lower Yuba Aquatic Monitoring Plan, filed June 5, 2017; (8) Upper Yuba River Aquatic Monitoring Plan, filed June 5, 2017; (9) Ringtail Management Plan filed October 27, 2016; (10) Hazardous Materials Management Plan filed June 5, 2017, and modified July 30, 2018; (11) Bat Management Plan, filed October 27, 2016; (12) Transportation System Management Plan, filed October 27, 2016; (13) Fire Prevention and Response Plan, filed October 27, 2016; (14) revised Recreation Facilities Plan filed September 19, 2018, and (15) Visual Resources Management, filed October 27, 2016. The plans may not be amended without prior Commission approval. Upon license issuance, the licensee must implement the plans.

Article 404. *Minimum Pool at New Bullards Bar Reservoir*. The licensee must maintain a minimum pool elevation in New Bullards Bar Reservoir of not less than 1,730 feet National Geodetic Vertical Datum of 1929, except for drawdowns necessary to maintain minimum streamflows specified in Certification Condition No. 32 (Appendix E).

Article 405. *Aquatic Invasive Species Management Plan*. In addition to monitoring the aquatic invasive species at the locations specified by the Aquatic Invasive Species Management Plan required by condition 39 in Appendix D, the licensee must also monitor Asian clams at the following recreational areas: Cottage Creek, Dark Day Boat Launch, and Emerald Cove.

Article 406. *New Bullards Bar Reservoir Fish Stocking Plan*. Within 6 months of license issuance, the licensee must file, for Commission approval, a revised New Bullard Bar Reservoir Fish Stocking Plan.

The licensee must revise the New Bullards Bar Reservoir Fish Stocking Plan, filed December 2, 2016, to include the following additional measures:

(1) a provision for annual consultation with the California Department of Fish and Wildlife to determine species of fish appropriate for stocking;

(2) a list of the species to be stocked in the reservoir;

(3) the number of each species to be stocked;

(4) the criteria on which decisions for modifying the stocking protocol must be made.

The revised New Bullards Bar Reservoir Fish Stocking Plan must be developed after consultation with California Department of Fish and Wildlife. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Article 407. *Summer Minimum Flows Below New Bullards Bar Dam.* The licensee must release the following continuous minimum flows, in cubic feet per second (cfs) into the North Yuba River below New Bullards Bar Dam, as measured at the North Yuba River low-flow release below New Bullards Bar Dam gage (at USGS gage 11413517):

June 1 through June 30	60 cfs
July 1 through August 31	40 cfs
September 1 through September 30	30 cfs

To ensure upramping and downramping rates do not adversely affect aquatic resources, ramping of flows must occur over the 3-day periods from June 1 through June 3 and September 28 through September 31.

Additionally, during schedule 6 water years, YCWA must provide the following minimum flow in the lower Yuba River, as measured at the Marysville - USGS Streamflow Gage 11421000:

June 1 through August 31	350 cfs

The flow release requirement may be temporarily modified if required by operating emergencies beyond the control of the licensee, and for short periods upon mutual agreement among the licensee, California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and National Marine Fisheries Service. If the flow is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Article 408. *Decontamination Protocols*. During any project activities that require movement of equipment from one waterbody to another, the licensee must implement procedures consistent with those described in the Aquatic Invasive Species Monitoring Plan, filed on October 27, 2016, for decontaminating all equipment used during project activities, to prevent the spread of chytrid fungus and aquatic invasive species.

Article 409. *Narrows Reach Fish Stranding Prevention Plan*. To help reduce the potential for fish stranding following shutdowns of the Narrows 2 Project facilities, the licensee, within 6 month of license issuance, must file, for Commission approval, a Narrows Reach fish stranding prevention plan.

The plan must include, but not necessarily be limited to, the following:

(1) a detailed list of potential operational and/or structural measures or other actions and their associated costs that could be implemented at the project to reduce stranding in the lower Yuba River from immediately below Englebright Dam to the Narrows 1 Powerhouse; and

(2) procedures for reporting a potential fish-stranding event to the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and California Department of Fish and Wildlife if a flow reduction of greater than 500 cubic feet per second occurs for more than 5 minutes. If the unplanned flow reduction occurs on a weekday, reporting to the fisheries agencies should be on the same day, via email and telephone. If the unplanned flow reduction occurs after 5:00 p.m. on a Friday, reporting to the fisheries agencies should be by 10:00 a.m. on the following Monday, via email and telephone.

The Narrows Reach fish stranding prevention plan must be developed after consultation with the U. S. Army Corps of Engineers, Pacific Gas & Electric Company, California Department of Fish and Wildlife, National Marine Fisheries Service, California State Water Resources Control Board, and U.S. Fish and Wildlife Service. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted parties, and specific descriptions of how stakeholders and agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the consulted parties to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Article 410. *Large Woody Material Management Plan.* The large woody material (LWM) management plan required by Water Quality Certificate condition 11 in appendix E must also:

(1) identify sources of LWM in the project reservoirs or nearby NFS lands;

(2) include provisions for storing and transporting LWM collected at New Bullards Bar Reservoir downstream to the lower Yuba River;

(3) identify suitable LWM size classes for placement;

(4) identify locations for placement in the lower Yuba River;

(5) detail a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests (e.g., American Whitewater); and

(6) contain a monitoring and mapping process to provide an indication of the stability of these enhancements and inform the need for future placement activities.

The licensee must consult with California Department of Fish and Wildlife, National Marine Fisheries Service, California State Water Resources Control Board, Forest Service, and U.S. Fish and Wildlife Service to review the LWM enhancement plan goals and the timing and frequency of placement events once within the first 3 years of license issuance and then in license year 10 and every 10 years thereafter to determine if reviusions to the plan are needed to meet plan objectives.

The large woody material management plan must be developed after consultation with the California Department of Fish and Wildlife, National Marine Fisheries Service, California State Water Resources Control Board, Forest Service, and U.S. Fish and Wildlife Service. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted parties, and specific descriptions of how stakeholders and agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the consulted parties to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Article 411. *Integrated Vegetation Management Plan*. Within 6 months of license issuance, or at least 90 days prior to the start of any ground-disturbing activity, whichever comes first, the licensee must file, for Commission approval, a revised Integrated Vegetation Management Plan.

The licensee must revise the Integrated Vegetation Management Plan, filed on October 27, 2016 to include the following additional measures:

(1) development of treatment plans and annual treatment and monitoring for target non-native invasive species on all lands within the project boundary;

(2) application of revegetation measures provided in sections 4.1 through 4.5 of the Integrated Vegetation Management Plan to all lands within the project boundary;

(3) implementation of best management practices, including but not limited to, limiting the use of pesticides and routine vegetation maintenance near breeding sites, to protect foothill yellow-legged frog and California red-legged frog habitat when vegetation management activities occur within 300 feet of streams;

(4) insurance that any pesticide use that is deemed necessary within the project boundary and within 500 feet of known locations of foothill yellow-legged frog must be designed to avoid adverse effects on individuals and their habitats;

(5) prohibition on the use of pesticides within a 260-foot buffer around the mean high water mark of aquatic features, unless necessary around project dams to ensure public safety;

(6) avoidance of stockpiling and subsequent removal of any fuels, slash, or debris from hazard tree removal within 1,000 feet of wetlands or aquatic features; and

(7) prior to any activities that would result in vegetation disturbance, conduct surveys for elderberry plants within 165 feet of the activity area and consult with U.S. Fish and Wildlife Service if elderberry plants are found to determine if additional protective measures are necessary.

The revised Integrated Vegetation Management Plan must be developed after consultation with the Forest Service, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Article 412. *Lower Yuba River Riparian Restoration Plan*. To help promote the development of riparian vegetation in the Lower Yuba River, the licensee, within 6 month of license issuance, or at least 90 days prior to the start of any ground-disturbing activity, whichever comes first, must file, for Commission approval, a lower Yuba River riparian restoration plan.

The plan must include, but not necessarily be limited to, the following:

(1) a provision for planting riparian vegetation on 100 acres of floodplain in the lower Yuba River, including no fewer than four separate planting sites;

(2) a species list for plantings that include, at a minimum, cottonwood and willow species;

(3) a description of planting methods consistent with methods used at the Hammon Bar restoration site, including planting to ground water depth;

(4) success criteria based on survivorship of plantings;

(5) monitoring methods and a schedule for determining success;

(6) provisions for additional plantings if success criteria are not met;

(7) a process and schedule for identifying planting sites;

(8) a reporting schedule; and

(9) an implementation schedule.

The lower Yuba River riparian restoration plan must be developed after consultation with the U. S. Fish and Wildlife Service, California Department of Fish and Wildlife, National Marine Fisheries Service, and the South Yuba River Citizen's League. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted parties, and specific descriptions of how stakeholders and agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the consulted parties to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Article 413. *Bald Eagle and American Peregrine Falcon Management Plan*. Within 6 months of license issuance, the licensee must file, for Commission approval, a revised Bald Eagle and American Peregrine Falcon Management Plan.

The licensee must revise the Bald Eagle and American Peregrine Falcon Management Plan, filed on October 27, 2016, to include surveys for American peregrine falcon eyries every year or until a new eyrie is documented.

The revised Bald Eagle and American Peregrine Falcon Management Plan must be developed after consultation with the Forest Service, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Article 414. *Recreation Flow Information.* The recreation flow information required by Forest Service condition 47 in Appendix D must also include forecasts for flows in the Middle Yuba River immediately downstream of Our House Diversion Dam, in Oregon Creek immediately downstream of Log Cabin Diversion Dam, in the North Yuba River imdeiately downstream of New Bullards Bar Dam and spillway, and in the Yuba River at Smartsville. The licensee must provide forecasts of flows at least once each month by the 15th of that month.

Article 415. *Programmatic Agreement and Historic Properties Management Plan.* The licensee must implement the "Programmatic Agreement Between the Federal Energy Regulatory Commission and the California State Historic Preservation Officer for Managing Historic Properties that May be Affected by Issuing a License to the Yuba County Water Agency for the Continued Operation of the Yuba River Development Hydroelectric Project in Yuba, Sierra, and Nevada Counties, California (FERC No. 2246-065)," executed on XXX, 2019, and including but not limited to, the Historic Properties Management Plan (HPMP) for the project. Pursuant to the requirements of this Programmatic Agreement, the licensee must file, for Commission approval, a revised HPMP within six months of the effective date of this license. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license. If the Programmatic Agreement is terminated prior to Commission approval of the revised HPMP, the licensee must obtain approval from the Commission and the California State Historic Preservation Officer before engaging in any ground-disturbing activities or taking any other action that may affect any historic properties within the project's area of potential effects.

Article 417. *Land Use and Occupancy*. (a) In accordance with the provisions of this article, the licensee must have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee must also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the

licensee must take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 water craft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee must require multiple use and occupancy of facilities for access to project lands or waters. The licensee must also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee must: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69 kilovolt or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee must file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location

of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 water craft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is 5 acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee must consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee must determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed must not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the

grantee must take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee must not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project must be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article must not apply to any part of the public lands and reservations of the United States included within the project boundary.

APPENDIX D

U.S. Department of Agriculture, Forest Service Final Conditions

Enclosure 1

Forest Service
Final Terms and Conditions Provided Under Section 4(e) of the Federal Power Act

In Connection with the Application for Relicensing of the Yuba River Development Project (FERC No. 2246-065)

20 September 2018

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INTRODUCTION

The USDA Forest Service (Forest Service) provides the following Final Terms and Conditions for the Yuba River Development Project, Federal Energy Regulatory Commission (hereafter, FERC or Commission) Project No. 2246, in accordance with Section 4(e) of the Federal Power Act and 18 CFR 5.25(d). Section 4(e) of the FPA states the Commission may issue a license for a project within a reservation only if it finds that the License will not interfere or be inconsistent with the purpose for which such reservation was created or acquired. This is an independent threshold determination made by the FERC, with the purpose of the reservation defined by the authorizing legislation or proclamation (see Rainsong v. FERC, 106 F.3d 269 (9th Cir. 1977). Forest Service, for its protection and utilization determination under Section 4(e) of the FPA, may rely on broader purposes than those contained in the original authorizing statutes and proclamations in prescribing conditions (see Southern California Edison v. FERC, 116F.3d 507 [D.C. Cir. 1997]).

The following terms and conditions are based on those resource and management requirements enumerated in the Organic Administration Act of 1897 (30 Stat. 11), the Multiple-Use Sustained Yield Act of 1960 (74 Stat. 215), the National Forest Management Act of 1976 (90 Stat. 2949), and any other law specifically establishing a unit of the National Forest System or prescribing the management thereof (such as the Wild and Scenic Rivers Act), as such laws may be amended from time to time, and as implemented by regulations and approved by Land and Resource Management Plans prepared in accordance with the National Forest Management Act. Specifically, the 4(e) conditions in this document are based on the Land and Resource Management Plans (as amended) for the Tahoe and Plumas National Forests, as approved by the Regional Forester of the Pacific Southwest Region.

Pursuant to Section 4(e) of the Federal Power Act, the Secretary of Agriculture, acting by and through Forest Service, considers the following conditions necessary for the adequate protection and utilization of the land and resources of the Tahoe and Plumas National Forests. License articles contained in the Commission's Standard Form L-1 (revised October 1975) issued by Order No. 540, dated October 31, 1975, cover general requirements.

Part I of this document includes administrative conditions deemed necessary for the administration of National Forest System (NFS) lands. Part II of this document includes specific resource requirements for protection and utilization of NFS lands. This filing includes one additional resource condition (Condition No. 54 – Drought Management Plan) that was not included in Forest Service Preliminary Terms and Conditions (previously filed with FERC on August 25, 2017). Three management plans (Condition No. 37 – Our House and Log Cabin Diversion Dams Sediment Management Plan, Condition No. 38 - Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan, Condition No. 46 – Recreation Facilities Plan) were collaboratively revised, and refiled with FERC by the Licensee. Our Final Terms and Conditions reference these revised plans on the FERC eLibrary, and include the new date and accession number. Documents (i.e., management and monitoring plans) referenced as previously filed with the Commission, on the FERC eLibrary, can be found at the following website: https://www.ferc.gov/docs-filing/elibrary.asp.

