
SOUTH SWP HYDROPOWER FERC PROJECT NO. 2426



FINAL PROPOSED STUDY PLAN

January 2017



**State of California
California Natural Resources Agency
DEPARTMENT OF WATER
RESOURCES
Hydropower License Planning and
Compliance Office**



**Los Angeles
DEPARTMENT OF
WATER AND POWER**

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COMMONLY USED TERMS, ACRONYMS & ABBREVIATIONS

§	Section
°C	degrees Celsius
µmhos	micro-mhos
µmhos/cm	micro-mhos per centimeter
AB	Assembly Bill
ABAAS	Architectural Barriers Act Accessibility Standards
ACHP	Advisory Council on Historic Preservation
aquatic	Living in or near water; plants adapted for a partially or completely submerged life
AIS	aquatic invasive species
ANF	Angeles National Forest
APE	Area of Potential Effect
AW	American Whitewater
bankfull	The water level, or stage, at which a stream, river or lake is at the top of its banks and any further rise would result in water moving into the flood plain.
bedrock	The solid rock that lies beneath soil and other loose surface materials.
BLM	United States Department of the Interior, Bureau of Land Management
BMI	Benthic Macroinvertebrates
CaCO ₃	Calcium carbonate
Cal-IPC	California Invasive Plant Council
CalTrout	California Trout, Inc.
CalVeg	USFS Classification and Assessment with Landsat of Visible Ecological Groupings
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second

chaparral	A shrubland adapted to summer-dry Mediterranean climate by having shrubs with evergreen, leathery leaves, such as chamise, manzanita, or scrub oak species.
CNDDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Commission	Federal Energy Regulatory Commission
CPUE	catch per unit effort
CRLF	California red-legged frog
CWA	Federal Water Pollution Control Act, known as Clean Water Act
CWHR	California Wildlife Habitat Relationships
deepwater habitats	Permanently flooded lands lying below the deepwater boundary of wetlands
deposit	Any accumulation of sediment
DLA	Draft Application for a New License
DNA	deoxyribonucleic acid
DO	dissolved oxygen
DOC	dissolved organic carbon
DPS	distinct population segment
drainage	Any channel that carries water
DWR	California Department of Water Resources
eDNA	environmental deoxyribonucleic acid
EPA	United States Environmental Protection Agency
epilimnion	The upper layer of water in a stratified lake
ESA	Federal Endangered Species Act
FC	federal candidate
FE	federal endangered
FERC	Federal Energy Regulatory Commission
FLA	Final Application for a New License
flooded	A condition in which the soil surface is temporarily covered with flowing water from any source, such as streams overflowing their banks, runoff from adjacent or surrounding slopes, inflow from high tides, or any combination of sources.
fluvial	Term used to describe river or stream-related features or processes. Fluvial deposits are sediments deposited by the flowing water of a stream.

forest	An area (or vegetation type) in which trees dominate in the overstory where their crowns generally overlap (with greater than 60 percent canopy cover).
FP	fully protected
FPA	Federal Power Act
frequently flooded	A flooding class in which flooding is likely to occur often under normal weather conditions (more than 50-percent chance of flooding in any year or more than 50 times in 100 years).
FR	Federal Register
FSORAG	Forest Service Outdoor Recreation Accessibility Guidelines
FSS	Forest Service Sensitive
FSTAG	Forest Service Trail Accessibility Guidelines
FT	federal threatened
FYLF	foothill yellow-legged frog
GDE	groundwater-dependent ecosystems
GIS	Geographic Information System
GPP	generator powered pulsator
GPS	global positioning system
herbaceous-dominated	Herbaceous cover exceeds 2 percent. Trees and shrubs do not exceed 10 percent cover. If less than 2 percent of the site is covered with herbaceous species, the site is considered barren (devoid of vegetation).
Historic property	Prehistoric or historic archaeological sites, buildings, structures, objects, districts, or locations of traditional religious and cultural importance that are included in, or eligible for inclusion in, the NRHP
hypolimnion	The lower layer of water in a stratified lake.
IHA	Indicators of Hydrologic Alteration
ILP	Integrated Licensing Process
Indian Tribe	Used in the NHPA and by FERC to mean an Indian community or group that is recognized by the federal government.
intermittent stream	A stream that has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from precipitation is a supplemental source of water for stream flow.
ISR	Initial Study Report

ITA	Indian Trust Assets
KOP	Key Observation Point
LADWP	Los Angeles Department of Water and Power
lake	Permanent lakes or reservoirs greater than 2 surface hectares (5 surface acres)
landslide	Downslope movement of rock, soil, and mud
Licensees	DWR and LADWP
LPNF	Los Padres National Forest
LWD	large woody debris
marsh	An ecosystem of more or less continuously waterlogged soil dominated by immersed herbaceous plants, but without a surface accumulation of peat.
MBTA	Migratory Bird Treaty Act
mg/L	milligram per liter
MOU	memorandum of understanding
MWD	Metropolitan Water District of Southern California
Native Americans	Indigenous people who lived in the area prior to the arrival of Europeans. Encompasses all indigenous communities potentially interested in or affected by the relicensing, regardless of federal recognition.
NEPA	National Environmental Policy Act
NFS	National Forest Service
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMWSE	normal maximum water surface elevation
NNIP	non-native invasive plants
No.	Number
NPDES	National Pollutant Discharge Elimination System
NPS	United States Department of the Interior, National Park Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
OEHHA	California Office of Environmental Health Hazard Assessment

OHP	Office of Historic Preservation
OHV	off-highway vehicle
PAD	Pre-Application Document
PFC	proper functioning condition
pH	Numeric scale of 0 to 14 that is used to specify the acidity and alkalinity of an aqueous solution
PHABSIM	Physical Habitat Simulation
plant community	All of the plant populations occurring in a shared habitat or environment.
PM&E	potential protection, mitigation, and enhancement
Privileged	For the purposes of the FERC's filing requirements, material deemed confidential by the Licensees will be filed with FERC as "Privileged." This information includes, but is not limited to, the location of sensitive cultural resources and the location of protected species, such as species listed as threatened or endangered under the federal Endangered Species Act. This includes business-sensitive and critical infrastructure information. Each page containing Privileged information will be so marked. The Licensees will not provide Privileged material to the public. Upon request, the Licensees will provide Privileged material to those agencies and Native American tribes with jurisdiction over the resources related to the Privileged material.
Project	South SWP Hydropower
Project area	This is the area within the FERC Project boundary.
Project vicinity	This is the area within the FERC Project boundary and the area surrounding the Project on the order of a USGS 1:24,000 quadrangle.
PSP	Proposed Study Plan
Pyramid reach	18.4-mile long section of Piru Creek, which extends from the spillway or a low-level outlet from Pyramid Dam to the NMWSE of Lake Piru
QAPP	Quality Assurance Program Plan
QA/QC	Quality Assurance/Quality Control
QPCR	quantitative polymerase chain reaction
relicensing participants	FERC, federal and California State agencies, Native American tribes, local governments, non-governmental organizations, businesses, members of the public, and others interested in the Project relicensing

rootwad	A root systems of an upended tree
RSD	relative stock densities
RWQCB	Regional Water Quality Control Board
sapling/shrub	A layer of vegetation composed of woody plants less than 3.0 inches in diameter at breast height but greater than 3.2 feet in height, exclusive of woody vines.
scrub	Vegetation characterized by shrubs; may be classified by habitat type or by characteristic species; shrubland.
SD1	Scoping Document 1
SE	California State endangered
Secchi depth	A measure of the clarity of water
SHPO	State Historic Preservation Officer
shrub-dominated	Shrub canopy closure exceeds 10 percent. However, tree crown closure never exceeds more than 10 percent of the site.
SIO	Scenic Integrity Objective
SM	Standard Method
SSC	Species of Special Concern
ST	California State threatened
su	standard unit
relicensing stakeholders	FERC, federal and State agencies, Native American tribes, local governments, non-governmental organizations, businesses, members of the public, and others interested in the Project relicensing
State	State of California
submerged	rooted vascular plants which do not emerge above the water surface
substrate	The base or substance on which an attached species is growing.
surface water	Water present above the substrate or soil surface
SWAMP	Surface Water Ambient Monitoring Program
SWP	State Water Project
SWRCB	State Water Resources Control Board
TCP	traditional cultural properties
TDS	total dissolved solids
TES	Threatened, Endangered and Sensitive

thalweg	A line connecting the lowest points of successive cross-sections along the course of a valley or river.
TOC	total organic carbon
topography	The shape of the land surface.
tree	A woody plant greater than 3.0 inches in diameter at breast height, regardless of height (exclusive of woody vines).
tree-dominated	Tree canopy exceeds 10 percent crown closure, or young tree density indicates imminent tree dominance
TSS	total suspended solids
understory	The vegetation layer between the overstory or canopy and the ground-story of a forest community, formed by shade tolerant trees of moderate height.
upland	Any area that does not qualify as a wetland because the associated hydrologic regime is not sufficiently wet to elicit development of vegetation, soils, and/or hydrologic characteristics associated with wetlands. Such areas occurring within floodplains are more appropriately termed non-wetlands.
USB	Universal Serial Bus
USFS	United States Department of Agriculture, Forest Service
USFWS	United States Department of the Interior, Fish and Wildlife Service
USGS	United States Geological Survey
USR	Updated Study Request
UWCD	United Water Conservation District
vegetation	The total plant life or cover in an area; also used as a general term for plant life; the assemblage of plant species in a given area.
viewshed	The geographical area that is visible from a location.
weed	Any plant growing where it is not wanted.