PART I: ADMINISTRATIVE CONDITIONS

Condition No. 1 – Consultation

Licensee shall annually consult with the United States Department of Agriculture, Forest Service. The date of the consultation meeting will be mutually agreed to by Licensee and Forest Service but in general should be held by April 15. At least 30 days in advance of the meeting, Licensee shall notify other interested stakeholders, confirming the meeting location, time and agenda. At the same time, Licensee shall also provide notice to United States Army Corps of Engineers (USACE), United States Department of Interior (USDI) Bureau of Land Management (BLM), USDI Fish and Wildlife Service (USFWS), and USDI National Park Service, California Department of Fish and Wildlife (CDFW), California State Water Resources Control Board (SWRCB), United States Department of Commerce National Oceanic and Atmospheric Administration, National Marine Fishery Service (NMFS), who may choose to participate in the meeting. Licensee shall attempt to coordinate the meeting so interested agencies and other stakeholders may attend.

Licensee shall make available to Forest Service, at least 2 weeks prior to the meeting, an operations and maintenance plan for the year in which the meeting occurs. In addition, Licensee shall present results from current year monitoring of noxious weeds and special-status species as well as any additional information that has been compiled for the Project area, including progress reports on other resource measures. The goals of this meeting are to share information, mutually agree upon planned maintenance activities, identify concerns that may have regarding activities and their potential effects on sensitive resources, and any measures required to avoid or mitigate potential effects. In addition, the goal of the meeting shall be to review and discuss the results of implementing the streamflow and reservoir-related conditions, results of monitoring, and other issues related to preserving and protecting ecological values affected by the Project.

Consultation shall include, but not be limited to:

- A written status report detailing compliance with the Project's Final 4(e) Conditions and any 10(a) Recommendations included in the license. The report shall include a summary of each of the Forest Service conditions and a statement indicating how the licensee met the condition during the previous year.
- Results of any monitoring studies performed over the previous year in formats agreed to by Forest Service and Licensee during development of implementation plans.
- Review of any non-routine maintenance.
- Discussion of any foreseeable changes to Project facilities or features.
- Discussion of any necessary revisions or modifications to implementation plans approved as part of this license.
- Discussion of needed protection measures for species newly listed as threatened, endangered, or sensitive, or changes to existing management plans that may no longer be warranted due to delisting of species or, to incorporate new knowledge about a species requiring protection.
- Discussion of any climate change effects on Project operations, and implications for NFS lands and resources.

- Discussion of needed protection measures for newly discovered cultural resource sites.
- Discussion of elements of current year maintenance plans, e.g. road and trail maintenance.
- Discussion of any planned pesticide use.

A record of the meeting shall be kept by Licensee and shall include any recommendations made by Forest Service for the protection of NFS lands and resources. Licensee shall file the meeting record, if requested, with the Commission no later than 60 days following the meeting.

Copies of other reports related to Project safety and non-compliance shall be submitted to Forest Service, and other interested agencies and stakeholders concurrently with submittal to the Commission. These include, but are not limited to: any non-compliance report filed by Licensee, geologic or seismic reports, and structural safety reports for facilities located on or affecting NFS lands.

A copy of the record for the previous water year regarding streamflow, study reports, and other pertinent records shall be provided to Forest Service, and other interested agencies and stakeholders by Licensee at least 60 days prior to the meeting date, unless otherwise agreed.

Copies of other reports related to monitoring, Project safety, and non-compliance on NFS lands shall be submitted to Forest Service concurrently with submittal to the Commission, with the goal of providing the material to Forest Service no later than 90 days in advance of the Annual Meeting. These include, but are not limited to: any non-compliance report filed by Licensee, geologic or seismic reports, and structural safety reports for facilities.

During the first several years of license implementation, it is likely that more consultation than just one Annual Meeting will be required, given the complexity of these projects.

Forest Service reserves the right, after notice and opportunity for comment, to require changes in the Project and its operation through revision of the Section 4(e) conditions to accomplish protection and utilization of NFS lands and resources.

Condition No. 2 - Organize Ecological Group and Host Meetings

Licensee shall, within 60 days of license issuance, establish an Ecological Group that includes, but is not limited to, Licensee, Forest Service, USACE, NMFS, USFWS, CDFW, BLM, and SWRCB. Ecological Group meetings shall be open to any organization or individual, who may fully participate in the meeting. Licensee will coordinate meeting agendas with interested agencies. Licensee shall maintain an Ecological Group e-mail contact list consisting of e-mail addresses (one primary and one alternate) provided to Licensee by the Forest Service, USACE, NMFS, USFWS, CDFW, BLM, and SWRCB agencies, and provided to Licensee by organizations or individuals that notified Licensee in writing of their interest in participating in the Ecological Group meetings.

Thereafter, Licensee shall organize and host Ecological Group meetings, and unless otherwise agreed to by the Ecological Group, meetings shall be held at Licensee's office in Marysville, CA.

Licensee shall organize and host at least one Ecological Group meeting each year on the second Tuesday in April, unless otherwise agreed to by the Ecological Group. Licensee shall organize and host additional Ecological Group meetings if agreed to by the Ecological Group. The April meeting shall begin at 9:00 AM, and the agenda for the April meeting shall include, unless otherwise modified by the Ecological Group, the following:

1. Introductions
2. Public comments
3. Licensee's report of any deviations from the conditions in the license since the previous meeting required under this condition
4. Discussion of Licensee's ecological-related FERC filings in the previous calendar year (e.g., reports required by measures or implementation plans)
5. Review of monitoring data and reports - Review and discuss the results of Upper and Lower Yuba River Aquatic and Water Temperature monitoring plans. In particular, the discussion will include the results of fish population monitoring data collected in the previous calendar year (and other prior years, as appropriate), in light of preserving and protecting ecological values affected by the Project
6. Discussion of Licensee's planned license-required ecological-related monitoring in the current calendar year
7. Discussion of any license-required agency ecological-related consultation in the current calendar year, and Licensee's proposal to complete the consultation, if needed
8. Discussion of any Licensee-anticipated proposals that have ecological consequences in the calendar year regarding: 1) changes or additions to facilities or features in the license; 2) variances to conditions in the license; or 3) amendments to the license
9. Licensee's follow-up on action items from the last meeting required by this condition
10. Identification of Licensee's follow-up action items from this meeting, if any
11. Adjourn

At least 30 days in advance of the April meeting, Licensee shall make available to the Ecological Group the following material:

- Reports and other information from the previous calendar year required by license conditions or implementation plans in the FERC license

Licensee shall prepare for each Ecological Group meeting held under this condition a letter summary that shall include the date and location of the meeting, attendees, subjects discussed, and Licensee's action items agreed to by Licensee at the meeting. The summary is not intended to be a transcript of the meeting or formal comments on the license by Licensee or participants in the meeting. Licensee shall file each meeting summary with the Commission no later than 30 days following the meeting.

If Licensee, Forest Service and the Ecological Group agree in advance, the April Ecological Group meeting may be coordinated with the annual meeting required in the Condition No. 1 (i.e., the two meetings may be held as one meeting or may be held as separate meetings on the same day at the same location). If the two meetings are held as one meeting, at a minimum, Licensee shall assure the agenda items for the April Ecological Group meeting are discussed at the joint meeting and Licensee shall file with the Commission within 30 days of the meeting a summary for the agenda item for the Ecological Group portion of the meeting (i.e., summary will not cover agenda items for the Condition No. 1). Agenda items for Condition No. 1 shall be summarized and reported to the Commission as required in that condition.

Licensee is only required to take actions recommended in writing by the Ecological Group if a term or condition of the license expressly provides that the Ecological Group may direct the Licensee to take such action.

Condition No. 3 - Forest Service Approval of Final Design

Before any new construction of the Project occurs on National Forest System lands, Licensee shall obtain prior written approval of Forest Service for all final design plans for Project components, which Forest Service deems as affecting or potentially affecting National Forest System resources. Licensee shall follow the schedules and procedures for design review and approval specified in the conditions herein. As part of such written approval, Forest Service may require adjustments to the final plans and facility locations to preclude or mitigate impacts and to insure that the Project is either compatible with on-the-ground conditions or approved by Forest Service based on agreed upon compensation or mitigation measures to address compatibility issues. Should such necessary adjustments be deemed necessary by Forest Service, the Commission, or Licensee to be a substantial change, Licensee shall follow the procedures of FERC Standard Article 2 of the license. Any changes to the license made for any reason pursuant to FERC Standard Article 2 or Article 3 shall be made subject to any new terms and conditions of the Secretary of Agriculture made pursuant to Section 4(e) of the Federal Power Act.

Condition No. 4 - Approval of Changes

Notwithstanding any license authorization to make changes to the Project, when such changes directly affect NFS lands, Licensee shall obtain written approval from Forest Service prior to making any changes in any constructed Project features or facilities, or in the uses of Project lands and waters or any departure from the requirements of any approved exhibits filed with the Commission. Following receipt of such approval from Forest Service, and a minimum of 60 days prior to initiating any such changes, Licensee shall file a report with the Commission describing the changes, the reasons for the changes, and showing the approval of Forest Service for such changes. Licensee shall file an exact copy of this report with Forest Service at the same time it is filed with the Commission. This condition does not relieve Licensee from the amendment or other requirements of Article 2 or Article 3 of this license.

Condition No. 5 - Maintenance of Improvements on or Affecting National Forest System Lands

Licensee shall maintain all its improvements and premises on NFS lands to standards of repair, orderliness, neatness, sanitation, and safety acceptable to Forest Service. Disposal of all materials will be at an approved existing location, except as otherwise agreed by Forest Service.

Condition No. 6 - Existing Claims

License shall be subject to all valid claims and existing rights of third parties. The United States is not liable to Licensee for the exercise of any such right or claim.

Condition No. 7 - Compliance with Regulations

Licensee shall comply with the regulations of the Department of Agriculture for activities on National Forest System lands, and all applicable Federal, State, county, and municipal laws, ordinances, or regulations in regards to the area or operations on or directly affecting National Forest System lands, to the extent those laws, ordinances or regulations are not preempted by federal law.

Condition No. 8 - Surrender of License or Transfer of Ownership

Prior to any surrender of this license, Licensee shall provide assurance acceptable to Forest Service that Licensee shall restore any project area directly affecting National Forest System lands to a condition satisfactory to Forest Service upon or after surrender of the license, as appropriate. To the extent restoration is required, Licensee shall prepare a restoration plan which shall identify the measures to be taken to restore such National Forest System lands and shall include adequate financial mechanisms to ensure performance of the restoration measures.

In the event of any transfer of the license or sale of the project, Licensee shall assure that, in a manner satisfactory to Forest Service, Licensee or transferee will provide for the costs of surrender and restoration. If deemed necessary by Forest Service to assist it in evaluating Licensee's proposal, Licensee shall conduct an analysis, using experts approved by Forest Service, to estimate the potential costs associated with surrender and restoration of any project area directly affecting National Forest System lands to Forest Service specifications. In addition, Forest Service may require Licensee to pay for an independent audit of the transferee to assist Forest Service in determining whether the transferee has the financial ability to fund the surrender and restoration work specified in the analysis.

Condition No. 9 - Protection of United States Property

Licensee, including any agents or employees of Licensee acting within the scope of their employment, shall exercise diligence in protecting from damage the land and property of the United States covered by and used in connection with this license.

Condition No. 10 – Indemnification

Licensee shall indemnify, defend, and hold the United States harmless for:

- any violations incurred under any laws and regulations applicable to, or
- judgments, claims, penalties, fees, or demands assessed against the United States caused by, or
- costs, damages, and expenses incurred by the United States caused by, or
- the releases or threatened release of any solid waste, hazardous substances, pollutant, contaminant, or oil in any form in the environment related to the construction, maintenance, or operation of the project works or of the works appurtenant or accessory thereto under the license.

Licensee's indemnification of the United States shall include any loss by personal injury, loss of life or damage to property caused by the construction, maintenance, or operation of the project works or of the works appurtenant or accessory thereto under the license. Indemnification shall include, but is not limited to, the value of resources damaged or destroyed; the costs of restoration, cleanup, or other mitigation; fire suppression or other types of abatement costs; third party claims and judgments; and all administrative, interest, and other legal costs. Upon surrender, transfer, or termination of the license, Licensee's obligation to indemnify and hold harmless the United States shall survive for all valid claims for actions that occurred prior to such surrender, transfer or termination.

Condition No. 11 - Damage to Land, Property, and Interests of the United States

Licensee has an affirmative duty to protect the land, property, and interests of the United States from damage arising from Licensee's construction, maintenance, or operation of the project works or the works appurtenant or accessory thereto under the license. Licensee's liability for fire and other damages to National Forest System lands shall be determined in accordance with the Federal Power Act and standard Form L-1 Articles 22 and 24.

Condition No. 12 - Risks and Hazards on National Forest System Lands

As part of the occupancy and use of the project area, Licensee has a continuing responsibility to reasonably identify and report all known or observed hazardous conditions on or directly affecting National Forest System lands within the project boundary that would affect the improvements, resources, or pose a risk of injury to individuals. Licensee will abate those conditions, except those caused by third parties or not related to the occupancy and use authorized by the License. Any non-emergency actions to abate such hazards on National Forest System lands shall be performed after consultation with Forest Service. In emergency situations, Licensee shall notify Forest Service of its actions as soon as possible, but not more than 48 hours, after such actions have been taken. Whether or not Forest Service is notified or provides consultation; Licensee shall remain solely responsible for all abatement measures performed. Other hazards should be reported to the appropriate agency as soon as possible.

Condition No. 13 – Access

Subject to the limitations set forth under the heading of "Access by the United States" in Condition No. 19 hereof, Forest Service reserves the right to use or permit others to use any part of the licensed area on NFS lands for any purpose, provided such use does not interfere with the rights and privileges authorized by this license or the Federal Power Act.

Condition No. 14 – Crossings

Licensee shall maintain suitable crossings as required by Forest Service for all roads and trails that intersect the right-of-way occupied by linear Project facilities (powerline, penstock, ditch, and pipeline).