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1.0 INTRODUCTION

The California Department of Water Resources (DWR) and Los Angeles Department of Water and Power (LADWP) (Licensees) appreciate the efforts of the Federal Energy Regulatory Commission (FERC or Commission), federal and State of California (State) resource agencies, and other stakeholders in participating in the South SWP Hydropower (FERC Project Number [No.] 2426) Integrated Licensing Process (ILP) to date. Through development of the Pre-Application Document (PAD),¹ FERC's scoping process, and stakeholder comments and recommended study plans summarized below, the Licensees have developed this Proposed Study Plan (PSP) which, when implemented, is intended to fully inform FERC and other agencies with regulatory responsibilities in fulfilling their obligations in this relicensing proceeding. The Licensees recognize that this PSP does not adopt all recommended studies, although the PSP does propose in many cases where an entire study is not adopted to incorporate certain elements of the recommended study. As required by Section 5.11(b)(4) of FERC's ILP regulations, the Licensees in this document provide detailed explanations as to why or why not each recommended study or study element is or is not proposed for inclusion in the PSP. The purpose of this Introduction is to provide a general framework and explanation of the Licensees' approach to the study recommendations. The Licensees are committed to seek resolution of the differences between their study proposals and the study requests filed by relicensing stakeholders and anticipate continuing the dialogue at the study plan meeting scheduled for February 8, as well as at such further, informal meetings as may be necessary.

1.1 PURPOSE OF PROPOSED STUDY PLAN

The purpose of relicensing studies is to supplement existing, relevant, and reasonably available information so that FERC, the Licensees, regulatory agencies, and the public have an adequate record to assess Project effects and to inform proposed requirements in the new license. FERC has stated:

The purpose of an approved study plan is to bring, to the extent possible, pre-filing finality to the issue of what information gathering and studies will be required by the Commission to provide a sound evidentiary basis on which the Commission and other participants in the process can make recommendations and provide terms and conditions. The study plan is developed in conjunction with NEPA [National Environmental Policy Act] scoping, and the latter inevitably involves judgments about which potential alternatives are reasonable to consider, and which alternatives will be eliminated from detailed consideration. It therefore follows that the Commission-approved study plan will reflect those determinations.²

In addition, the PSP should be consistent with FERC policy and court precedent related to the Federal Power Act (FPA). Thus, the adequacy of the PSP may be determined by

¹ Pre-Application Document of California Department of Water Resources and Los Angeles Department of Water and Power to File an Application for a New License, Project No. 2426-227 (filed Aug. 1, 2016).

² Hydroelectric Licensing Under the Federal Power Act, 68 C.F.R. 51,070, 51,078 (Aug. 25, 2003).

reference to the requirements FERC must meet under the FPA and NEPA. FERC's ILP regulations also stipulate that the PSP should include information and studies needed for consultation under Section 7 of the Endangered Species Act (ESA), consultation under Section 106 of the National Historic Preservation Act (NHPA), and for state water quality certification under Section 401 of the Clean Water Act (CWA).³

1.1.1 FPA Requirements

FPA Section 313(b) requires FERC's findings of fact to be "supported by substantial evidence."⁴ Substantial evidence has been defined to mean "such relevant evidence as a reasonable mind might find adequate to support a conclusion."⁵ This standard "does not require perfect information."⁶ To meet the standard, FERC must "examine the relevant data and articulate a satisfactory explanation for its action including a 'rational connection between the facts found and the choice made.'"⁷

In addition, FERC and reviewing courts have held that existing conditions are the proper baseline for environmental analysis in the context of relicensing.⁸ Trying to establish what conditions were, or might have been, 50 years ago is unlikely to be accurate or defensible. Attempting to predict what conditions would be today if a project had not been built provides equally uncertain results. Current conditions are, therefore, the baseline under the FPA for comparison of relicensing alternatives.

1.1.2 NEPA Requirements

NEPA requires that federal agencies take a "hard look" at a project.⁹ However, NEPA does not require a "crystal ball inquiry."¹⁰ FERC's NEPA document "is required to furnish only such information as appears to be reasonably necessary under the circumstances for evaluation of the project rather than to be so all-encompassing in scope that the task of preparing it would become either fruitless or well-nigh impossible."¹¹

1.1.3 FERC's Study Criteria

Under FERC's regulations for the ILP, a study request must meet each of the seven required criteria. While some of the study requestors made an effort to address FERC's

³ 18 C.F.R. § 5.9(a).

⁴ 16 United States Code § 825(b).

⁵ *Allegheny Elect. Coop. v. FERC*, 922 F.2d 73, 80 (2d Cir. 1990).

⁶ *Wis. Power & Light Co. v. FERC*, 363 F.3d 453, 464 (D.C. Cir. 2004).

⁷ *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (quoting *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168 (1962)).

⁸ See, e.g., *Pub. Util. Dist. No. 1 of Chelan Cty.*, 107 FERC ¶ 61,280 at P 61 (2004) (citing *Am. Rivers v. FERC*, 187 F.3d 1007, *reh'g denied*, 201 F.3d 1186 (9th Cir. 1999)).

⁹ *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n.21 (1976).

¹⁰ *Nat. Res. Def. Council v. Morton*, 458 F.2d 827, 837 (D.C. Cir. 1972).

¹¹ *Nat. Res. Def. Council v. Callaway*, 524 F.2d 79, 88 (2d Cir. 1975) (citing *Indian Lookout Alliance v. Volpe*, 484 F.2d 11 (8th Cir. 1973)).

seven criteria, some study requestors did not demonstrate how their study requests were consistent with each criterion, or addressed the criterion in only a general way.

FERC's ILP regulations require that a study request must meet the following criteria:¹²

1. Describe the goals and objectives of each study proposal and the information to be obtained;
2. If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
3. If the requestor is not a resource agency, explain any public interest considerations in regard to the proposed study;
4. Describe existing information concerning the subject of the study proposal, and the need for additional information;
5. Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
7. Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The Licensees determined that a number of the studies requested did not meet the seven study criteria under FERC's regulations. These study requests fell into the following general categories: (1) request for study of pre-Project conditions (discussed above in Section 1.1.1); (2) lack of Project nexus; and (3) the study is unlikely to inform license conditions.

1.1.4 Lack of Connection between Project Operations and an Effect on a Resource

Under FERC's regulations, a study requestor must demonstrate a reasonable connection between project operations and effects on the resource in question.¹³ This "nexus" between the project's operation and a resource impact must not amount to mere speculation, but have a basis in fact and/or be informed by professional judgment. A study request cannot be used as an attempt to search for the existence of a "nexus." If the study request is an attempt to search for a project effect, it does not meet the

¹² 18 C.F.R. § 5.9(b).

¹³ *Id.* § 5.9(b)(5).

criteria for a study request. In *City of Centralia v. FERC*, the United States Court of Appeals for the D.C. Circuit found that an applicant could be required “to conduct a study when there is some evidence of a problem and a study is necessary to determine the extent of the harm.”¹⁴ The Court also held that an applicant does not have “a duty to determine if a problem exists,” and that it is not enough to speculate that a problem may exist or that the “evidence” of a problem is based on a “prediction based on opinions.”¹⁵

The United States Department of Agriculture, Forest Service (USFS), California Department of Fish and Wildlife (CDFW), and State Water Resources Control Board (SWRCB) have requested studies on Project effects in Piru Creek upstream of Pyramid Lake and in Castaic Creek upstream of the Project check-dams. These entities have not demonstrated a reasonable nexus between Project operations and effects on resources in these creek sections. FERC has set the geographic scope of environmental analysis in Piru Creek up to, but not upstream of, Pyramid Lake, and in Castaic Creek from Elderberry Forebay to Castaic Lake because it determined that Project operations may cumulatively affect water quality through these geographic reaches.¹⁶ Project operations have no direct, indirect, or cumulative effects on Piru Creek upstream of Pyramid Lake or in Castaic Creek upstream of the Project check-dam basins, and the Licensees have not adopted any study requests or portions of study requests that pertain to these creek sections.