Condition No. 15 - Surveys, Land Corners

Licensee shall avoid disturbance to all public land survey monuments, private property corners, and forest boundary markers. In the event that any such land markers or monuments on National Forest System lands are destroyed by an act or omission of Licensee, in connection with the use and/or occupancy authorized by this license, depending on the type of monument destroyed, Licensee shall reestablish or reference same in accordance with (1) the procedures outlined in the "Manual of Instructions for the Survey of the Public Land of the United States," (2) the specifications of the County Surveyor, or (3) the specifications of FS. Further, Licensee shall ensure that any such official survey records affected are amended as provided by law.

Condition No. 16 – Signs

Licensee shall consult with Forest Service prior to erecting signs related to safety issues on NFS lands covered by the license. Prior to Licensee erecting any other signs or advertising devices on NFS lands covered by the license, Licensee must obtain the approval of Forest Service as to location, design, size, color, and message. Licensee shall be responsible for maintaining all Licensee-erected signs to neat and presentable standards.

Condition No. 17 – Ground Disturbing Activities

If Licensee proposes ground-disturbing activities on or directly affecting NFS lands that were not specifically addressed in the Commission's NEPA processes, Licensee, in consultation with Forest Service, shall determine the scope of work and potential for Project-related effects, and whether additional information is required to proceed with the planned activity. Upon Forest Service request, Licensee shall enter into an agreement with Forest Service under which Licensee shall fund a reasonable portion of Forest Service staff time and expenses for staff activities related to the proposed activities.

Condition No. 18 – Use of National Forest System Roads for Project Access

Licensee shall obtain suitable authorization for all project access roads and NFS roads needed for Project access. The authorization shall require road maintenance and cost sharing in reconstruction commensurate with Licensee's use and project-related use. The authorization shall specify road maintenance and management standards that provide for traffic safety,

minimize erosion, and damage to natural resources and that are acceptable to Forest Service as appropriate.

Licensee shall pay Forest Service for its share of maintenance cost or perform maintenance or other agreed to services, as determined by Forest Service for all use of roads related to project operations, project-related public recreation, or related activities. The maintenance obligation of Licensee shall be proportionate to total use and commensurate with its use. Any maintenance to be performed by Licensee shall be authorized by and shall be performed in accordance with an approved maintenance plan and applicable Best Management Practices (BMPs). In the event a road requires maintenance, restoration, or reconstruction work to accommodate Licensee's needs, Licensee shall perform such work at its own expense after securing Forest Service authorization.

Licensee shall complete a condition survey and a proposed maintenance plan subject to Forest Service review and approval as appropriate once each year. The plan may take the format of a road maintenance agreement provided all the above conditions are met as well as the conditions set forth in the proposed agreement.

In addition, all NFS roads used as Project Access roads (PAR) and Right-of-Way access roads (ROW) shall have:

- Current condition survey.
- Be mapped at a scale to allow identification of specific routes or segments.
- Forest Service assigned road numbers are used for reference on the maps, tables, and in the field.
- GIS compatible files of GPS alignments of all roads used for Project access are provided to Forest Service.
- Adequate signage is installed and maintained by Licensee at each road or route, identifying the road by Forest Service road number.

Condition No. 19 - Access by the United States

The United States shall have unrestricted use of any road over which Licensee has control within the project area for all purposes deemed necessary and desirable in connection with the protection, administration, management, and utilization of Federal lands or resources. When needed for the protection, administration, and management of Federal lands or resources the United States shall have the right to extend rights and privileges for use of the right-of-way and road thereon to States and local subdivisions thereof, as well as to other users. The United States shall control such use so as not to unreasonably interfere with the safety or security uses, or cause Licensee to bear a share of costs disproportionate to Licensee’s use in comparison to the use of the road by others.

Condition No. 20 - Road Use

Licensee shall confine all vehicles being used for project purposes, including but not limited to administrative and transportation vehicles and construction and inspection equipment, to roads or specifically designed access routes, as identified in the Transportation System Management Plan (refer to Condition No. 51). Forest Service reserves the right to close any and all such routes

where damage is occurring to the soil or vegetation, or, if requested by Licensee, to require reconstruction/construction by Licensee to the extent needed to accommodate Licensee's use. Forest Service agrees to provide notice to Licensee and the Commission prior to road closures, except in an emergency, in which case notice will be provided as soon as practicable.

Condition No. 21 - Hazardous Materials Management Plan

Upon Commission approval, Licensee shall implement the Hazardous Materials Management Plan, filed separately with the Commission, by Yuba County Water Agency, on June 5, 2017 (FERC eLibrary Accession No. 20170605-5050), for locations on, or directly affecting, NFS lands.

Condition No. 22 - Pesticide-Use Restrictions on National Forest System Lands

Pesticides may not be used on NFS lands or in areas affecting NFS lands to control undesirable woody and herbaceous vegetation, aquatic plants, insects, rodents, non-native fish, etc., without the prior written approval of Forest Service. During the Annual Meeting described in Condition No. 1, Licensee shall submit a request for approval of planned uses of pesticides for the upcoming year. Licensee shall provide at a minimum the following information essential for review:

- Whether pesticide applications are essential for use on NFS lands;
- Specific locations of use;
- Specific herbicides proposed for use;
- Application rates;
- Dose and exposure rates; and
- Safety risk and timeframes for application.

Exceptions to this schedule may be allowed only when unexpected outbreaks of pests require control measures that were not anticipated at the time the report was submitted. In such an instance, an emergency request and approval may be made.

Any pesticide use that is deemed necessary to use on NFS lands within 500 feet of known locations of Western Pond Turtles, Sierra Nevada Yellow-Legged Frog, Foothill Yellow Legged Frog, or known locations of Forest Service special-status or culturally significant plant populations will be designed to avoid adverse effects to individuals and their habitats. Application of pesticides must be consistent with Forest Service riparian conservation objectives.

On NFS lands, Licensee shall only use those materials registered by the U.S. Environmental Protection Agency and consistent with those applied by Forest Service and approved through Forest Service review for the specific purpose planned. Licensee must strictly follow label instructions in the preparation and application of pesticides and disposal of excess materials and containers. Licensee may also submit Pesticide Use Proposal(s) with accompanying risk assessment and other Forest Service required documents to use pesticides on a regular basis for the term of the license as addressed further in Condition No. 40, Integrated Vegetation

Management Plan. Submission of this plan will not relieve Licensee of the responsibility of annual notification and review.

Condition No. 23 - Construction Inspections

Within 60 days of planned ground-disturbing activity on or affecting NFS lands, Licensee shall file with the Commission a 'Safety During Construction Plan' that identifies potential hazard areas and measures necessary to address public safety. Areas to consider include construction activities near public roads, trails, and recreation areas and facilities.

Licensee shall perform daily (or on a schedule otherwise agreed to by Forest Service in writing) inspections of Licensee's construction operations on NFS lands and Licensee adjoining property while construction is in progress. Licensee shall document these inspections (informal writing sufficient) and shall deliver such documentation to Forest Service on a schedule agreed to by Forest Service. The inspections must specifically include fire plan compliance, public safety, and environmental protection. Licensee shall act immediately to correct any items found to need correction.

A registered professional engineer or other qualified employee of the appropriate specialty shall regularly conduct construction inspections of structural improvements on a schedule approved by Forest Service.

Condition No. 24 - Unattended Construction Equipment

Licensee shall not place construction equipment on NFS lands prior to actual use or allow it to remain on NFS lands subsequent to actual use, except for a reasonable mobilization and demobilization period agreed to by Forest Service.

Condition No. 25 – Review of Improvements on National Forest System Lands

If during the term of the License the Commission determines that the project involves the use of any additional National Forest System (NFS) lands, outside the current project boundary, Licensee shall obtain a special use authorization from Forest Service for the occupancy and use of such additional NFS lands. Licensee shall obtain the executed authorization before beginning any ground-disturbing activities on NFS lands outside the FERC boundary covered by the special use authorization, and shall file that authorization with the Commission if the activity is related to the Project. Licensee shall be responsible for the costs of collecting all information directly related to the evaluation of the effects of the proposed occupancy and use that Forest Service needs in order to make a decision concerning issuance of a special use authorization. If, during the term of the License, Licensee proposes to perform any project construction work, Licensee shall obtain a construction temporary special use authorization from Forest Service before beginning any ground-disturbing activities on NFS lands outside the FERC boundary. The special use authorization will include appropriate vegetation management and erosion control measures as needed to protect NFS lands and resources. Licensee shall be responsible for the costs of collecting all information directly related to the evaluation of the effects of the proposed construction that Forest Service needs in order to make a decision concerning issuance of a construction temporary special use authorization. Licensee may commence ground-disturbing

activities authorized by the License and construction temporary special use authorization no sooner than 60 days following the date Licensee files Forest Service temporary special use authorization with the Commission, if the temporary special use authorization is related to Project activity, unless the Commission prescribes a different commencement schedule. In the event there is a conflict between any provisions of the License and Forest Service special use authorization, the special use authorization shall prevail to the extent that Forest Service, in consultation with the Commission, deems necessary to protect and utilize NFS resources.

Condition No. 26 - Modifications of 4(e) Conditions after Biological Opinion or Water Quality Certification

Forest Service reserves the right to modify these conditions, if necessary, to respond to any Final Biological Opinion issued for this Project by the National Marine Fisheries Service, United States Fish and Wildlife Service; or any Certification issued for this Project by the State Water Resources Control Board.

Condition No. 27 - Modifications of 4(e) Conditions in the Event of Anadromous Fish Re-introduction

Forest Service reserves the right to modify these conditions to respond to any reintroduction of Chinook salmon or steelhead, listed under the Endangered Species Act, to stream reaches that are on or may have effects on NFS lands within the Project area for this Commission-licensed facility.

PART II: RESOURCE CONDITIONS

Condition No. 28 – Environmental Awareness Training to Employees

Licensee shall, beginning in the first full calendar year of the new license term, annually perform employee environmental awareness training for hydro operation and maintenance staff, and shall also perform such training for new hydro operation and maintenance staff within 1 month of when a staff member is first assigned to the Project. The training shall include:

- providing and reviewing maps showing the locations of federal land and environmentally sensitive areas (e.g., locations of special-status species populations, areas with Limited Operating Procedures, cultural resources and protected habitats) known to occur within the FERC Project Boundary;
- describing the general contents of the license, including plans, as they pertain to operations and maintenance and the protection of environmental resources;
- providing guides for the identification of special-status species, non-native invasive plants (NNIP) and aquatic invasive species (AIS) that are known or suspected by Licensee to occur within the FERC Project Boundary;
- describing reporting procedures to Licensee's management if hydro operation and maintenance staff incidentally, during the performance of their work, observe new populations of special-status species, NNIP or AIS, or if they observe dangerous, injured, or dead wildlife.

The goal of the training shall be to familiarize Licensee's hydro operation and maintenance staff with special-status species, NNIP and AIS and sensitive areas known or suspected by Licensee to occur within the FERC Project Boundary, and procedures to avoid adverse effects. It is not the intent of this condition that Licensee's hydro operation and maintenance staff perform surveys or become experts (i.e., have more than a common knowledge) in the identification of special-status species, NNIP, AIS or historic properties.

Licensee shall direct its hydro operation maintenance staff to avoid disturbance to sensitive areas shown on the maps, and to advise all Licensee contractors to avoid these sensitive areas. If Licensee determines that disturbance of a sensitive area shown on the maps is unavoidable, License shall consult with the appropriate agencies to minimize adverse effects to the sensitive area. Licensee shall update the employee environmental awareness training material as needed.

Condition No. 29 – Special-Status Species

Before taking actions to construct new project features on NFS lands that may affect Forest Service special-status species or their critical habitat on NFS lands, Licensee shall prepare and submit a biological evaluation (BE) for Forest Service approval. The BE shall evaluate the potential impact of the action on the species or its habitat. Forest Service may require mitigation measures for the protection of the affected species on NFS lands.

The BE shall:

- Include procedures to minimize or avoid adverse effects to special-status species.
- Ensure project-related activities shall meet restrictions included in site management plans for special-status species.
- Develop implementation and effectiveness monitoring of measures taken or employed to reduce effects to special-status species.

Condition No. 30 - Annual Review of Special-Status Species Lists and Assessment of New Species on Federal Land

Licensee shall, beginning the first full calendar year after license issuance, in consultation with Forest Service annually review the current lists of all special-status species (species that are Federally Endangered or Threatened, Proposed Threatened or Endangered, Forest Service Sensitive, Forest Service Species of Conservation Concern, or Tahoe and Plumas National Forest Watch Lists, State Threatened or Endangered, State Species of Special Concern, and CDFW Fully Protected) that might occur on National Forest System lands, as appropriate, in the Project area that may be directly affected by Project operations. When a species is added to one or more of the lists, Forest Service, in consultation with Licensee shall determine if the species or un-surveyed suitable habitat for the species is likely to occur on such NFS lands, as appropriate. For such newly added species, if Forest Service determines that the species is likely to occur on such NFS lands, Licensee shall develop and implement a study plan in consultation with Forest Service to reasonably assess the effects of the project on the species. Licensee shall prepare a report on the study including objectives, methods, results, recommended resource measures where appropriate, and a schedule of implementation, and shall provide a draft of the final report to Forest Service for review and approval. Licensee shall file the report, including evidence of consultation, with the Commission and shall implement those resource management measures required by the Commission.

If new occurrences of Forest Service special-status plant or wildlife species as defined above are detected prior to or during ongoing construction, operation, or maintenance of the Project or during Project operations, Licensee shall immediately notify Forest Service. If Forest Service determines that the Project-related activities are adversely affecting Forest Service Sensitive, Forest Service Species of Conservation Concern or watch list species, Licensee shall, in consultation with Forest Service, develop and implement appropriate protection measures

If new occurrences of state or federally listed or proposed threatened or endangered species are detected prior to or during ongoing construction, operation, or maintenance of the Project or during Project operations, Licensee shall immediately notify Forest Service and the relevant Service Agency (United States Fish and Wildlife Service or National Marine Fisheries Service or CDFW) for consultation or conference in accordance with the Endangered Species Act. If state listed or fully protected species are affected, CDFW shall be notified.