1.1.5 Study Request Constitutes Basic Research and/or is Not Likely to Inform the Development of License Conditions

FERC’s policy and regulations provide that a study requestor must specify how the results of the study will inform the development of license conditions.¹⁷ It is not the purpose of relicensing to begin or support programs of multi-year research at an applicant’s expense, and studies should recognize the timeframe available under the ILP. A study request must show how the results of the study will provide information relevant to potential protection, mitigation, and enhancement (PM&E) measures, and not just contribute to general knowledge of a resource.

USFS, CDFW, and SWRCB have requested studies of the flow regime in Pyramid reach (i.e., the 18.4-mile-long section of Piru Creek between Pyramid Dam and the normal maximum water surface elevation [NMWSE] of Piru Lake).¹⁸ These studies are not likely to inform the development of license conditions. In 2003, the United States Department of the Interior, Fish and Wildlife Service (USFWS) notified DWR that water releases from Pyramid Dam, including minimum flows in the summer months for fish habitat, were resulting in unauthorized incidental take of the federal endangered (FE)

¹⁴ *City of Centralia v. FERC*, 213 F.3d 742, 749 (D.C. Cir. 2000).

¹⁵ *Id.* (citing *Bangor Hydro-Elec. Co. v. FERC*, 78 F.3d 659, 663 (D.C. Cir. 1996)).

¹⁶ Scoping Document 1 for the South SWP Hydropower Project § 4.1.2, Project No. 2426-227 (issued Sept. 30, 2016).

¹⁷ 18 C.F.R. § 5.9(b)(5).

¹⁸ Lake Piru is not part of the South SWP Project. See *Cal. Dep’t of Water Res. & City of Los Angeles*, 129 FERC ¶ 62,073 at P 6 n.6 (2009).

arroyo toad (*Bufo californicus*).¹⁹ USFWS stated that: “Without returning water releases from Pyramid Dam to a more natural flow regime, we believe that take of the endangered arroyo toad would continue to occur.”²⁰ Accordingly, USFWS stipulated that DWR should return Pyramid reach to a year-round natural flow regime and deliver State Water Project (SWP) water to United Water Conservation District (UWCD) at Lake Piru during the winter months when the higher flows would not interfere with arroyo toad reproduction.²¹

DWR then engaged in intensive consultations with USFWS, CDFW, USFS, and other interested parties to determine an operating schedule for Pyramid Dam that would comply with the ESA. The new flow regime to take effect in 2005 was based on the natural hydrology, with limited exceptions for emergency flood protection and periodic radial gate and other testing. The timing of water deliveries to UWCD would be changed to November through February and would be made in association with a natural runoff event, and in dry years there could be times in the summer with no surface water flow in Pyramid reach.²² DWR also completed an environmental review of the proposed flow regime under the California Environmental Quality Act, which consisted of public scoping, studies and analysis, consultation with the resource agencies and interested parties, and preparation of a Draft and Final Environmental Impact Report.

In February 2005, DWR filed a request for temporary waiver of the minimum streamflow requirements and other trout fishery requirements of license Articles 51 and 52.²³ Citing the need to avoid incidental take of arroyo toads, DWR requested that the minimum flow requirements be suspended in lieu of the modified flow regime approved by USFWS, pending FERC’s grant of a permanent license amendment. FERC granted the temporary waiver on April 12, 2005, following a public notice and comment period in which no entity objected to the waiver.²⁴ FERC, in its order, acknowledged that the species most likely to be affected by the new flow regime would be rainbow trout (*Oncorhynchus mykiss* [*O. mykiss*]), and that the new summer conditions “may eliminate the majority of trout occurring in middle Piru Creek²⁵ between July and October.”²⁶ Nonetheless, FERC stated: “If the waiver request were denied, the current flow release schedule *would cause additional losses of arroyo toad* and adversely affect its habitat.”²⁷ Therefore, FERC concluded: “[T]he proposed modified natural flow regime

¹⁹ Letter to E. Begley, California Department of Water Resources, from B. Fahey, USFWS, Project No. 2426-000 (dated Aug. 20, 2003) (attached to Request for Temporary Waiver or Amendment of License Requirements filed on Feb. 10, 2005).

²⁰ *Id.* at 3.

²¹ *Id.* at 2-3.

²² Natural inflows at Pyramid Lake account for approximately 3 percent of total inflow, and in drier years, there is no inflow at all to Pyramid Lake. Pre-Application Document at 3-24.

²³ Request for Temporary Waiver or Amendment of License Requirements, Project No. 2426 (filed Feb. 10, 2005).

²⁴ *Cal. Dep’t of Water Res. & City of Los Angeles*, 111 FERC ¶ 62,040 (2005).

²⁵ “middle Piru Creek” and “Pyramid reach” are different names for the same section of Piru Creek.

²⁶ *Id.* at p. 64,068.

²⁷ *Id.* at p. 64,068-69.

would avoid incidental take of the federally listed arroyo toad and provide benefits by controlling non-native plant and animal species.”²⁸

In October 2009, following its issuance of a draft and final Environmental Assessment under NEPA and the SWRCB’s issuance of a water quality certification pursuant to Section 401 of the CWA, FERC granted a permanent license amendment to codify the new flow regime.²⁹ Based on the extensive record, thorough federal and state level environmental reviews, and the unequivocal position of the USFWS, FERC found that: “Sustained summer flows and attenuated winter storm flows in the project reach have caused the unauthorized take of the arroyo toad and the deterioration of its habitat.”³⁰ Conversely, FERC concluded: “[A]mending the project license consistent with the proposed action would restore habitat for the arroyo toad (*Bufo californicus*) (FE) and improve habitat for other special-status species. The proposed action would benefit arroyo toads by increasing geomorphic processes, providing the scouring needed to reduce riparian and emergent vegetation, increasing stream terraces and sand bars, and providing the natural fluvial process to redistribute sediments.”³¹ In approving the license amendment, FERC overruled various objections by California Trout, Inc. (CalTrout) and Friends of the River including their concerns regarding impacts on rainbow trout.

In sum, the Licensees are required under the ESA to maintain the flow regime approved by FERC in 2009 to prevent unauthorized take of the arroyo toad. The requirement to obtain a new license under the FPA does not change the Licensees’ or FERC’s ESA obligations to prevent illegal take of the toads. Additional studies of the flow regime in Pyramid reach will not inform the development of license flow requirements, because both FERC and the Licensees are prohibited under the ESA from altering the flow regime below Pyramid Dam. These issues were thoroughly vetted in the proceedings leading to the 2009 license amendment and there have been no significant changes to warrant restudying them now.

In contrast, there are no listed anadromous fish species in Pyramid reach, and National Marine Fisheries Service (NMFS) has acknowledged it has no jurisdiction to require a change to the flow regime for the protection of listed anadromous fish species.³² The FE distinct population segment (DPS) of the Southern California steelhead (*O. mykiss*) and its designated critical habitat do not occur in the Project area because the Santa Felicia Dam blocks all upstream steelhead migration into Pyramid reach.³³ The resource agencies and CalTrout have requested studies of the flow regime in Pyramid reach in

²⁸ *Id.* at p. 64,069 (emphasis added).

²⁹ *Cal. Dep’t of Water Res. & City of Los Angeles*, 129 FERC ¶ 62,073 at P 56.

³⁰ *Id.* at P 33.

³¹ *Id.* at P 56.

³² NMFS Comments on Pre-application Document and Scoping Document 1 at Section 3.0, Project No. 2426-227 (filed Nov. 28, 2016).

³³ *Cal. Dep’t of Water Res. & City of Los Angeles*, 129 FERC ¶ 62,073 at P 42.

the event of future reintroduction of steelhead at Santa Felicia Dam.³⁴ As the Licensees discussed in their comments on Scoping Document 1 (SD1), studies or analyses of potential Project effects on steelhead passage and habitat—in the event steelhead may someday be introduced upstream of Santa Felicia Dam—would be entirely premature and dependent on the outcome of steelhead passage efforts at Santa Felicia Dam, which are not reasonably certain to occur in the near future.³⁵

In summary, the Licensees have not adopted any study requests or portions of study requests related to flow in Pyramid reach.

1.2 SUMMARY

Nine stakeholders filed comments on the Licensees' PAD. Five of the stakeholder's comment letters included 66 specific study requests. As shown in Table 1.2-1, many of the study requests were similar in purpose and scope. Table 1.2-1 is an overview of the study requests, the stakeholder or stakeholders requesting the studies, and whether the Licensees adopt without modification, adopt with modifications, or decline to adopt the study request in the PSP. More detail is provided in Section 2.0 of this PSP. The four stakeholders that filed comments on the PAD and did not include specific study requests were CalTrout, USFWS, NMFS, and the Federal Emergency Management Agency. Of these four agencies, NMFS, supported USFS and other federal and State agency's study requests.

³⁴ NMFS Comments on Pre-Application Document at Section 3.0; United States Department of Agriculture, Forest Service Comments on Pre-Application Document and Scoping Document 1, Project No. 2426-227 (filed Nov. 28, 2016); California Trout Comments on Pre-Application Document and Scoping Document 1 at 3-4, Project No. 2426-227 (filed Nov. 29, 2016).

³⁵ Comments of California Department of Water Resources and Los Angeles Department of Water and Power on Scoping Document 1 at 3-6, Project No. 2426-000 (filed Dec. 12, 2016).

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Table 1.2-1. Stakeholder Requested New Studies

USFS Study Requests	CDFW Study Requests	SWRCB Study Requests	AW Study Requests	NPS Study Requests	Licensees' Reply to Requested Study
Bioaccumulation		Bioaccumulation Study			Not Adopted
Physical Habitat Simulation (PHABSIM) for Fish Populations Upstream and Downstream of Pyramid Lake	Physical Habitat Simulation (PHABSIM) for Fish Populations Upstream and Downstream of Pyramid Lake	Physical Habitat Simulation for Fish Populations			Not Adopted
Algae Upstream, Downstream, and Within Pyramid Lake					Not Adopted
Benthic Macroinvertebrates Upstream and Downstream of Pyramid Lake	Benthic Macroinvertebrates Upstream and Downstream of Pyramid Lake	Aquatic Invertebrates Study			Not Adopted
Stream Fish Populations Downstream of Pyramid Dam	Stream Fish Populations Downstream of Pyramid Dam	Fish Populations (Streams)			Adopted with Modification
Stream Fish Populations Upstream of Pyramid Dam	Stream Fish Populations Upstream of Pyramid Dam				Not Adopted
Aquatic Invasive Species	Comprehensive Aquatic Invasive Species Survey				Adopted with Modification
Environmental DNA (eDNA) on Upper and Middle Piru and Within Pyramid and Quail Lakes					Adopted with Modification
Water Quality	Water Quality	Water Quality Assessment			Adopted with Modification
Channel Morphology	Channel Morphology	Channel Morphology Assessment			Not Adopted
Hydrologic Alteration / Flow Regime	Hydrologic Alteration / Flow Regime	Indicators of Hydrologic Alteration			Adopted with Modification
Fish Passage	Fish Passage	Fish Passage			Not Adopted
Wildlife Study Plan: Bats	Wildlife (Bats)				Adopted with Modification
Wildlife Study Plan: Large Mammal Movement	Wildlife Study Plan – Large Mammal Movement				Adopted with Modification
Wildlife Study Plan: Raptors Species					Adopted with Modification
Wildlife Study Plan: ESA Terrestrial Species	Special-status Species – Special-status Terrestrial Species (Avian, Mammal, Invertebrate)				Adopted with Modification
Wildlife Study Plan: TES Reptiles and Amphibians	Special-status Species – Reptile and Amphibian				Adopted with Modification
Wildlife Study Plan: Migratory Bird Act Treaty Protected Bird Species, Forest Service Sensitive Species, CDFW Fully Protected and Species of Special Concern					Adopted with Modification
Botanical Resources	Botanical Resources				Adopted with Modification
Invasive Noxious Weeds	Comprehensive Non-native Plant Survey (Aquatic and Terrestrial)				Adopted with Modification
Engineering					Adopted with Modification
Large Woody Debris	Large Woody Debris				Not Adopted

Table 1.2-1. Stakeholder Requested New Studies (continued)

USFS Study Requests	CDFW Study Requests	SWRCB Study Requests	AW Study Requests	NPS Study Requests	Licensees' Reply to Requested Study
Groundwater	Groundwater				Not Adopted
Groundwater Dependent Ecosystems	Groundwater Dependent Ecosystems				Not Adopted
Scenery Integrity Objective Study					Adopted with Modification
Assess Projected Recreation Use and Demand in the Project Area					Adopted with Modification
Assess Recreation Carrying Capacity of the Project Area					Adopted with Modification
Assess Regional Uniqueness and Significance of the Project Area's Primary Recreation Opportunities					Adopted with Modification
Assess Fire Hazards from Project-Induced Recreation					Not Adopted
Whitewater Boating Study			Whitewater Recreation Study	Whitewater Boating Study	Not Adopted
Project-Related Roads Maintenance and Use Study					Not Adopted
Water Temperature Monitoring and Development of Water Temperature Model		Water Temperature Model			Adopted with Modification
	Fish Entrainment Risk Assessment	Fish Entrainment			Adopted with Modification
	Comprehensive Argentine Ant Survey				Not Adopted
	Herbicide, Pesticide and Rodenticide Effects on Vegetation and Wildlife				Not Adopted
		Water Balance / Operations Model			Not Adopted
		Fish Populations (Reservoirs)			Adopted with Modification
Requested Studies – 32	Requested Studies – 21	Requested Studies – 12	Requested Studies – 1	Requested Studies – 1	21 – Adopted with Modification 16 – Not Adopted
Total Requested Studies – 37					37

Key:
 AW = American Whitewater
 CDFW = California Department of Fish and Wildlife
 ESA = Federal Endangered Species Act
 eDNA = environmental deoxyribonucleic acid
 NPS = United States Department of the Interior, National Park Service
 PHABSIM = Physical Habitat Simulation
 SWRCB = State Water Resources Control Board
 TES = Threatened, Endangered and Sensitive
 USFS = United States Department of Agriculture, Forest Service

2.0 REPLY TO STAKEHOLDER STUDY REQUESTS

The Licensees’ replies to stakeholder study requests are provided below. The replies address elements of the stakeholder study requests that were adopted, adopted with modification, or were not adopted as part of this PSP. Similar elements of studies requested by multiple stakeholders are addressed together in the following sections.

2.1 BIOACCUMULATION STUDY REQUEST (USFS AND SWRCB)

USFS requested a study named *Bioaccumulation* (USFS, pp. 42 through 51). In general, the goal of the requested study is to provide the California Office of Environmental Health Hazard Assessment (OEHHA) “with the information needed, if any, to develop consumption recommendations for targeted species” (USFS, p. 42). The study area would include Pyramid Lake and Quail Lake. USFS estimated the cost to complete its requested study between \$100,000 and \$120,000.

The SWRCB requested a study named *Bioaccumulation* (SWRCB, Attachment B, pp. 14 through 17). The SWRCB’s study goals are similar to the USFS’ study goals. The SWRCB states the goal of its study is to provide the OEHHA with the “information needed to determine if the 2013 Health Advisory Guidelines for Eating Fish from Pyramid Lake (Los Angeles County) March 2013 (2013 Health Advisory) recommendations are adequately protective of public health and provide the basis for updating health advisories during the term of the new license.” (SWRCB, Attachment B, p. 14). The SWRCB estimated the cost to complete its requested study between \$80,000 and \$100,000.

As described below, the Licensees have not adopted the study requests.