Condition No. 31 - Water Year Types for the Middle Yuba River and Oregon Creek

Beginning within the first 90 days of the new license term, Licensee shall in each year in each of the months of February, March, April, May and October determine the applicable water year type described in Table 1 of this condition. Licensee shall use this determination to implement articles and conditions of the license that are dependent on water year type and that concern flows in the Middle Yuba River downstream of Our House Diversion Dam and in Oregon Creek downstream of Log Cabin Diversion Dam. Water year types for these articles and conditions shall be defined as listed in Table 1 of this condition.

Table 1. Water Year types for the Yuba River Development Project in the Middle Yuba River downstream of Our House Diversion Dam and in Oregon Creek downstream of Log Cabin Diversion Dam.

Water Year Type	DWR Forecast of Total Unimpaired Runoff in the Yuba River at Smartsville in Thousand Acre-Feet or DWR Full Natural Flow Near Smartsville for the Water Year in Thousand Acre-Feet[1]
Wet	Greater than 3,240
Above Normal	2,191 to 3,240
Below Normal	1,461 to 2,190
Dry	901 to 1,460
Critically Dry	Equal to or Less than 900

[1] DWR rounds the Bulletin 120 forecast, which this condition relies on to establish water year types in February, March, April and May, to the nearest 1,000 acre-feet. DWR rounds its Full Natural Flow calculation, which this condition relies on to establish water year types in October, to the nearest acre-foot, and Licensee will round DWR's Full Natural Flow to the nearest 1,000 acre-feet.

In each of the months of February, March, April and May, the water year type shall be based on California Department of Water Resources (DWR) water year forecast of unimpaired runoff in the Yuba River at Smartsville as set forth in DWR's Bulletin 120 entitled "Water Year Conditions in California." DWR's forecast published in February, March and April shall apply from the 16th day of that month through the 15th day of the next month. From May 16 through October 15, the water year type shall be based on DWR's forecast published in May.

From October 16 through February 15 of the following year, the water year type shall be based on the sum of DWR's monthly (i.e., not daily) full natural flow for the full water year for the Yuba River near Smartsville, as made available by DWR on the California Data Exchange Center (CDEC) in the folder named "FNF Sum." Currently these data are available at: http://cdec.water.ca.gov/cgi-progs/stages/FNFSUM. If DWR does not make the full natural flow for the full water year available until after October 15 but prior to or on October 31, from 3 days after the date the full natural flow is made available until February 15 of the following year, the water year type shall be based on the sum of DWR's monthly full natural flow for the full water year as made available. If DWR does not make available the final full natural flow by October 31, the water year type from November 1 through February 15 of the following year shall be based on DWR's May Bulletin 120.

Condition No. 32 - Minimum Streamflows for the Middle Yuba River and Oregon Creek

Licensee shall meet the minimum streamflow requirements for the Middle Yuba River downstream of Our House Diversion Dam and for Oregon Creek downstream of Log Cabin Diversion Dam that are shown in Table 1 of this condition. Licensee shall record streamflow at

all of the gages listed in this table, as required by USGS (Article 8 of FERC's Form L-5, Standard Articles).

Minimum streamflows shall be measured in cubic feet per second (cfs) once every 15 minutes at the compliance gage, and these 15-minute measurements averaged into hourly measurements that will be recorded and reported to USGS and FERC.

Minimum streamflows may be temporarily modified as follows:

- For short periods and upon consultation with and approval by the Forest Service, USFWS, CDFW and SWRCB. Licensee shall provide notification to the Commission prior to implementing such modifications.
- Due to an emergency. An emergency is defined as an outage due to an event that is reasonably out of the control of Licensee and requires Licensee to take immediate action, either unilaterally or under instruction of law enforcement, emergency services, California ISO or other regulatory agency staff, including actions to prevent the imminent loss of human life or damage to property. An emergency may include, but is not limited to: natural events such as landslides, storms, or wildfires; vandalism; malfunction or failure of transmission lines or Project works; or other public safety incidents. If Licensee temporarily modifies the requirements of this condition, Licensee shall make all reasonable efforts to promptly resume performance of the requirements, and shall notify the Forest Service, USFWS, CDFW and the SWRCB within 48 hours of the start of the modification. Licensee shall provide notification to the Commission as soon as possible but no later than 10 days after such incident.
- For one 4-hour period each calendar year at each dam to perform required testing of the low-level outlet (i.e., sluiceway) gates. Testing shall be performed when the dam is spilling and include rapidly fully opening and then fully closing the gate. To the extent practicable, Licensee shall coordinate the low-level outlet gate testing with other openings of the low-level outlet gate that may occur for Licensee's compliance with other conditions of the license. Licensee may forego testing of the valves in years when hydraulic conditions (e.g., sufficient spills) are not present.

Except as otherwise provided, Licensee shall implement the minimum streamflows shown in Table 1 of this condition beginning in the first 90 days of the new license term unless a facility modification or construction is necessary. Changes between minimum streamflow values may be made with one adjustment to the controlling valve (i.e., ramping from one minimum flow to another minimum flow is not required).

Where a facility must be modified or constructed to allow compliance with required minimum streamflows, including flow measurement facilities, then, except as otherwise provided, Licensee shall submit applications for permits to modify or construct the facility as soon as reasonably practicable but no later than within the first 2 years of the new license term, and Licensee will complete the work as soon as reasonably practicable but no later than within 2 years after receiving all required permits and approvals for the work. During the period before facility modifications or construction are completed, and within the first 90 days of the new license term,

Licensee shall make a good faith effort to provide the specified minimum streamflows within the reasonable capabilities of the existing facilities.

Table 1. Minimum streamflows in cubic feet per second (cfs) in the Middle Yuba River downstream of Our House Diversion Dam and in Oregon Creek downstream of Log Cabin Diversion Dam by month and Water Year Type [see Condition No. 31].

Month	Wet Water Year	Above Normal Water Year	Below Normal Water Year	Dry Water Year	Critically Dry Water Year
MIDDLE YUBA RIVER - BELOW OUR HOUSE DIVERSION DAM (COMPLIANCE POINT: USGS STREAMFLOW GAGE 11408880)					
October 1 - 30	60*	60*	55*	50*	40*
November 1-30	60*	60*	55*	50*	40*
December 1 - 31	70*	60*	55*	50*	40*
January 1 - 31	90*	75*	70*	50*	40*
February 1- 29	90*	75*	70*	50*	40*
March 1 - 31	100*	90*	80*	55*	45*
April 1 - 30	120*	100*	90*	70*	60*
May 1- 31	120*	100*	90*	70*	60*
June 1 - 30	120*	100*	90*	70*	60*
July 1 - 31	100*	80*	70*	60*	45*
August 1 - 31	80*	70*	60*	50*	45*
September 1- 30	70*	60*	55*	50*	45*
OREGON CREEK - BELOW LOG CABIN DIVERSION DAM (COMPLIANCE POINT: USGS STREAMFLOW GAGE 11409400)					
October 1 - 30	8*	8*	6*	6*	6*
November 1-30	17*	15*	15*	10*	6*
December 1 - 31	17*	15*	15*	10*	6*
January 1 - 31	17*	15*	15*	10*	6*
February 1- 29	24*	19*	18*	12*	12*
March 1 - 31	30*	30*	18*	12*	12*
April 1 - 30	43*	43*	27*	18*	18*
May 1- 31	43*	43*	27*	18*	18*
June 1 - 30	43*	43*	27*	18*	18*
July 1 - 31	25*	20*	15*	10*	6*
August 1 - 31	13*	10*	8*	6*	6*
September 1- 30	13*	10*	8*	6*	6*

* Or stream inflow into the impoundment if stream inflow is less.

Condition No. 33 - Control Project Spills at Our House Diversion Dam

In non-tunnel closure years as described in Condition No. 35, Licensee shall, from April 1 through July 31 in Below Normal, Dry, and Critically Dry water years (WY) and from May 1 through July 31 in Wet and Above Normal WYs, as described in Condition No. 31, implement the spill reduction schedule described in this condition at Our House Diversion Dam. The spill reduction shall be performed by adjusting the opening of the Our House Diversion Dam low-level (5-foot diameter) outlet valve. "Spill flow" for the purpose of this condition shall be determined based on flow measurements at USGS streamflow gage 11408880 minus the required minimum streamflow at that time, described in Condition No. 32. Specifically, Licensee shall follow these spill reduction steps:

Reductions from Spills greater than 600 cfs

Step 1. When the previous day's mean daily flow below Our House Diversion Dam is greater than 600 cfs plus the required minimum streamflow and the mean hourly flow below the dam is less than 600 cfs plus the required minimum streamflow,

by approximately noon Licensee shall fully open Our House Diversion Dam's low-level outlet valve.

Step 2. After a minimum of 48 hours with the low-level outlet valve fully open, Licensee shall reduce flows at a target rate of 100 cfs, but no less than 90 cfs and no greater than 110 cfs, every 48 hours using the low-level outlet valve until a mean daily flow of about 300 cfs plus the required minimum streamflow is achieved. Flow reductions shall be made relative to the mean hourly flow during the preceding hour at the time of the valve adjustment.

Step 3. After flow through the low-level outlet valve has been reduced below a mean daily flow of 300 cfs plus the required minimum streamflow, Licensee shall reduce flows at a target rate of 100 cfs, but no less than 90 cfs and no greater than 110 cfs, every 72 hours using the low-level outlet valve until a mean daily flow of less than 200 cfs plus the required minimum streamflow is achieved. Flow reductions shall be made relative to the mean hourly flow during the preceding hour at the time of the valve adjustment.

Step 4. After flow through the low-level outlet valve has been reduced below a mean daily flow of 200 cfs plus the required minimum streamflow, Licensee shall reduce flows at a target rate of 50 cfs, but no less than 45 cfs and no greater than 55 cfs, every 72 hours using the low-level outlet valve until the low-level outlet valve is fully closed. Flow reductions shall be made relative to the mean hourly flow during the preceding hour at the time of the valve adjustment.

Table 1 summarizes the spill reductions in Steps 1 through 4.

Table 1. Summary of Our House Diversion Dam spill reductions from approximately 600 cfs plus the required minimum streamflow.

Mean Daily Flow Measurement at USGS Gage 11408880	Frequency of Adjusting Low-Level Outlet Valve	Target Flow Reduction
600 - 300 cfs plus Required Minimum Streamflow	48 hours	100 cfs, but no less than 90 cfs and no greater than 110 cfs
299 - 200 cfs plus Required Minimum Streamflow	72 hours	100 cfs, but no less than 90 cfs and no greater than 110 cfs
199 – 0 cfs plus Required Minimum Streamflow	72 hours	50 cfs, but no less than 45 cfs and no greater than 55 cfs

Reductions from Spills of between 599 and 200 cfs

- When Licensee has not implemented Table 1 of this condition, and mean daily flows below the dam are less than 600 cfs plus the required minimum streamflow but greater than 200 cfs plus the required minimum streamflow and the flow appears to be receding, the next day Licensee shall open the low-level outlet valve to the point where water is no longer spilling over the dam or a target rate of 100 cfs, but no less than 90 cfs and no greater than 110 cfs, less than the previous day's spill, whichever is greater. Subsequent low-level outlet valve adjustments shall occur at the frequency and magnitude shown in Table 1 of this condition. Flow reductions shall be made relative to the mean hourly flow during the preceding hour at the time of the valve adjustment.

The Dam Pool Elevation is Less than the Lohman Ridge Diversion Tunnel Invert Elevation

- If, during the time Licensee is implementing Table 1 of this condition, the dam pool elevation is below the invert elevation of the Lohman Ridge Tunnel (2,015 ft), Licensee shall adjust the low-level outlet valve opening a minimum of once daily so that the combined outflow of the low-level outlet valve plus the required minimum streamflow matches Our House Diversion Dam impoundment inflow. Any time that the fish valve can be used to release the total inflow to the impoundment, the Licensee shall close the low-level outlet and make all releases through the fish valve. If the pool inflow increases such that the water level increases above the elevation of the invert, the Licensee shall follow the flow reduction steps specified in Table 1. Spill cessation shall be considered complete once outflows below Our Diversion Dam are less than or equal to the required minimum instream flow.

Inflow Increases and Spill Re-initiates

- If, during the time Licensee is implementing Table 1 of this condition, inflow into the impoundment increases such that mean daily flow below the dam is more than 600 cfs plus the required minimum streamflow, Licensee shall fully close the low-level outlet valve until such time as Table 1 of this condition can commence again.
- If, during the time Licensee is implementing Table 1 of this condition inflow into the impoundment re-initiates spill over the dam of less than 600 cfs mean daily flow, Licensee shall open the low-level outlet valve to eliminate spill at the dam. Once inflow to the impoundment is receding, subsequent changes to the low-level outlet valve opening shall occur at a frequency and magnitude commensurate with Table 1 of this condition, and the procedure of stepwise closing of the valve as described above for "Reductions from Spills of between 599 and 200 cfs" shall commence.

Inflow Increases and Spill Does Not Re-initiate

- If, during the time Licensee is implementing Table 1 of this condition, inflow into the impoundment increases and does not cause spill over the dam, Licensee shall maintain the current opening of the low-level outlet valve until flows either cause spill or decrease to a level approximately equal to that occurring when the flow increase began. Once inflow to the impoundment is receding, subsequent changes to the low-level outlet valve opening shall occur at a frequency and magnitude commensurate with Table 1 of this condition, and the procedure of stepwise closing of the valve as described above for "Reductions from Spills of between 599 and 200 cfs" shall commence.

The Our House Diversion Dam fish release valve and the Lohman Ridge Diversion Tunnel may remain open throughout the above procedures.

Compliance and Reporting

For the purposes of this condition: 1) compliance for this condition shall be adjustments to the low-level outlet opening to achieve the target flow reductions within the specified range described above and specified in Table 1; 2) opening and closing low-level outlet valve between the valve settings described above may be made in one valve adjustment (i.e., ramping between settings is not required); and 3) the low-level outlet valve adjustments described in Table 1 of

this condition shall be made by approximately noon each day, providing there is safe access to the site.

This condition is subject to temporary modification if required for repairs to the dam or associated equipment, by equipment malfunction, as directed by law enforcement authorities, or in emergencies. An emergency is defined as an outage due to an event that is reasonably out of the control of Licensee and requires Licensee to take immediate action, either unilaterally or under instruction of law enforcement, emergency services, or other regulatory agency staff, including actions to prevent or reduce the imminent loss of human life or damage to property. An emergency may include, but is not limited to: natural events such as landslides, storms, or wildfires; vandalism; malfunction or failure of Project works; or other public safety incidents. If Licensee temporarily modifies the requirements of this condition, Licensee shall make all reasonable efforts to promptly resume performance of the requirements and shall notify the Forest Service, SWRCB, and CDFW within 48 hours of the modification. Licensee shall provide notification to the Commission as soon as possible but no later than 10 days after such incident.

Licensee shall commence the dam spill reduction schedules in this condition within the first 90 days of the new license term unless facility modifications or construction is required. Where facilities must be modified or constructed to allow compliance with the required spill reduction schedule, including flow measurement facilities, except as otherwise provided, Licensee shall submit applications for permits to modify or construct the facilities as soon as reasonably practicable but no later than within the first 2 years of the new license term, and will complete the work as soon as reasonably practicable but no later than 2 years after receiving all required permits and approvals for the work. During the period before facility modifications or construction activities are completed, and starting within the first 90 days of the new license term, Licensee shall make a good faith effort to provide the specified spill reduction schedules within the reasonable capabilities of the existing facilities.

If Licensee makes a valve adjustment in compliance with this condition in the previous calendar year, prior to the Ecological Group's April meeting described in Condition No. 2, in the next calendar year, Licensee shall file with FERC and make available to the Forest Service, SWRCB and CDFW: 1) a plot showing for each valve adjustment period during the previous calendar year the mean daily flow into the Our House Diversion Dam impoundment (i.e., sum of USGS gage 11408870 [Lohman Ridge tunnel flow] and USGS gage 11408880 [flow downstream of Our House Dam]) and the mean daily flow downstream of Our House Diversion Dam (i.e., USGS gage 11408880); and 2) for each valve adjustment during the previous calendar year, the date and time the valve adjustment was made and the flow at USGS gage 11408880 immediately prior to and immediately after the valve adjustment.

Condition No. 34 - Control Project Spills at Log Cabin Diversion Dam

Licensee shall, from April 1 through July 31 of each year implement the spill reduction schedule described in this condition at Log Cabin Diversion Dam. The spill reduction shall be performed by adjusting the opening of the Log Cabin Diversion Dam low-level (5-foot diameter) outlet valve. "Spill Flow" for the purpose of this condition shall be determined based on flow measurements at USGS streamflow gage 11409400 (flow in Oregon Creek below Log Cabin

Dam) minus the required minimum streamflow at that time, described in Condition No. 32. The purpose of this condition is to reduce spills from approximately 100 cfs to the minimum flow requirement. Specifically, Licensee shall follow the spill reduction steps:

Reductions from Spills between Approximately 100 cfs and 50 cfs

Step 1. Licensee will implement Step 1 of the schedule when daily flows appear to be receding and the Licensee anticipates that a Spill Flow on the first day of the reduction schedule will be between 100 cfs and 50 cfs. Licensee shall open Log Cabin Diversion Dam's low-level outlet valve until spill over the dam is eliminated.

Step 2. After a minimum of 96 hours, Licensee shall reduce flows at a rate of approximately 20 cfs every 96 hours using the low-level outlet valve until flows below the dam are equal to the required minimum flow. Flow reductions shall be made relative to the mean hourly flow during the preceding hour at the time of the valve adjustment.

Table 1 summarizes the spill reductions in Steps 1 and 2.

Table 1. Summary of Log Cabin Diversion Dam spill reductions from approximately 100 cfs plus the required minimum streamflow.

Mean Daily Flow Measurement at USGS Gage 11409400	Frequency of Adjusting Low-Level Outlet Valve	Target Mean Daily flow Reduction
100 – 0 cfs plus Required Minimum Streamflow	96 hours	20 cfs

The Dam Pool Elevation is Less than the Camptonville Diversion Tunnel Invert Elevation

- If, during the time Licensee is implementing Table 1 of this condition, the dam pool elevation is below the invert elevation of the Camptonville Tunnel (1,952 ft), Licensee shall adjust the low-level outlet valve opening a minimum of once daily so that the combined outflow of the low-level outlet valve plus the required minimum streamflow approximately matches Log Cabin Diversion Dam impoundment inflow. If required outflows are less than or equal to the capacity of the minimum streamflow valve, the low level outlet valve may be closed and all releases made through the minimum streamflow valve. Spill cessation shall be considered complete once outflows below Log Cabin Diversion Dam are less than or equal to the required minimum instream flow.

Inflow Increases and Spill Re-initiates

- If, during the time Licensee is implementing Table 1 of this condition, inflow into the impoundment increases such that mean hourly flow below the dam is more than 100 cfs plus the required minimum streamflow during the preceding hour, and water is spilling over the dam, Licensee shall fully close the low-level outlet valve until such time as Table 1 of this condition can commence again.
- If, during the time Licensee is implementing Table 1 of this condition, inflow into the impoundment increases such that mean hourly flow below the dam is less than 100 cfs plus the required minimum streamflow during the preceding hour, and water is spilling over the dam, Licensee shall open the low-level outlet valve to eliminate spill at the dam. Subsequent changes to the low-level outlet valve opening shall occur at a frequency and magnitude commensurate with Table 1 of this condition. If flows

through the low-level outlet value are increased by more than 20 cfs from the previous day, the count-of-hours within the 96-hour adjustment period is reset; otherwise the count-of-hours within the 96-hour adjustment period is maintained.

Inflow Increases and Spill Does Not Re-initiate

- If, during the time Licensee is implementing Table 1 of this condition, a 20 cfs step down in flow would cause additional spill below the diversion dam, the Licensee shall maintain the current low-level outlet valve setting until a 20 cfs step down in flow would not cause additional spill below the dam.

The Log Cabin Diversion Dam fish release valve, the Lohman Ridge Diversion Tunnel and Camptonville Diversion Tunnel may remain open throughout the above procedures.

Compliance and Reporting

For the purposes of this condition: 1) compliance for this condition shall be adjustments to the low-level outlet opening to achieve the target flow reductions within the specified range described above and specified in Table 1; 2) opening and closing low-level outlet valve between the valve settings described above may be made in one valve adjustment (i.e., ramping between settings is not required); and 3) the low-level outlet valve adjustments described in Table 1 of this condition shall be made by approximately noon each day, provided there is safe access to the site.

This condition is subject to temporary modification if required for repairs to the dam or associated equipment, by equipment malfunction, as directed by law enforcement authorities, or in emergencies. An emergency is defined as an outage due to an event that is reasonably out of the control of Licensee and requires Licensee to take immediate action, either unilaterally or under instruction of law enforcement, emergency services, or other regulatory agency staff, including actions to prevent or reduce the imminent loss of human life or damage to property. An emergency may include, but is not limited to: natural events such as landslides, storms, or wildfires; vandalism; malfunction or failure of Project works; or other public safety incidents. If Licensee temporarily modifies the requirements of this condition, Licensee shall make all reasonable efforts to promptly resume performance of the requirements and shall notify the Forest Service, SWRCB, and CDFW within 48 hours of the modification. Licensee shall provide notification to the Commission as soon as possible but no later than 10 days after such incident.

Licensee shall commence the dam spill reduction schedules in this condition within the first 90 days of the new license term unless facility modifications or construction is required. Where facilities must be modified or constructed to allow compliance with the required spill reduction schedule, including flow measurement facilities, except as otherwise provided, Licensee shall submit applications for permits to modify or construct the facilities as soon as reasonably practicable but no later than within the first 2 years of the new license term, and will complete the work as soon as reasonably practicable but no later than 2 years after receiving all required permits and approvals for the work. During the period before facility modifications or construction activities are completed, and starting within the first 90 days of the new license

term, Licensee shall make a good faith effort to provide the specified spill reduction schedules within the reasonable capabilities of the existing facilities.

If Licensee makes a valve adjustment in compliance with this condition in the previous calendar year, prior to the Ecological Group's April meeting described in Condition No. 2, in the next calendar year, Licensee shall file with FERC and make available to the Forest Service, SWRCB and CDFW: 1) a plot showing for each valve adjustment period during the previous calendar year the mean daily flow into the Log Cabin Diversion Dam (i.e., sum of USGS gage 11409350 [Camptonville Diversion tunnel flows] plus USGS gage 11409400 [flow in Oregon Creek below Log Cabin Dam] minus USGS gage 11408870 [Lohman Ridge tunnel flow]) and the mean daily flow at USGS gage 11409400 (flow in Oregon Creek below Log Cabin Dam); and 2) for each valve adjustment during the previous calendar year, the date and time the valve adjustment was made and the flow at USGS gage 11409400 (flow in Oregon Creek below Log Cabin Dam) immediately prior to and immediately after the valve adjustment.

Condition No. 35 - Periodically Close Lohman Ridge Diversion Tunnel

License shall, beginning in the first full calendar year after license issuance, fully close the Lohman Ridge Diversion Tunnel as described in this condition.

Spring and Summer Tunnel Closures
If the end-of-March New Bullards Bar Reservoir storage is 775,000 acre-feet or greater and the subsequent April is a Wet Water Year, as defined in Condition No. 31, Licensee shall close the Lohman Ridge Diversion Tunnel within 2 business days of when the California Department of Water Resources publishes that April Bulletin 120. The Lohman Ridge Diversion Tunnel shall remain fully closed through September 30 of that calendar year. Concurrent with the Lohman Ridge Diversion Tunnel closure, Licensee shall open the low-level outlet and fish release valve at Log Cabin Diversion Dam, but Licensee may leave the Camptonville Diversion Tunnel fully open.

Fall Tunnel Closures
If May is a Wet, Above Normal or Below Normal water year, as defined in Condition No. 31, and the subsequent end-of-September New Bullards Bar Reservoir storage is 600,000 acre-feet or greater, Licensee shall fully close the Lohman Ridge Diversion Tunnel from October 1 through December 31 of that calendar year.

This condition is subject to temporary modification if required for repairs to the dam or associated equipment, by equipment malfunction, as directed by law enforcement authorities, or in emergencies. An emergency is defined as an outage due to an event that is reasonably out of the control of Licensee and requires Licensee to take immediate action, either unilaterally or under instruction of law enforcement, emergency services, or other regulatory agency staff, including actions to prevent or reduce the imminent loss of human life or damage to property. An emergency may include, but is not limited to: natural events such as landslides, storms, or wildfires; vandalism; malfunction or failure of Project works; or other public safety incidents. If Licensee temporarily modifies the requirements of this condition, Licensee shall make all reasonable efforts to promptly resume performance of the requirements and shall notify the Forest Service, SWRCB, and CDFW within 48 hours of the modification.

For fall tunnel closures, Licensee shall make a good faith effort to notify the Forest Service and SWRCB at least 5 business days prior to any anticipated tunnel closure. For spring tunnel closures, Licensee shall make a good faith effort to notify the Forest Service and SWRCB at least 1 business day prior (5 days prior, if tunnel closure appears likely based on the March California Department of Water Resources Bulletin 120 forecast and New Bullards Bar Reservoir elevation) to any anticipated tunnel closure. Coincident with these notifications, Licensee shall post a notice at Our House Diversion Dam and New Colgate Powerhouse public river access points, describing potential flow increases, and coordinate with the Forest Service to post the same notice at other recreation facilities and public river access points downstream of Our House Diversion Dam on the Middle Yuba River. Licensee shall provide notification to the Commission as soon as possible but no later than 10 days after such tunnel closures.

Where facilities must be modified or constructed to allow compliance with the required tunnel closures, except as otherwise provided, Licensee shall submit applications for permits to modify or construct the facilities as soon as reasonably practicable but no later than within the first 2 years of the new license term, and will complete the work as soon as reasonably practicable but no later than 2 years after receiving all required permits and approvals for the work. During the period before facility modifications or construction activities are completed, Licensee shall make a good faith effort to provide the specified tunnel closures in this condition within the reasonable capabilities of the existing facilities.

Licensee shall notify the Commission within 30 days of closing the Lohman Ridge Diversion Tunnel in compliance with this condition. The notification will include the date and time the tunnel was closed, and Licensee shall make the notice available to Forest Service and SWRCB.

Condition No. 36 – Streamflow and Reservoir Level Compliance Monitoring Plan

Upon Commission approval, Licensee shall implement the Streamflow and Reservoir Level Compliance Monitoring Plan, filed separately with the Commission, by Yuba County Water Agency, on June 5, 2017 (FERC eLibrary Accession No. 20170605-5050), for stream flow gages on NFS lands.

Condition No. 37 – Our House and Log Cabin Diversion Dams Sediment Management Plan

Upon Commission approval, Licensee shall implement the Our House and Log Cabin Diversion Dams Sediment Management Plan, filed separately with the Commission, by Yuba County Water Agency, on July 27, 2018 (FERC eLibrary Accession No. 20180727-5007 for locations, on, or directly affecting, NFS lands.

Condition No. 38 – Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan

Upon Commission approval, Licensee shall implement the Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Management Plan, filed separately with the Commission, by Yuba County Water Agency, on April 12, 2018 (FERC eLibrary Accession No. 20180412-5129) for locations, on or directly affecting, NFS lands.

Condition No. 39 – Aquatic Invasive Species Management Plan

Upon Commission approval, Licensee shall implement the Aquatic Invasive Species Management Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175), for locations on, or directly affecting, NFS lands.

Condition No. 40 – Integrated Vegetation Management Plan

Upon the Commission approval, Licensee shall implement the Integrated Vegetation Management Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175), for locations on, or directly affecting, NFS lands.

Condition No. 41 - Bald Eagle and American Peregrine Falcon Management Plan

Upon Commission approval, Licensee shall implement the Bald Eagle and American Peregrine Falcon Management Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175), for locations on, or directly affecting, NFS lands.