Request Elements	Licensees’ Reply
Request Element #1 – Conduct a bioaccumulation study	<p>NOT ADOPTED. The Licensees have not adopted the USFS’ and SWRCB’s request for a <i>Bioaccumulation Study</i> for four reasons. First, both the USFS and SWRCB base their study requests on their stated need for information for OEHHA. However, the Licensees note that OEHHA, the California agency with jurisdiction to collect such information and to limit recreation fishing at Quail Lake and Pyramid Lake, has not expressed any need for the information. Nor does USFS or the SWRCB state that OEHHA advised them that a need existed. (Criterion 4)</p> <p>Second, neither the USFS nor the SWRCB have provided any evidence regarding why the information on which OEHHA established health advisory guidelines for eating fish from Pyramid Lake in 2013 is no longer adequate (Criterion 4).</p> <p>Third, the USFS and SWRCB both did not adequately describe a nexus between Project operations and their effect on bioaccumulation. The USFS states: “The California Department of Water Resources (DWR) and the Los Angeles Department of Water and Power (LADWP) (Licensees) continued operation and maintenance (O&M) of the existing South SWP Hydropower Project (Project) has a potential to increase methyl mercury, arsenic,</p>

	<p>cadmium, copper, selenium, silver, polychlorinated biphenyls, legacy pesticides, polybrominated diphenyl ethers, dioxins, dibenzofurans, organophosphates, polycyclic aromatic hydrocarbons, tributyltin, microcystin, Omega-3 fatty acids, and other emerging contaminants in the system, making it available for bioaccumulation through various trophic levels of the aquatic ecosystem,” but offers no explanation as to the mechanism through which Project O&M would do this. Similarly, the SWRCB’s request states: “Impoundment of water (including accumulation of sediment) and operation of Project facilities have the potential to increase the bioavailability of chemicals of concern, particularly mercury.” While the disturbance of sediments in reservoirs can promote the mobilization of mercury, Pyramid Lake is operated under strict limitations on the levels to which water surface elevations can fluctuate. Quail Lake is operated as a forebay to the William E. Warne Powerplant and, as such, does not experience significant fluctuations in water surface elevation. Further, the Licensees do not propose to alter operations in a manner that would change these minor reservoir fluctuations or in any way disturb sediment in the reservoirs. Nor does the Project use any of the chemicals described by the SWRCB. In short, neither the USFS nor SWRCB has established a reasonable Project nexus. (Criterion 5)</p> <p>Fourth, the Commission previously rejected a request for a bioaccumulation study for the agencies under similar circumstances. In its September 14, 2009 Study Plan Determination for the Merced River Hydroelectric Project (FERC Project No. 2179), the Commission stated, “but because MID [Merced Irrigation District, the applicant] is not proposing to alter project operations to increase water fluctuations or mobilize substrates, we find the study is not necessary. In their August filing, the Resource Agencies and Conservation Groups suggest that the existence of Project impoundments provides a nexus between the Project and mercury bioaccumulation. We note that the baseline for the NEPA analysis of the Project is existing conditions, not the original construction of the Project reservoirs. Due to the lack of a nexus between Project operation and the resource to be studied, and because the proposed study would not inform the development of license requirements (Criterion 5), we do not adopt this requested study.” Thus, the Commission itself declined to require a similar requested study because it did not have a project nexus and would not inform license requirements, and should draw the same conclusion here (Criterion 5).</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ and SWRCB’s requests.</p>
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2.2 PHYSICAL HABITAT SIMULATION (PHABSIM) FOR FISH POPULATIONS UPSTREAM AND DOWNSTREAM OF PYRAMID LAKE STUDY REQUEST (USFS AND CDFW), PHYSICAL HABITAT SIMULATION FOR FISH POPULATIONS STUDY REQUEST (SWRCB)

USFS requested a study named *Physical Habitat Simulation (PHABSIM) for Fish Populations Upstream and Downstream of Pyramid Lake* (USFS, pp 52 through 59). In

general, the goal of the requested study is “to quantify fish habitat as a function of stream flow” (USFS, p. 52). The study plan title and text suggest that the study be conducted in Piru Creek upstream and downstream of Pyramid Dam. Section 6.1 (Study Area) of the study request states that the study would be conducted in six reaches, but then only identifies two: (1) Pyramid reach, including the 18-mile-long section from Pyramid Dam to the Blue Point Campground; and (2) Castaic reach, including the five-mile-long section from Elderberry Forebay to the confluence of Dry Creek. The requested study would include selecting final study sites and transect locations in the study reaches in consultation with resource agencies. The plan states that PHABSIM modeling would focus on rainbow trout (*O. mykiss*), arroyo chub (*Gila orcutti*), and Santa Ana sucker (*Catostomus santaanae*). The USFS states that the results of the PHABSIM study would be used in setting an appropriate flow regime (i.e., magnitude, timing, and duration) in order to ensure the long-term viability of aquatic species downstream of Pyramid Lake (USFS, p. 52). USFS estimated the cost to complete its requested study between \$180,000 and \$250,000.

The CDFW requested a new study named *Physical Habitat Simulation (PHABSIM) for Fish Populations Upstream and Downstream of Pyramid Lake*, (CDFW, Attachment 1), which is essentially identical to USFS’ requested study. Notably, CDFW’s study identifies the same two study reaches in Pyramid reach as those identified by the USFS, but does not include the area upstream of Pyramid Lake, though CDFW’s study plan title suggests otherwise.

The SWRCB requested a study named *Physical Habitat Simulation for Fish Populations* (SWRCB, Attachment B, pp. 17 through 22), which is also essentially the same as the USFS’ requested study, with three exceptions: (1) the SWRCB study only proposes the application of PHABSIM downstream of Pyramid Dam; (2) the SWRCB plan includes a barrier assessment, presumably for upstream migration of fishes in Pyramid reach; and (3) the SWRCB’s study does not identify any target species. The SWRCB states that results from the study would be used to develop mitigation measures informing the development of new Project flows for aquatic habitat and upstream migration of aquatic organisms (SWRCB, Attachment B, p. 18).

The Licensees note that NMFS stated its support for the other federal and State agencies’ requests regarding habitat and flow (PHABSIM) modeling of salmonid life stages and barrier assessment in Pyramid reach (NMFS, pp. 5 and 6), but NMFS did not request any specific studies. NMFS states that the agencies’ requests would inform how the Project could potentially affect *O. mykiss*, and that these fish will play an important role in the recovery of the endangered Southern California steelhead population (NMFS, p. 6). The Licensees do not adopt the requests for habitat and flow modeling, as discussed below, and do not agree that the requests would inform how the Project could potentially affect *O. mykiss*, for the reasons stated in Section 1.1.5 of this PSP.

As described below, the Licensees did not adopt the USFS’, CDFW’s and SWRCB’s, requested studies.

Request Elements	Licensees' Reply
Request Element #1 – Conduct a PHABSIM study in Piru Creek upstream of Pyramid Lake	<p>NOT ADOPTED. The Licensees did not adopt the USFS' request for a PHABSIM study in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream fish habitat and thus there is no Project nexus for the study.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS' request that are specifically related to the development of a PHABSIM model and subsequent analysis in Piru Creek upstream of Pyramid Lake.</p>
Request Element #2 – Conduct a PHABSIM study in Pyramid reach	<p>NOT ADOPTED. The Licensees did not adopt the USFS', CDFW's, and SWRCB's request for a PHABSIM study in Pyramid reach for the reasons stated in Section 1.1.5 of this PSP. Because the current flow regime is required by the ESA to prevent unauthorized take of arroyo toads, a study of impacts of alternative flow regimes on fish habitat is not likely to inform development of new license conditions. In addition, the current flow regime follows the natural hydrograph with limited exceptions such as the addition of up to 3,150 acre-feet of water delivery in the winter months in association with a natural runoff event.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS', CDFW's, and SWRCB's request that are specifically related to the development of a PHABSIM model and subsequent analysis in Pyramid reach.</p>
Request Element #3 – Conduct a fish passage barriers assessment in Pyramid reach	<p>NOT ADOPTED. The Licensees did not adopt the SWRCB's request for a fish barriers assessment in Pyramid reach for the same reasons described in the Licensees' reply to Request Element #2. Currently, the flows mimic the natural hydrograph to protect an endangered species. In addition, the SWRCB has not established that there is an issue regarding fish barriers in Pyramid reach (i.e. rainbow trout are found throughout the reach). Nor has SWRCB established a nexus between the Project and fish barriers if they were to occur in the reach (Criterion 5). In essence the SWRCB request appears to be more of a research study.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the SWRCB's request that are specifically related to the development of a fish barriers assessment in Pyramid reach.</p>
Request Element #4 – Conduct a PHABSIM study upstream of Elderberry Forebay on 5 miles of Castaic Creek	<p>NOT ADOPTED. The Licensees did not adopt the USFS' request for a PHABSIM study in Castaic Creek upstream of check-dam basins for reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream fish habitat and thus there is no Project nexus for the study.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS' request that are specifically related to the development of a PHABSIM model and subsequent analysis in Castaic Creek upstream of check-dam basins.</p>

2.3 ALGAE UPSTREAM, DOWNSTREAM AND WITHIN PYRAMID LAKE STUDY REQUEST (USFS)

USFS requested a study named *Algae Upstream, Downstream and Within Pyramid Lake* (USFS, pp. 60 through 75). In general, the goal of the requested study is “to characterize algal assemblages within Project-affected reaches upstream (control), downstream and within Pyramid Dam using the Surface Water Ambient Monitoring Program (SWAMP) protocols...” (USFS, p. 60). The study area would include areas of Piru Creek and tributaries above Pyramid Lake, Pyramid Dam, and Pyramid reach and tributaries. Pyramid Dam would be sampled for floating and suspended algae. USFS estimated the cost to complete its requested study between \$180,000 and \$215,000.