Condition No. 42 - Bat Management Plan

Upon Commission approval, Licensee shall implement the Bat Management Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175), for locations on, or directly affecting, NFS lands.

Condition No. 43 – Upper Yuba River Aquatic Monitoring Plan

Upon Commission approval, Licensee shall implement the Upper Yuba River Aquatic Monitoring Plan, filed separately with the Commission, by Yuba County Water Agency, on June 5, 2017 (FERC eLibrary Accession No. 20170605-5050), for locations on, or directly affecting, NFS lands.

Condition No. 44 – Water Temperature Monitoring Plan

Upon Commission approval, Licensee shall implement the Water Temperature Monitoring Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175), for locations on, or directly affecting, NFS lands.

Condition No. 45 – Water Quality Monitoring Plan

Upon Commission approval, Licensee shall implement the Water Quality Monitoring Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175), for locations on, or directly affecting, NFS lands.

Condition No. 46 – Recreation Facilities Plan

Upon Commission approval, Licensee shall implement the Recreation Facilities Plan, filed separately with the Commission, by Yuba County Water Agency, on September 19, 2018 (FERC eLibrary Accession No. 20180919-5141), for locations on, or directly affecting, NFS lands.

Condition No. 47 – Recreation Flow Information

Licensee shall, beginning as soon as reasonably feasible but not later than one year after license issuance, make the stream flow and reservoir elevation information identified in Table 1 of this condition available to the public.

Table 1. Stream flow and reservoir elevation information that the Licensee shall make available to the public.

Stream/Location	Information to be Provided	Current Gage Identification[1]	
		USGS	CDEC
North Yuba River Upstream of New Bullards Bar Reservoir	Streamflow	11413100	NYS
North Yuba River New Bullards Bar Reservoir	Reservoir Level	11413515	BUL
Middle Yuba River Lohman Ridge Diversion Tunnel	Tunnel Flow	11408870	To be Assigned
Middle Yuba River Downstream of Our House Diversion Dam[2]	Streamflow	11408880	OHR
Oregon Creek Downstream of Log Cabin Diversion Dam[2]	Streamflow	11409400	LCB

[1] Refer to Condition No. 36 for a description of each gage.

[2] Gage required to document compliance with license flow requirements.

If the gage is required to document compliance with license flow requirements and is not USGS rated above the license compliance flow, Licensee shall make a good faith effort to estimate the flow above the USGS rating. If the gage is not required to document compliance with the license conditions, Licensee shall provide the information up to the rating of the gage described in Condition No. 36, and make a good faith effort to estimate the flow above the USGS rating. The flow information shall be made available to the public on a real-time basis via the Internet; the publication of the information may be accomplished through a third party, such as USGS or the California Data Exchange Center (CDEC). The preference is that data shall be reported in 15-minute intervals; however, data that are reported no less than in hourly intervals is acceptable. It is understood this information will be provisional and subject to change because it will not have undergone a quality assurance or quality control review before it is made available to the public.

Condition No. 48 – Whitewater Boating Below Our House Diversion Dam

Licensee shall, beginning in the first full calendar year after license issuance and each year thereafter, provide on weekends between October 1 and March 31 a whitewater boating flow from at least 10:00 AM to 5:00 PM (Pacific Time Zone) of between 600 cfs and 2,000 cfs, as

measured at the USGS Streamflow Gage 11408880, on the schedule identified in Table 1 of this condition.

Table 1. Whitewater boating flows Licensee shall provide.

Water Year Type [see Condition No. 31]			**Number of Weekend Whitewater Boating Days from October 1 through March 31**
DWR's Full Natural Flow at Smartsville for the Full Water Year that Ended on September 30	**DWR's Bulletin 120 February Forecast**	**DWR's Bulletin 120 March Forecast**	
Wet, Above Normal, Below Normal or Dry	Any Water Year Type	Wet	8
Wet, Above Normal, Below Normal or Dry	Any Water Year Type	Above Normal	6
Wet, Above Normal, Below Normal or Dry	Any Water Year Type	Below Normal, Dry, or Critically Dry	4
Critically Dry	Wet or Above Normal	Any Water Year Type	2
Critically Dry	Below Normal, Dry, or Critically Dry	Any Water Year Type	0

If the conditions in the first three columns in the above table are met, then the number of weekend whitewater boating flow days to be provided by Licensee shall be the number shown in the last column, to the extent that inflow conditions to Our House Reservoir provide the Licensee the ability to meet the listed number of days (i.e. inflow is between 600 cfs and 2,000 cfs from 10 AM to 5 PM [Pacific Time Zone], on weekend days). The whitewater boating flow may occur due to natural conditions or manipulation of Project facilities by Licensee.

The selection of which weekend days to provide the whitewater boating flow shall be at Licensee's sole discretion. However, if Licensee intends to manipulate Project facilities (e.g., partially close the Lohman Ridge Diversion Tunnel) for the purpose of providing a required whitewater boating flow day, prior to 5:00 PM (Pacific Time Zone) on the previous day Licensee shall post to a publically-available website and notify the Forest Service of Licensee's intention to provide a whitewater boating flow on the next day.

For the purpose of compliance with this condition, a whitewater boating flow day will be any weekend day when mean hourly flow as measured at the USGS Streamflow Gage 11408880 is between 600 cfs and 2,000 cfs from 10:00 AM to 5:00 PM (Pacific Time Zone).

By May 1 of each year, Licensee will file with the Commission a letter that documents Licensee's compliance with this condition for the previous October through March period. The letter will state: 1) the number of whitewater boating flow days required by this condition during the previous October through March period; 2) the dates on which the required whitewater boating flow days occurred; and 3) the mean hourly flows as measured at USGS Streamflow Gage 11408880 from 10:00 AM through 5:00 PM (Pacific Time Zone), on each of the dates.

If the Lohman Ridge Diversion Tunnel intake or other Project facilities must be modified to reasonably provide the whitewater boating flow, then, except as otherwise provided, Licensee shall submit applications for permits to modify the facility(ies) as soon as reasonably practicable but no later than within the first 2 years of the new license term, and Licensee will complete the work as soon as reasonably practicable but no later than within 2 years after receiving all required permits and approvals for the work. During the period before facility(ies) modification is complete, and beginning within the first 90 days of the new license term, Licensee shall make

a good faith effort to provide the specified whitewater boating flow days within the capabilities of the existing facility(ies).

The condition is subject to temporary modification if required by equipment malfunction, as directed by law enforcement authorities, or in emergencies. An emergency is defined as an outage due to an event that is reasonably out of the control of Licensee and requires Licensee to take immediate action, either unilaterally or under instruction of law enforcement, emergency services, or other regulatory agency staff, including actions to prevent the imminent loss of human life or damage to property. An emergency may include, but is not limited to: natural events such as landslides, storms, or wildfires; vandalism; malfunction or failure of project works; or other public safety incidents. If Licensee temporarily modifies the requirements of this condition, Licensee shall make all reasonable efforts to promptly resume performance of the requirements, and shall notify the Forest Service, CDFW and the SWRCB within 48 hours of the start of the modification. Licensee shall provide notification to the Commission as soon as possible but no later than 10 days after such incident.

Condition No. 49 – Visual Resource Management Plan

Upon Commission approval, Licensee shall implement the Visual Resource Management Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175) for locations on, or directly affecting, NFS lands.

Condition No. 50 – Historic Properties Management Plan

Upon Commission approval, Licensee shall implement the Historic Properties Management Plan, filed separately with the Commission, by Yuba County Water Agency, on July 5, 2016 (FERC eLibrary Accession No. 20160705-5039) for locations on, or directly affecting, NFS lands.

Condition No. 51 – Transportation System Management Plan

Upon Commission approval, Licensee shall implement the Transportation System Management Plan, filed separately with the Commission, by Yuba County Water Agency, on June 5, 2017 (FERC eLibrary Accession No. 20170605-5050), for locations on, or directly affecting, NFS lands.

Condition No. 52 – Erosion and Sediment Control Plan

Upon Commission approval, Licensee shall implement the Erosion and Sediment Control Plan, filed separately with the Commission, by Yuba County Water Agency, on October 27, 2016 (FERC eLibrary Accession No. 20161027-5175) for locations on, or directly affecting, NFS lands.

Condition No. 53 – Fire Prevention and Response Plan

Upon Commission approval, Licensee shall implement the Fire Prevention and Response Plan, filed separately with the Commission, by Yuba County Water Agency, on June 5, 2017(FERC eLibrary Accession No. 20170605-5050) for locations on, or directly affecting, NFS lands.

Condition No. 54 – Drought Management Plan

For the protection of Forest Service resources, within 1 year of License issuance, the Licensee shall file with the Commission, a Drought Management Plan developed in consultation with the Forest Service, SWRCB, other Government Agencies, and other interested parties, and approved by Forest Service. Upon Commission approval, Licensee shall implement the Plan.

The Plan shall include, at a minimum, but may not be limited to, the components below, unless otherwise agreed to by the Forest Service during Plan finalization:

- **Appropriate Definition of Drought** – definition of drought conditions based on available data specific to the Yuba River Development Project, including current storage in New Bullards Bar Reservoir, watershed snowpack and soil moisture conditions, current and projected operating requirements for instream flows and water supply deliveries, weather forecasts, and other Project operation limitations.
- **Notification of Drought Concern** – description of Licensee's process for early notification to the Forest Service, SWRCB, and other interested agencies, if a drought is anticipated that may result in the need for temporary variances from License conditions, under this Plan.
- **Proposed Drought Response Measures** – description of License conditions for which a variance may be requested by the Licensee, under this Plan.
- **Potential Impacts to Resources** - description of anticipated or potential impacts to fish and wildlife species, water quality, vegetation, recreation, and other Forest Service resources, as a result of License variances, under this Plan.
- **Monitoring** - description of monitoring that would be conducted by Licensee to identify the impacts of any License variance (requested under this Plan) on fish and wildlife species, water quality, vegetation, recreation, and other Forest Service resources, and requirements for prompt reporting to the Forest Service, SWRCB, and other Agencies, if impacts are greater than anticipated.
- **Return to Regular Operations** - description of how and when the License variance would expire (e.g., when drought conditions cease, or when local conditions improve such that the variances are no longer needed).
- **Process for Engaging Agencies and the Public** – description of Licensee's process for discussing drought conditions, potential License variances, and related drought response measures, with the Forest Service, SWRCB, USFWS, CDFW, and other interested parties (e.g., through the Ecological Group defined in Condition No. 2).
- **Mandatory Conditioning Agency Approval** – description of a process (as defined by the Forest Service) by which the Licensee shall obtain approval from the Tahoe and Plumas National Forest, Forest Supervisors, or another Forest Service official designated by the Forest Service, for any variances from Forest Service FPA Section 4(e) Conditions in this License.
- **Reporting and Revision of the Plan** – description of Licensee's processes for: (1) regular reporting to the Forest Service, SWRCB, and other interested Agencies, during any drought that has resulted in the need for License variances, (2) developing a summary report once the drought has ceased, and (3) revising this Plan, as needed, throughout the new License term.

APPENDIX E

California State Water Resources Control Board Preliminary Conditions

PRELIMINARY TERMS AND CONDITIONS FOR YUBA RIVER DEVELOPMENT PROJECT (FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246)

In accordance with the memorandum of understanding (MOU) executed between the Federal Energy Regulatory Commission (FERC) and the State Water Resources Control Board (State Water Board) on November 19, 2013, and to the extent that information is available, State Water Board staff is providing water quality certification (certification) preliminary terms and conditions in response to the notice of Ready for Environmental Analysis (REA) by FERC for the Yuba River Development Project (Project), FERC Project No. 2246. The Project is owned and operated by Yuba County Water Agency (YCWA or Licensee). This document is strictly preliminary in nature, and is being sent to further coordination regarding information needs and potential conditions between FERC and the State Water Board. As such, this document does not reflect a decision by the State Water Board to adopt any particular term or condition, nor does it limit the State Water Board's consideration of terms or conditions different from or in addition to those presented here.

1. Minimum lnstream Flows

The State Water Board will likely condition the North Yuba River below New Bullards Bar Dam, Oregon Creek below Log Cabin Diversion Dam, Middle Yuba River below Our House Diversion Dam, and Yuba River below Englebright Dam with minimum instream flows in light of the whole record. The whole record includes, but is not limited to, the FERC record (including recommendations by resource agencies); final National Environmental Policy Act (NEPA) document; and final California Environmental Quality Act (CEQA) document.
Minimum instream flows will likely be specific to water-year types (see Preliminary Condition 4).

2. Ramping Rates

Project operations will likely be subject to ramping rate specifications in order to limit artificial flow fluctuations in Project-affected river and stream reaches, including the Yuba River between the Narrows 1[1] and Narrows 2 powerhouses.

[1] Narrows 1 powerhouse is owned and operated by Pacific Gas and Electric Company (PG&E). Per the Coordinated Operations Plan between YCWA and PG&E, dated April 19, 2016, PG&E will operate Narrows 1 powerhouse each day according to the Narrows 1 daily flow volume and flow rate specified by YCWA.

3. Restoration Plan

The State Water Board will likely require that the Licensee develop and implement a restoration plan, in consultation with the relevant resource agencies. The restoration plan should include the total area to be restored, restoration method, performance metrics, maintenance, and implementation and effectiveness monitoring. The restoration, in concert with minimum instream flows and ramping rates, should protect or enhance aquatic habitats, water quality, water temperature, vegetation, fish, wildlife, invertebrates, and other designed beneficial uses of water. A restoration plan would require State Water Board Deputy Director for Water Rights (Deputy Director) approval. The Deputy Director may require revisions to a potential restoration plan. Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

4. Water Year Type Classification

The State Water Board will likely determine the criteria to classify water year types for the Project-affected reaches. Water year type classification criteria for Project-affected waters upstream of Englebright Dam will likely be based on the California Department of Water Resources Bulletin 120 water forecasts. Water year type classification criteria for Project affected waters downstream of Englebright Dam will likely be based on the North Yuba lndex[2]. The State Water Board anticipates further refining these classification criteria to address uncertainty in February forecasting.