As described below, the Licensees did not adopt the USFS’ requested studies.

Request Elements	Licensees’ Reply
Request Element #1 – Conduct algae sampling in Piru Creek upstream of Pyramid Lake	<p>NOT ADOPTED. The Licensees did not adopt the USFS’ request for an algae study in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream water quality and thus there is no Project nexus for the study (Criterion 5).</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ request that are specifically related to an algae study in Piru Creek upstream of Pyramid Lake.</p>
Request Element #2 – Conduct algae sampling in Pyramid reach	<p>NOT ADOPTED. The Licensees did not adopt this element of the requested study because USFS did not adequately describe the need for the information or establish a Project nexus. First, USFS provided no information to suggest that algae are currently an issue in Pyramid reach (Criterion 4).</p> <p>Second, USFS did not adequately describe a nexus between Project operations and algae in Pyramid reach. The Licensees perform no work in the reach, and do not introduce any chemicals or substances that would introduce or spread algae in Pyramid reach. (Criterion 5)</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ request that are specifically related to an algae study in Pyramid reach. However, incidental observations of algae will be recorded during relicensing studies.</p>
Request Element #3 – Conduct algae sampling in Pyramid Lake	<p>NOT ADOPTED. The Licensees did not adopt this element of the requested study because USFS did not describe why the existing information and the information the Licensees routinely collect regarding algae in Pyramid Lake are not adequate. As described in the Licensees’ PAD, the Licensees detected algal blooms in Pyramid Lake during sampling events in 2013, 2014, and 2015. Species that dominated microcystin-producing algal blooms in the Lake include <i>Microcystis</i> spp., <i>Woronichinia naegeliana</i>, <i>Gloetrichia</i> sp., <i>Limnoraphis birgei</i>, <i>Aphanizomenon</i> spp., <i>Dolichospermum</i> sp., and <i>Planktothrix</i> sp. Based on this information, the Licensees obtained a National Pollutant Discharge Elimination System (NPDES) permit to periodically treat Pyramid Lake for algae. This existing</p>

	<p>information and any additional data collected by the Licensees during the implementation of the NPDES permit and treatment of algae in Pyramid Lake will be included in the Licensees' Draft Application for a New License (DLA) and Final Application for a New License (FLA), and is adequate for the development of license requirements. (Criterion 5)</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS' request that are specifically related to an algae study in Pyramid Lake.</p>
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2.4 BENTHIC MACROINVERTEBRATES UPSTREAM AND DOWNSTREAM OF PYRAMID LAKE STUDY REQUEST (USFS AND CDFW) AND AQUATIC INVERTEBRATE STUDY REQUEST (SWRCB)

USFS requested a study named *Benthic Macroinvertebrates Upstream and Downstream of Pyramid Lake* (USFS, pp 76 through 87). In general, the goal of the requested study is “to characterize benthic macroinvertebrate (BMI) taxonomical, biomass, and density assemblages as well as habitat within Project-affected reaches” (USFS, p. 77). The USFS states “Instream flow requirements” (USFS, pp. 78 through 79) as the only potential license condition that the requested study would inform. The study area would include Piru Creek and its tributaries upstream and downstream of Pyramid Dam. The requested study would include conducting SWAMP data collection at three sites in ten reaches. USFS estimated the cost to complete its requested study between \$180,000 and \$215,000.

CDFW requested a study named *Benthic Macroinvertebrates Upstream and Downstream of Pyramid Lake* (CDFW, Attachment 1) that is essentially identical to USFS' requested study. CDFW does not make any statements about how the results of the requested study would be used.

SWRCB requested a study named *Aquatic Invertebrates Study* (SWRCB, Attachment A, pp. 55 through 63) that is also essentially the same as the study requested by USFS, except that the SWRCB did not request a study in Piru Creek upstream of Pyramid Dam. The SWRCB's requested study states that the information from the study would be used for “ensuring that Project flows are protective of the designated beneficial uses...” (SWRCB, Attachment B, p. 49).

As described below, the Licensees did not adopt the USFS', CDFW's and, SWRCB's requested studies.

Request Elements	Licensees' Reply
Request Element #1 – Conduct BMI surveys in Piru Creek upstream of Pyramid Lake, and in Buck Creek, and Snowy Creek, tributaries to Piru Creek	NOT ADOPTED. The Licensees did not adopt the USFS' and CDFW's requests for BMI surveys in Piru Creek and some of its tributaries upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream aquatic habitat and thus there is no Project nexus for the study (Criterion 5).

	<p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ request that are specifically related to BMI surveys in Piru Creek upstream of Pyramid Lake.</p>
<p>Request Element #2 – Conduct BMI surveys in Pyramid reach, and in Fish Creek and Agua Blanca Creek, tributaries to Pyramid reach</p>	<p>NOT ADOPTED. The Licensees did not adopt the USFS’, CDFW’s and SWRCB’s request for BMI surveys in Pyramid reach and some of its tributaries for the reasons stated in Section 1.1.5 of this PSP (i.e. BMI abundance is largely dependent on flows and the current flow regime is required by the ESA to prevent unauthorized take of arroyo toads).</p> <p>Further, neither USFS nor CDFW or SWRCB provide any evidence to suggest that there is a Project-related problem with BMI in Pyramid reach and its tributaries. As stated in Section 1.1.4, “If the study request is an attempt to search for a project effect, it does not meet the criteria for a study request.”</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’, CDFW’s and SWRCB’s request that are specifically related to conducting BMI surveys in Pyramid reach, and in Fish Creek and Agua Blanca Creek, tributaries to Pyramid reach.</p>

2.5 STREAM FISH POPULATIONS DOWNSTREAM OF PYRAMID DAM STUDY REQUEST (USFS AND CDFW) AND FISH POPULATIONS (STREAMS) STUDY REQUEST (SWRCB)

USFS requested a study named *Stream Fish Populations Downstream of Pyramid Dam* (USFS, p. 88 through 102). In general, the goal of the requested study is “to provide current information on fish in Project-affected streams” (USFS, p.88). The study area would include Piru Creek downstream of Pyramid Dam and its tributaries. USFS estimated the cost to complete its requested study between \$140,000 and \$200,000.

CDFW’s requested a study named *Stream Fish Populations Downstream of Pyramid Dam* (CDFW, Attachment 1) that is essentially identical to USFS’ requested study, with the exception of one additional stream reach and three sampling sites.

The SWRCB’s requested a study named *Fish Populations (Streams)* (SWRCB, Attachment A, pp. 28 through 39) is also essentially the same as the USFS’ requested study.

As described below, the Licensees’ proposed *Pyramid Reach Fish Populations Study* in Section 3.1.3 of this PSP adopts some, but not all, of the elements in USFS’, CDFW’s, and SWRCB’s requested studies.

Request Elements	Licensees’ Reply
<p>Request Element #1 – Select fish sampling sites</p>	<p>ADOPTED WITH MODIFICATION. The Licensees’ proposed <i>Pyramid Reach Fish Populations Study</i> includes three study sites in the reach between Pyramid Dam and the normal maximum water surface elevation of Lake Piru. The Licensees did not include sites requested by the USFS, CDFW, and SWRCB in Fish Creek and Agua</p>