5. Spill Recession

The State Water Board will likely condition instream flow recession rates off spill events at New Bullards Bar Dam in the North Yuba River, Log Cabin Diversion Dam in Oregon Greek, and Our House Diversion Dam in the Middle Yuba River in light of the whole record. Spill events are defined as water flowing through spill gates or overtopping dams. The objective of the spill recessions is to prevent potential adverse effects caused by rapid changes in regulated streamflow that are inconsistent with recession rates that would occur on a natural hydrograph were the dam not obstructing natural flow. Spill recession rates will attempt to mimic natural recession rates.

[2] The North Yuba Index is an indicator of the amount of water available in the North Yuba River at New Bullards Bar Reservoir that can be used to achieve flows on the Lower Yuba River through operations of New Bullards Bar Reservoir. The index is comprised of two components: (1) active storage in New Bullards Bar Reservoir at the commencement of the current water year and; (2) total inflow to New Bullards Bar Reservoir for the current water year, including diversions from the Middle Yuba River and Oregon Creek to New Bullards Bar Reservoir.

Operations of the proposed New Bullards Bar Dam Auxiliary Flood Control Outlet on New Bullards Bar Dam will likely be considered a spill event.

6. Streamflow and Reservoir Level Compliance

The State Water Board will likely require the Licensee to develop and implement a Stream Flow and Reservoir Level Compliance Plan to document compliance with streamflow and reservoir level requirements in the new FERC license. At a minimum, this plan should include:

1. Locations where the Licensee monitors streamflow and reservoir levels;
2. Equipment to be used by the Licensee to monitor streamflow and reservoir levels in compliance with requirements of this certification;
3. A description of how the equipment used by the Licensee to monitor streamflow and reservoir levels in compliance with the requirements of this certification is deployed, set (e.g., frequency of data collection), operated, calibrated, and maintained.
4. A description of how data are retrieved from the equipment used by the Licensee to monitor compliance with the requirements in the license related to streamflow and reservoir levels, including frequency of data downloads, quality assurance/quality control procedures, and data storage.
5. A description of how streamflow and reservoir level data is provided to the State Water Board.

The Stream Flow and Reservoir Level Compliance Plan will be submitted to the Deputy Director for approval. The Deputy Director may require revisions to the plan.

7. Tunnel Closures at Lohman Ridge and Camptonville Diversion Tunnels

The State Water Board will likely require a schedule to periodically close the Lohman Ridge Diversion Tunnel on the Middle Yuba River and the Camptonville Diversion Tunnel on Oregon Creek. The schedule will likely be determined based on water year types as described in Preliminary Condition 4, and New Bullards Bar Reservoir water level elevation. The goal of this schedule is to restore a more natural hydrograph in Oregon Creek downstream of Log Cabin Diversion Dam and the Middle Yuba River downstream of Our House, and to enhance aquatic habitat quality and quantity for native biota. The objective of the schedule to close the Lohman Ridge Diversion Tunnel is to reduce the number of years when water from the Middle Yuba River and Oregon Creek is diverted to New Bullards Bar Reservoir when New Bullards Bar is spilling or when such a diversion would result in spill at New Bullards Bar Dam, and allow the water to naturally continue down the Middle Yuba River and Oregon Creek instead.

8. New Colgate Powerhouse Intake

The State Water Board will likely condition the operation and maintenance of the upper and lower intakes for New Colgate Powerhouse. Alternatively, the State Water Board may rely on Ecological Group (Preliminary Condition 26) consultation to determine the operation of the upper or lower intake. The upper and lower intakes are separated by approximately 180.5 feet of elevation, providing the Licensee flexibility to extract water within and above the cold water pool in New Bullard's Bar Reservoir. The goal of operating both the upper and lower intakes is to provide favorable water temperatures for biota year-round downstream of New Colgate Powerhouse and Englebright Dam. The Licensee may also be required to ensure both intakes are operational and maintained.

9. General Condition for Plans

The State Water Board will likely include a general condition for certification-required plans. This general condition applies to Preliminary Conditions 10-25, each of which requires the Licensee to develop a monitoring and/or implementation plan. The plans should include reporting and consultation requirements, and plan revision guidelines to adaptively manage and monitor beneficial uses affected by Project facilities, maintenance and operations. Each plan is intended to cover the period between FERC's approval of the plan and issuance of a new license (i.e., through the term of the new license and any annual licenses issued by FERC until a new license is issued).

The Licensee shall provide relevant state and federal agencies and interested groups with a minimum 30-day comment period on the plans, which did not receive agreement from relevant resource agencies during the relicensing process. The Licensee shall file the final plan with the Deputy Director for approval along with documentation of consultation, comments received, and a description of how the final plan incorporates the comments or justification for excluding comments from the final plan. The Deputy Director may require modifications to the plan. Upon Deputy Director approval, the Licensee shall file the approved final plan with FERC. When FERC approves the plan, the Licensee shall implement the plan as approved by FERC.

The plans included or reference in the *Amended Application for a New License Major Project- Existing Dam* (Amended FLA), filed by YCWA with FERC that have been agreed to by all relevant resource agencies during relicensing negotiations, are considered to be "developed in consultation with relevant resource agencies" for the purposes of this certification. In this circumstance, the Licensee is not required to provide the relevant state and federal agencies and interested groups with a minimum 30-day comment period on the plans. The Licensee shall submit the "agreed to plans" to the Deputy Director for approval with documentation of relicensing negations. Upon Deputy Director approval, the Licensee shall file the approved plan with FERC. When

FERC approves the plan, the Licensee shall implement the plan as approved by FERC. Alternatively, where the plan is finalized prior to issuance of water quality certification, compliance with the plan, including any State Water Board required amendments thereto, may be a condition of the certification absent additional Deputy Director approval.

10. Log Cabin and Our House Diversion Dam Mitigation Plan

The State Water Board will likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to mitigate for Project related impacts to beneficial uses in the Middle Yuba River and Oregon Creek from the Log Cabin and Our House diversion dams and the Lohman Ridge and Camptonville diversion tunnels. Impacts to beneficial uses include, but are not limited to: a barrier to fish and wildlife migration (diversion dams), fish and wildlife entrainment (diversion tunnels), and impaired hydrographs downstream of the diversion dams.

Mitigation shall be commensurate with the level of impact. Mitigation may include, but is not limited to: restoration or enhancement of local aquatic habitat; additional diversion tunnel closures; or other avoidance and minimization strategies. Monitoring may be required to document mitigation effectiveness.

Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

11. Large Woody Material Management Plans

<u>Our House and Log Cabin Diversion Dams</u>

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies, to develop and implement a plan to allow mobile large woody material (LWM) to pass over Our House and Log Cabin diversion dams when conditions permit safe access and working conditions. The primary goal of this plan is to allow the natural downstream transport of LWM past Our House Diversion Dam on the Middle Yuba River and Log Cabin Diversion Dam on Oregon Creek to improve downstream habitat quality. This plan should consider a protocol for LWM that may be hazardous to Project infrastructure or is too large to safely pass over the dam.

<u>New Bullards Bar Dam and Reservoir</u>

The State Water Board will likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to collect, store, and dispose of LWM in New Bullard's Bar Reservoir on the North Yuba River. The objectives of this plan are to ensure the safety of Project facilities and be protective of environmental and

recreational resources. The collection, storage, and disposal of LWM at New Bullards Bar Reservoir should avoid adverse effects to federal and state endangered species act and special status species in and around the storage and collection area.

The State Water Board will also likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to mitigate for the reduction of LWM downstream of New Bullards Bar Dam. Mitigation may include, but is not limited to, safely passing LWM over New Bullards Bar Dam or placing LWM in the North Yuba River below New Bullards Bar Dam and in the Yuba River below Englebright Dam. The goal of this plan is to increase the number of LWM below New Bullard's Bar Dam in order to improve downstream aquatic habitat. LWM enhancement in the North Yuba River below New Bullard's Bar Dam should occur before or concurrent with sediment augmentation below New Bullards Bar Dam (Preliminary Condition 12 in part). LWM enhancement in the Yuba River below Englebright Dam should, to the extent feasible, be anchored. The Licensee shall consult with representatives from the boating community (e.g., American Whitewater) to ensure LWM placement in the river is not hazardous to boaters. The Licensee may also be required to monitor the implementation and effectiveness of LWM augmentation and to submit associated reports to the Deputy Director. Best management practices (BMPs) should be developed to minimize the impact to beneficial uses (e.g., turbidity and wildlife) from LWM placement and installation.

This condition will recognize that it is subordinate to safety determinations by FERC and the California Division of Safety of Dams, and shall include provisions related to safety concerns by other government entities.

Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

12. Sediment Management Plans

Log Cabin and Our House Diversion Dams

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies, to develop and implement a plan to prescribe procedures and guidelines for the management of sediment behind Log Cabin and Our House diversion dams. The objectives are:

1. To maintain or improve the health of the aquatic environment downstream of the dams by allowing the passage of sediments that occur behind the dams.

2. To provide for dam safety and proper functioning of Project facilities, specifically the fish release and low level outlet valves to ensure compliance with certification conditions.

Sediment management methods may include, but are not limited to: conditional passage of sediment through low level outlet valves, based on timing and flow requirements: intermittent mechanical removal of sediment; valve unclogging protocols; and emergency sediment removal. BMPs should be developed for sediment removal activities to minimize the impacts to natural resources. During sediment management activities, the Licensee should monitor turbidity.

The Licensee may also be required to collect bulk sediment samples from each diversion impoundment area to be analyzed by a California-certified laboratory for metals, prior to each sediment management event. Results would be provided to the Deputy Director for review. Deputy Director approval may be required prior to the commencement of a sediment management activities.

Prior to implementing this plan, the Licensee shall obtain the required permits and/or approvals.

New Bullards Bar Reservoir

The State Water Board will likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to mitigate for the reduction in sediment transport past New Bullards Bar Dam in the North Yuba River. Mitigation may include, but is not limited to, sediment augmentation below New Bullards Bar Dam. The goal of this plan is to replace sediment lost downstream of New Bullards Bar Dam in order to improve downstream habitat. Sediment replacement downstream of New Bullards Bar Dam should occur after or concurrent with LWM enhancement below New Bullards Bar Dam (Preliminary Condition 11, in part). The Licensee may also be required to monitor implementation and effectiveness of the sediment augmentation and submit associated reports to the Deputy Director. BMPs should be developed to minimize the impact to beneficial uses (e.g., turbidity and wildlife) from initial sediment placement.

Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

13. Water Quality Monitoring Plan

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies to develop and implement a plan to monitor water quality. This plan should include monitoring sites at Project reservoirs and locations throughout

Project affected stream and river reaches. The monitoring sites should be adequately abundant and spatially distributed to provide data that measures potential impacts to water quality as a result of Project facilities or operations. Water quality monitoring should occur at intervals during the license term to document trends in lime and changes in water quality related to operational changes and construction of new Project facilities that may impact water quality or designated beneficial uses of water. At a minimum, this plan should include *in-situ,* water chemistry, recreation related water quality, and bioaccumulation monitoring components. At any point monitoring suggests water quality conditions are in exceedance of Basin Plan water quality objectives, the Licensee shall immediately notify the State Water Board and Central Valley Regional Water Quality Control Board. Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

14. Water Temperature Monitoring Plan

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies, to develop and implement a plan to monitor potential Project effects on water temperature. The objective of this plan is to monitor water temperature flowing into the Project area and in Project reservoirs, impoundments, and affected stream and river reaches. This plan should include an adequate number of sites to track the changes in water temperature entering impoundments, stored in impoundments, and released below impoundments. In flowing water, the Licensee should install and anchor appropriate devices to continuously record water temperature seasonally or throughout the year. In reservoirs, the Licensee should monitor water temperature and thermocline depth by profile sampling near the dam to determine reservoir stratification depths. Water temperature data will identify if Project operations or facilities are impacting thermal conditions for biota (especially rainbow trout, steelhead trout, and Chinook salmon). Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

15. Upper Yuba River Aquatic Monitoring Plan

The State Water Board will likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to collect information regarding aquatic resources in Project affected creeks, rivers, and reservoirs upstream of Englebright Dam. At a minimum, monitoring locations should include New Bullards Bar Reservoir, Our House and Log Cabin impoundments, Oregon Creek below Log Cabin Diversion Dam, North Yuba River below New Bullards Bar Reservoir, and Middle Yuba River below Our House Diversion Dam. Additional monitoring locations may be necessary to compare resources with and without Project influence (e.g., location upstream of Project facilities). The objective of this plan is to collect data on the distribution, abundance, and condition of stream fish (especially rainbow trout *(Oncorhynchus mykiss)),* benthic macroinvertebrates, foothill yellow-legged frogs

(Rana boy/ii), western pond turtle *(Actinemys marmorata),* channel morphology (creeks, rivers, and diversion impoundments), riparian vegetation, and LWM. This plan should provide information on Project impacts to designated beneficial uses (e.g., cold freshwater habitat, wildlife habitat, and spawning). Monitoring should also identify the effects to aquatic resources resulting from protection, mitigation, and enhancement measures. At a minimum, this plan should include the following information for each resource monitored:

1. Identify the resources that will be monitored and the frequency that monitoring will occur.
2. Describe where monitoring will occur.
3. Describe the methods YCWA will follow to monitor identified resources.
4. Describe how the collected data will be analyzed.
5. Describe how the data will be made available.
6. Describe how this Plan may be revised, as needed.

Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan, or include specific measures to be taken for adaptive management, based on the data collected.

16. Lower Yuba River Monitoring Plan

The State Water Board will likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to collect information regarding aquatic resources in the Yuba River downstream of Englebright Reservoir. The objective of this plan is to collect data on the distribution, abundance, and condition of benthic macroinvertebrates, channel substrate, riparian vegetation, LWM, and adult and juvenile anadromous fish. This plan should provide information on Project impacts to designated beneficial uses (e.g., cold and warm freshwater habitat, wildlife habitat, and spawning). At a minimum, this plan should include the following information for each resource monitored:

1. Identify the resources that will be monitored and the frequency that monitoring will occur.
2. Describe where monitoring will occur.
3. Describe the methods YCWA will follow to monitor identified resources.
4. Describe how the collected data will be analyzed.
5. Describe how the data will be made available.
6. Describe how this Plan may be revised, as needed.

Additional focus should be attributed to monitoring for stranded salmonids during Narrows 2 Powerhouse flow fluctuations that have a potential to negatively impact anadromous salmonids (e.g., Chinook salmon and steelhead trout). At a minimum, this

component should discuss fish stranding surveys (protocols, locations, and triggers), required permits if fish are stranded, and reporting and consultation procedures. Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan, or include specific measures to be taken for adaptive management, based on the data collected.

17. Narrows Reach Fish Stranding Prevention Plan

The State Water Board will likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to reduce fish stranding in the Yuba River from immediately below Englebright Dam to the Narrows 1 Powerhouse (Narrows Reach). The goal of this plan is to develop permanent or long term measures to reduce or eliminate fish stranding, especially anadromous salmonids, during the range of flows experienced in the Narrows Reach as a result of Project operations and coordinated operations with the Narrows Project. This plan should consider locations in the Narrows Reach where fish stranding has historically or has a potential to occur. Measures to reduce stranding may include, but are not limited to, changes in Narrows 2 operations and/or coordinated operations with the Narrows Project, construction of entrainment deterrents, maintenance of gravel bars and streambanks, or filling of intermittent pools. Measures should include implementation and effectiveness monitoring.

Additionally, the State Water Board may develop specific conditions to address Narrows Reach stranding that would appear in or supplement the plan.

18. Aquatic Invasive Species Management Plan

The State Water Board will likely require the Licensee, in consultation with relevant resource agencies, to develop and implement a plan to manage aquatic invasive species (AIS). The goal of this plan is to establish a framework with specific activities to minimize the spread and impact of AIS on native fauna and habitats. This plan should identify and describe AIS currently established within the Project area and AIS with high potential to become established within the Project area. This plan may include, but is not limited to, the following measures:

1. Implement actions to minimize and prevent the introduction and spread of AIS into and throughout Project-affected waters.
2. Provide education and outreach to ensure public awareness of AIS effects and management throughout Project-affected waters.
3. Implement monitoring programs for early detection of AIS.
4. Ensure all Project AIS management activities comply with federal and State of California laws, regulations, policies, and management plans, and with Forest Service directives and orders regarding AIS.

5. Monitor and minimize the spread of established AIS.

Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan, or include specific measures to be taken if new AIS are discovered in the Project area.

19. Bald Eagle and Peregrine Falcon Plan

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies, to develop and implement a plan for the protection of bald eagle *(Haliaeetus leucocepha/us)* and American peregrine falcons *(Falco peregrinus anatum)* in all areas within and outside of the FERC Project boundary where bald eagle(s) and American peregrine falcon(s) are affected or have the potential to be affected by the Project This plan should include measures to ensure that Project operations and maintenance and Project related recreation activities do not result in the unauthorized take[3] of bald eagles and peregrine falcons. Project related activities should be consistent with federal and State of California laws and regulations relating to bald eagles and American peregrine falcons. This plan may include, but is not limited to, establishing limited operating period, establishing buffer zones, and undertaking monitoring surveys.

20. New Bullards Bar Reservoir Fishery Plan

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies, to develop and implement a plan to supplement the fishery at New Bullards Bar Reservoir. This plan may include annual fish stocking (i.e. kokanee and rainbow trout), hatchery restrictions to maintain genetic integrity, and other options to promote a healthy fishery. This plan should be consistent with California Fish and Game Code and support REC-1 beneficial uses of water in the North Yuba River. This plan should include a monitoring component to measure the effectiveness of this plan (e.g., creel surveys).

21. Whitewater Boating Flows below Our House Diversion Dam

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies and interested parties, to develop and implement a plan for the release of whitewater boating flows below Our House Diversion Dam in the Middle Yuba River. This plan should identify the whitewater boating time period, method(s) of public notification, magnitude of flow releases measured at a specific streamflow

[3] As defined in California Fish and Game Code (Sections 86, 3511, 3503, 3503.5, 3513) and federal Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act

gage(s), and potential impacts to aquatic biota. This plan should consider water year type forecasts when scheduling boating flows. Whitewater boating flows below Our House Diversion Dam should be designed to uphold REC-1 designated beneficial uses that may have been diminished due to the development of Our House Diversion Dam and the Lohman Ridge Diversion Tunnel.

22. Public Access below New Bullards Bar Dam

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies and interested parties, to develop and implement a plan to provide public access to the North Yuba River below New Bullards Bar Dam for REC-1 designated beneficial uses. At a minimum, this plan should include development and maintenance of an access road from Marysville Road near New Bullards Bar Dam to a boater put-in location on the North Yuba River below New Bullards Bar Dam. Alternatively, the use and maintenance of the Licensee's access road, which provides access to the North Yuba River below New Bullards Bar Dam, could be used for this plan. This plan should include potential construction (e.g., fencing, warning signs) to protect Project facilities from public vandalism or harm.

23. Drought Management Plan

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies and interested parties, to develop and implement a plan that outlines overarching guidance for operations during multi-year drought conditions. The plan should include an anticipated schedule to initiate State Water Board and Ecological Group (Preliminary Condition 26) consultation regarding any potential drought-related FERC license or certification variances. If particular conditions are likely to require variance in extended drought periods, the State Water Board may include a drought management term in such conditions.

24. Erosion and Sediment Control Plan

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies, to develop and implement a plan to minimize undesirable erosion or sedimentation conditions near streams and reservoirs caused from Project operations and maintenance. This plan should contain erosion and sediment reduction protocols for ground-disturbing activities that include, but are not be limited to, routine operations; maintenance; new construction; emergencies within the Project affected area; management of historic properties and integrated vegetation; transportation; and recreation. Protocols shall abide by applicable regulations and reduce impacts to water quality within the Project area.

Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

25. Hazardous Material Plan

The State Water Board will likely require the Licensee, in consultation with the relevant resource agencies, to develop and implement a plan for storage, use, transportation, and disposal of hazardous materials in the Project area. This plan should discuss appropriate measures and equipment required to prevent the extent of any hazardous material spill. This plan should also include protocols to prevent adverse impacts to beneficial uses in the event that hazardous materials are spilled. On-site containment for hazardous-chemical storage shall be placed away from watercourses and include secondary containment and appropriate management as specified in California Code of Regulations, title 27, section 20320. Protocols and methods in this plan shall abide by federal, state and local laws and policies. Additionally, the State Water Board may include specific metrics or methods that would appear in or supplement the plan.

26. Ecological Group

The State Water Board will likely require the Licensee to organize an Ecological Group and host Ecological Group meetings. Ecological Group meetings should convene once per year on a defined date and additional Ecological Group meetings may be held, as appropriate. At a minimum, the Ecological Group should be composed of the Forest Service, United States Army Corps of Engineers, Nation Marine Fisheries Service, United States Fish and Wildlife Service, California Department of Fish and Wildlife, Bureau of Land Management, relevant Tribes, and the State Water Board. .

The purpose of the meetings should be to provide a forum for stakeholders to be informed of Project activities and elements impacted by the Project. Discussion topics may include, but are not limited to, monitoring reports and other data from the previous calendar year, license noncompliance, recommendations or revisions to license required monitoring or implementation plans, and scheduled Project facility maintenance.

At least 30 days prior to the Ecological Group Meeting, the Licensee shall make available to the Ecological Group reports and information from the previous calendar year required by the certification, or implementation plans and other relevant meeting material. Within 30 days following each Ecological Group Meeting, the Licensee shall file a meeting summary with FERC and the State Water Board.

27. General Annual Employee Awareness Training

The State Water Board will likely require the Licensee to provide general awareness training on compliance with water quality certification requirements to hydro operation and maintenance staff each year. The training topics should include, but are not limited to, conditions of this certification; special-status species; non-native invasive plants; AIS; sensitive areas known or suspected by Licensee or resource agencies to occur within the Project affected area; and procedures to avoid and minimize adverse effects to beneficial uses.

28. Coordinated Operations Plan with Narrows Project

The State Water Board will likely require the Licensee to file with the State Water Board a Coordinated Operations Plan for the Project and Narrows Project (FERC Project No. 1403). The purpose of this plan is to provide for coordinated operations of the Project and the Narrows Project to assure implementation of the flow-related conditions in the Project license, including maintenance offlow requirements and ramping rates during normal operations, scheduled outages, and unscheduled outages. If Licensee and the licensee for the Narrows Project are unable to reach agreement on this plan within the first 90 days of the new license term, then Licensee shall advise the State Water Board of the consultations that have occurred between the two licensees. Every 30 days thereafter, the Licensee shall continue to update the State Water Board until the plan is complete and submitted to the State Water Board.

29. Newly Identified Impacts

The State Water Board reserves the authority to require additional conditions and revise current conditions whenever Project-related potential impacts or newly-listed species within the Project-affected area are identified or introduced (e.g., anadromous fish passage above Englebright Dam or emigration of juvenile salmonids through dams or powerhouses) to ensure adequate protection of Basin Plan objectives and beneficial uses.

The State Water Board also reserves the authority to require the Licensee to develop, in consultation with appropriate resource agencies, and conduct studies whenever new Project-related potential impacts or newly-listed species within the Project-affected area are identified or introduced. Such studies should be designed to determine and recommend appropriate measures to minimize new Project-related impacts and impacts or newly-listed species within the Project-affected area.

The following standard conditions will likely apply to this Project in order to protect water quality and beneficial uses over the term of the Project's license and any annual extensions.

30. Unless otherwise specified in the certification or at the request of the State Water Board, data and/or reports must be submitted electronically in a format accepted by the State Water Board to facilitate the incorporation of this information into public reports and the State Water Board's water quality database systems in compliance with California Water Code section 13167.

31. The State Water Board's approval authority includes the authority to withhold approval or to require modification of a proposal or plan prior to approval. The State Water Board may take enforcement action if YCWA fails to provide or implement a required plan in a timely manner.

32. The State Water Board reserves the authority to add to or modify the conditions of a certification to incorporate changes in technology, sampling, or methodologies and/or load allocations developed in a total maximum daily load developed by the State Water Board or the Central Valley Regional Water Quality Control Board.

33. Future changes in climate projected to occur during the license term may significantly alter the baseline assumptions used to develop the conditions in a certification. The State Water Board reserves authority to modify or add conditions in a certification to require additional monitoring and/or other measures, as needed, to verify that Project operations meet water quality objectives and protect the beneficial uses assigned to the Project-affected stream reaches.

34. A certification requires compliance with all applicable requirements of the Basin Plan. The Applicant must notify the State Water Board and the Central Valley Regional Water Quality Control Board within 24 hours of any unauthorized discharge to surface waters.

35. The State Water Board reserves the authority to add to or modify the conditions of this certification: (1) if monitoring results indicate that continued operation of the Project could violate water quality objectives or impair the beneficial uses of Yuba River or its tributaries; (2) to coordinate the operations of this Project and other hydrologically connected water development projects, where coordination of operations is reasonably necessary to achieve water quality objectives or protect beneficial uses of water; or (3) to implement any new or revised water quality objectives and implementation plans adopted or approved pursuant to the Porter-Cologne Water Quality Act, or section 303 of the Clean Water Act.

36. Notwithstanding any more specific conditions in a certification, the Project shall be operated in a manner consistent with all water quality standards and implementation plans adopted or approved pursuant to the Porter-Cologne Water Quality Control Act or section 303 of the Clean Water Act. The Applicant must take all reasonable measures to protect the beneficial uses of the Yuba River and its tributaries.

37. A certification does not authorize any act which results in the taking of a threatened, endangered, or candidate species or any act, which is now prohibited, or becomes prohibited in the future, under either California Endangered Species Act (Fish & G. Code §§ 2050-2097) or the Endangered Species Act (ESA) (16 U.S.C. §§ 1531 - 1544). If a "take" will result from any act authorized under a certification or water rights held by YCWA, YCWA must obtain authorization for the take prior to any construction or operation of the portion of the Project that may result in a take. YCWA is responsible for meeting all requirements of the applicable ESAs for the Project authorized under a certification.

38. In the event of any violation or threatened violation of the conditions of a certification, the violation or threatened violation is subject to any remedies, penalties, process or sanctions as provided for under applicable state or federal law. For the purposes of section 401(d) of the Clean Water Act, the applicability of any state law authorizing remedies, penalties, process or sanctions for the violation or threatened violation constitutes a limitation necessary to assure compliance with the water quality standards and other pertinent requirements incorporated into a certification.

39. In response to a suspected violation of any condition of a certification, the State Water Board may require the holder of any federal permit or license subject to a certification to furnish, under penalty of perjury, any technical or monitoring reports the State Water Board deems appropriate, provided that the burden, including costs, of the reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. The State Water Board may add to or modify the conditions of a certification as appropriate to ensure compliance.

40. No construction shall commence until all necessary federal, state, and local approvals have been obtained.

41. The Applicant must submit any change and/ or proposed change to the Project, including Project operation, technology changes or upgrades, or methodology, which would have a significant or material effect on the findings, conclusions, or conditions of this certification, to the State Water Board for prior review and written approval. The State Water Board shall determine significance and may require consultation with state and federal agencies. If the State Water Board is not notified of a change to the Project, it will be considered a violation of this

certification. If such a change would also require submission to FERC, the change must first be submitted and approved by the State Water Board.

42. The Applicant must provide State Water Board staff access to Project sites to document compliance with this certification.

43. The State Water Board shall provide notice and an opportunity to be heard in exercising its authority to add or to modify any of the conditions of this certification.

44. A certification is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Water Code Section 13330 and California Code of Regulations, title 23, division 3, chapter 28, article 6 (commencing with section 3867).

45. A certification is not intended and shall not be construed to apply to any activity involving a hydroelectric facility and requiring a FERC license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to California Code of Regulations, title 23, section 3855, subdivision (b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

46. Nothing in a certification shall be construed as State Water Board approval of the validity of any water rights, including pre-1914 claims. The State Water Board has separate authority under the Water Code to investigate and take enforcement action if necessary to prevent any unauthorized or threatened unauthorized diversions of water.

47. Certification is conditioned upon total payment of any fee required under California Code of Regulations, title 23, chapter 28.