	<p>Blanca Creek, or the North Fork of Fish Creek. The agencies did not adequately describe the Project nexus (Criterion 5) with Fish Creek, the North Fork of Fish Creek, or Agua Blanca Creek. These streams are tributaries to Pyramid reach and the Licensees perform no work and do not control flow in the tributaries. Additionally, the USFS, CDFW, and SWRCB requested three sampling sites in each stream reach, for a total of nine sites in the Pyramid reach, but did not provide a rationale for such extensive sampling. The reach includes three hydrologically distinct segments (upstream of Fish Creek, between Fish Creek and Agua Blanca Creek, and downstream of Agua Blanca Creek), which will be adequately represented by one of the Licensees' three proposed study sites.</p>
<p>Request Element #2 – Collect fish population data using electrofishing</p>	<p>ADOPTED. The Licensees adopted USFS', CDFW's, and SWRCB's request to use electrofishing to collect fish population information, with snorkeling as an alternative method.</p>
<p>Request Element #3 – Collect fry emergence data</p>	<p>NOT ADOPTED. The Licensees did not adopt the fry emergence sampling requested by the USFS, CDFW, and SWRCB because the agencies did not adequately describe the Project nexus (Criterion 5) for Fish Creek and Agua Blanca Creek. As described above, the Licensees perform no work and do not control flows in these creeks. The Licensees did not adopt the agencies' requested fry emergence survey in Pyramid reach because the agencies did not describe how these data would inform license requirements (Criterion 5). Further, the agencies' statement that the timing of fry emergence "is an area of interest to better define fry periodicity in the study area" (USFS, p. 97, CDFW, Attachment 1; and SWRCB, Attachment B, p.34) infers this is a research study, and therefore a study that is not needed to inform license requirements as described in Section 1.1.5 of this PSP.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS', CDFW's, and SWRCB's requests that are specifically related to collecting emergence data in two years and analysis of fry emergence data.</p>
<p>Request Element #4 – Collect fish population data in two consecutive years</p>	<p>ADOPTED WITH MODIFICATION. The Licensees' proposed <i>Pyramid Reach Fish Populations Study</i> will be conducted in one year. The Licensees did not adopt USFS', CDFW's, and SWRCB's request for a second year of data because the agencies did not justify the need for two years of data. Further, the ILP provides a process under which a stakeholder may request a modification to a study after the data from the first year are reviewed. The Licensees will include the results of its fish sampling in its Initial Study Report (ISR), and if any interested relicensing stakeholders believe that additional data are required to accomplish study objectives, the stakeholder may request, with adequate justification, that FERC direct the Licensees to modify the study to collect a second year of data. There is no justification or need to require two years of data at this time.</p>
<p>Request Element #5 – Conduct Quality Assurance/Quality Control (QA/QC) analysis and analyze data</p>	<p>ADOPTED WITH MODIFICATION. The Licensees' proposed <i>Pyramid Reach Fish Populations Study</i> and the USFS', CDFW's, and SWRCB's study requests are essentially identical in their proposed QA/QC and analyses of data.</p>

Request Element #6 – Provide a report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC’s ILP regulations. Available information will be provided to interested parties in the ISR, Updated Study Request (USR), DLA, and FLA. See Section 4.0 for additional information on reporting of study results.
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2.6 STREAM FISH POPULATIONS UPSTREAM OF PYRAMID DAM STUDY REQUEST (USFS AND CDFW)

USFS requested a study named *Stream Fish Populations Upstream of Pyramid Dam* (USFS, pp. 103 through 116). In general, the goal of the requested study would be “to provide current information on fish in Project-affected streams” (USFS, p. 103). The study area would include Piru Creek upstream of Pyramid Dam and Buck Creek. USFS estimated the cost to complete its requested study between \$140,000 and \$200,000.

CDFW’s requested study named *Stream Fish Populations Upstream of Pyramid Dam* (CDFW, Attachment 1) is very similar to USFS’ requested study, with some notable exceptions. The goal of CDFW’s proposed study is “to provide current information on fish in Project-affected streams *and* to provide baseline information of fish populations in the upper portions of the Piru Creek watershed as reference sites for comparison to fish populations in Project-affected stream areas.” The study area expands on that proposed by USFS to include Snowy Creek, Lockwood Creek, Mutau Creek, Alamo Creek, and Cedar Creek, but does not include Buck Creek. CDFW estimates the cost to complete its requested study to be the same as USFS’ estimated cost, even though CDFW added sampling in five additional locations.

As described below, the Licensees did not adopt USFS’ and CDFW’s study requests.

Request Elements	Licensees’ Reply
Request Element #1 – Conduct fish population study in Piru Creek upstream of Pyramid Lake	NOT ADOPTED. The Licensees did not adopt the USFS’ and CDFW’s request for a fish populations study in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream fish populations and thus there is no Project nexus for the study (Criterion 5). Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ and CDFW’s requests.

2.7 AQUATIC INVASIVE SPECIES STUDY REQUEST (USFS) AND COMPREHENSIVE AQUATIC INVASIVE SPECIES SURVEY STUDY REQUEST (CDFW)

USFS requested a study named *Aquatic Invasive Species* (USFS, pp. 117 through 125). In general, the goal of the requested study would be to “document presence and distribution of aquatic invasive species within the study area and project related facilities, specifically waterways and lakes...” (USFS, p. 117). The study area would include all Project facilities, “and project-affected stream reaches in the vicinity of project dams (e.g., within about ¼ mile)...” and developed recreation sites. The requested

study did not include detailed elements, instead stating, “The Licensees will select sample site locations in consultation with [agencies]...” for Step 1 – Initial Reconnaissance and Study Site Selection, and provided no details for Step 2 – Focused Surveys. In addition, study methods were not identified. USFS estimated the cost to complete its requested study between \$120,000 and \$145,000.

With the exception of limiting the study area to all Project facilities, Pyramid reach, and Castaic Creek at Elderberry Forebay and developed recreation sites, CDFW’s requested study named *Comprehensive Aquatic Invasive Species Survey Study Request* (CDFW, Attachment 1) is essentially identical to USFS’s requested study. CDFW’s cost estimate to perform its study is the same as USFS’s, even though the USFS’ study would have a much larger study area.

As described below, the Licensees’ proposed *Aquatic Invasive Species (AIS) Study* in Section 3.1.1 of this PSP adopts some of USFS’ and CDFW’s requested studies.

Request Elements	Licensees’ Reply
Request Element #1 – Conduct AIS surveys in Pyramid reach	<p>NOT ADOPTED. The Licensees rarely perform Project O&M work in Pyramid reach, and when the work occurs, all clean equipment protocols are followed. Nor are there any Project recreation facilities in the reach. Therefore, the Project would not introduce AIS directly into the reach.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ request that are specifically related to AIS surveys in Pyramid reach. However, incidental observations of AIS will be recorded during relicensing studies.</p> <p>In December 2016, the Licensees found quagga mussels in the Angeles Tunnel during a routine tunnel inspection. Mussels were removed and the observation reported to CDFW as required by State regulations. If CDFW subsequently requires the Licensees to conduct additional quagga mussel surveys, the Licensees will provide this information during the relicensing.</p>
Request Element #2 – Conduct AIS surveys in Castaic Creek upstream of Elderberry Forebay	<p>NOT ADOPTED. The Licensees did not adopt the USFS’ request for AIS surveys in Castaic Creek upstream of check-dam basins for the reasons stated in Section 1.1.4 of this PSP.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ request that are specifically related to AIS surveys in Castaic Creek upstream of check-dam basins.</p>
Request Element #3 – Conduct AIS surveys in stream reaches within 0.25 miles of the Project	<p>NOT ADOPTED. The Licensees did not adopt the USFS’ request for AIS surveys in stream reaches within 0.25 miles of the Project for two reasons. First, USFS provides no indication that there are Project-related AIS impacts in stream reaches 0.25 mile away from the Project, so the need for the information has not been established (Criterion 4). Second, USFS does not describe the nexus to the Project (Criterion 5). There is no Project O&M in tributaries a quarter mile upstream of the Project, therefore, Project O&M would not introduce AIS in these upstream tributaries.</p>

Request Element #4 – Perform AIS surveys in Pyramid Lake at sites to be determined in consultation with agencies	ADOPTED WITH MODIFICATION. The Licensees have not adopted USFS’ and CDFW’s request that AIS survey sites in Pyramid Lake be selected in consultation with agencies because there is no need to delay specifying the locations. The Licensees’ proposed <i>AIS Study</i> lists nine locations in Pyramid Lake where AIS surveys will be performed. In addition, the Licensees’ proposed <i>AIS Study</i> includes surveys for AIS clams and snails at one location in Elderberry Forebay and two locations in Quail Lake.
Request Element #5 – Determine study methods in consultation with agencies	ADOPTED WITH MODIFICATION. The proposed <i>AIS Study</i> describes the methods the Licensees propose to employ.
Request Element #6 – QA/QC data	ADOPTED. The Licensees’ proposed <i>AIS Study</i> includes QA/QC of all data.
Request Element #7 – Prepare study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC’s ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.8 ENVIRONMENTAL DNA (eDNA) ON UPPER AND MIDDLE PIRU AND WITHIN PYRAMID AND QUAIL LAKES STUDY REQUEST (USFS)

USFS requested a study named *Environmental DNA (eDNA) on Upper and Middle Piru and within Pyramid and Quail Lakes* (USFS, pp. 126 through 134). In general, the goal of the requested study is “to qualify the taxonomical assemblages of all aquatic biota within Project affected reaches upstream, within and downstream of Pyramid Dam, and Quail Lake, using environmental DNA (eDNA)” (USFS, p. 126). The study area would include Piru Creek upstream of Pyramid Dam, Buck Creek, Snowy Creek, Pyramid Lake, the Pyramid reach of Piru Creek, Fish Creek, Agua Blanca Creek, and Quail Lake. USFS estimated the cost to complete its requested study between \$80,000 and \$110,000.

As described below, the Licensees’ proposed *Pyramid Reach Fish Populations Study* in Section 3.1.3 of this PSP adopts some, but not all, of the elements in USFS’ requested study.

Request Elements	Licensees’ Reply
Request Element #1 – Conduct eDNA sampling in Piru Creek upstream of Pyramid Lake, including in Bucks Creek and Snowy Creek	NOT ADOPTED. The Licensees did not adopt the USFS’ request for eDNA sampling in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream aquatic habitat and thus there is no Project nexus for the study (Criterion 5). Given this explanation, the Licensees have not addressed in this reply the request elements in the USFS’ requests regarding eDNA sampling in Piru Creek upstream of Pyramid Lake.
Request Element #2 – Conduct eDNA sampling in Pyramid	NOT ADOPTED. The Licensees did not adopt the USFS’ request for eDNA sampling in Fish Creek and Agua Blanca Creek, tributaries to Pyramid reach. USFS has not established a Project nexus to these

reach tributaries (Fish Creek and Agua Blanca Creek)	<p>tributaries: the Licensees perform no work and do not control flow in the tributaries (Criterion 5.) Further, since the Project does not affect flow in the creeks and no Project O&M occurs in the creeks, the information would not inform license requirements (Criterion 5).</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS' requests regarding eDNA sampling in Pyramid reach tributaries.</p>
Request Element #3 – Conduct eDNA sampling in spring and fall of the same year	<p>NOT ADOPTED. The Licensees did not adopt the USFS' request for eDNA sampling in spring and fall of the same year. The Licensees have chosen to target native species that are not migratory, and seasonal sampling would not yield additional information. Sampling will be conducted in the spring at the tail end of winter runoff to take advantage of higher flows that are more capable of transporting deoxyribonucleic acid (DNA) over greater distances.</p>
Request Element #4 – Perform eDNA sampling in Pyramid reach at sites selected in consultation with agencies	<p>ADOPTED WITH MODIFICATION. The Licensees' <i>Pyramid Reach Fish Populations Study</i> includes a task for eDNA collection in Pyramid reach.</p> <p>The Licensees' study proposes eDNA sampling will be performed at regular intervals (1,640 feet) over the entire length of the reach from Pyramid Dam downstream to the NMWSE of Piru Lake.</p>
Request Element #5 – eDNA sampling methods	<p>ADOPTED WITH MODIFICATION. The Licensees essentially adopted USFS' request for eDNA sampling methods. The Licensees' proposed <i>Pyramid Reach Fish Populations Study</i> states the Licensees will follow the USFS's Protocol for Collecting Environmental DNA Samples From Streams (Carim et al. 2016).</p>
Request Element #6 – Collect physical habitat and water quality data	<p>ADOPTED. The Licensees' proposed <i>Pyramid Reach Fish Populations Study</i> targets fish species, and results will be reported in relation to the habitat mapping and water quality data collected as part of the Licensees' proposed <i>Pyramid Reach Fish Populations Study</i>.</p>

Request Element #7 – Analyze data	ADOPTED WITH MODIFICATION. The samples collected by the Licensees will be processed with a species targeted quantitative polymerase chain reaction (QPCR) approach for Santa Ana sucker (a Species of Special Concern (SSC)), arroyo chub (SSC), prickly sculpin, speckled dace, unarmored three spine stickleback (an FE species), and rainbow trout. The analysis requested by the USFS was unclear and mixed descriptions for both a QPCR approach, which targets one or more specific species, and a generalized sequencing approach, which sorts the identified DNA fragments into taxonomic groups and identifies individual species through a probabilistic strategy. The former approach is relatively inexpensive (\$150 per sample), while the latter is much more expensive (\$15,000 to \$20,000 per sample). The USFS' request does not specify which approach should be used for each sample, and this uncertainty casts substantial doubt on the USFS cost estimate. More specifically, if the Licensees were to collect the 72 requested samples, and adopt the general sequencing approach, processing alone could cost \$1.1 to \$1.4 million dollars and would not yield better data. In comparison, the eDNA portion of the Licensees' proposed <i>Pyramid Reach Fish Populations Study</i> will cost approximately \$42,000 for fieldwork and analysis (Criterion 7).
Request Element #8 – QA/QC data	ADOPTED. The Licensees' proposed <i>Pyramid Reach Fish Populations Study</i> includes QA/QC of all data.
Request Element #9 – Prepare study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.9 WATER QUALITY STUDY REQUEST (USFS AND CDFW), AND WATER QUALITY ASSESSMENT STUDY REQUEST (SWRCB)

The SWRCB requested a study named *Water Quality Assessment* (SWRCB, pp. 9 through 14). In general, the goal of the requested study is “to fill existing water quality data gaps and evaluate Project impacts to designated beneficial uses of water” (SWRCB, p. 9). The study area would include locations where previous water quality sampling has occurred, generally upstream and downstream of Project reservoirs and below Project powerhouses. The SWRCB did not provide a cost estimate to perform its requested study, but states that these data could be collected as part of the Licensees' ongoing sampling.

The USFS and CDFW also requested respective water quality studies. The goal of both the USFS' *Water Quality Study* (USFS, pp. 135 through 145) and CDFW's *Water Quality Study* (CDFW, Attachment 1) is to “characterize existing conditions in project reservoirs and project affected stream reaches, and to determine needs for additional focused water quality studies or long term monitoring” (USFS p. 135, CDFW p. 54). The methods are almost identical to the SWRCB's study request, including sampling parameters, locations and timing. Unlike the SWRCB, USFS and CDFW state that an additional goal of their requested studies is to “determine the source of mercury exceedance in Pyramid Lake and pH and chloride in Piru Creek” “to verify water quality

in the project-affected river reaches and compliance with the United States Environmental Protection Agency (EPA) thresholds.” (USFS, p. 139, CDFW, Attachment 1). The USFS and CDFW each estimate the cost of their respective study to be \$413,000.

As described below, the Licensees’ proposed *Water Quality and Temperature Study* in Section 3.1.16 of this PSP adopts some, but not all, of the elements in the studies requested by SWRCB, USFS and CDFW.

Request Elements	Licensees’ Reply
Request Element #1 – Selection of water quality parameters	ADOPTED WITH MODIFICATION. The Licensees’ proposed <i>Water Quality and Temperature Study</i> includes most of the parameters requested in SWRCB’s request. The Licensees did not adopt sampling for total coliform, fecal coliform, <i>Escherichia coli</i> and petroleum hydrocarbons. SWRCB did not provide any evidence to suggest that any of these parameters are an issue within the proposed Project boundary, especially Quail Lake that supports non-contact recreation and in Pyramid reach, where there are no Project recreation facilities (Criterion 5). USFS and CDFW did not address why the sampling is needed to achieve their shared study goal (i.e., determine the source of mercury exceedance in Pyramid Lake and pH and chloride in Piru Creek) or why existing information is not sufficient (Criterion 4). Project O&M and Project-related recreation do not introduce mercury or chloride into surface waters or would otherwise degrade pH.
Request Element #2 – Survey sites upstream of the Project	NOT ADOPTED. The Licensees did not adopt the USFS’ request for water quality sampling in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream water quality and thus there is no Project nexus for the study (Criterion 5). Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’ requests regarding water quality sampling in Piru Creek upstream of Pyramid Lake.
Request Element #3 – Select sites with interested parties	ADOPTED WITH MODIFICATION. The Licensees’ proposed <i>Water Quality and Temperature Study</i> includes proposed sampling sites.
Request Element #4 – Sample timing	ADOPTED WITH MODIFICATION. SWRCB requests that reservoir sampling occur during the spring runoff and summer low-flow conditions, as well as a third fall sample for reaches downstream of Project facilities. The Licensees’ proposed <i>Water Quality and Temperature Study</i> includes sampling once in the fall. The Project operates year-round so potential affects to water quality should be similar throughout the year. Sampling in the fall, after the warm summer and prior to winter rains, captures data at a point after an entire season of summer low-flows.
Request Element #5 – Sample in second year based on review of first year study results	NOT ADOPTED. SWRCB, USFS, and CDFW request a review of the data to determine if a second year of focused studies is required. The Licensees did not adopt this request because the ILP provides a process to modify a study if a second year of studies is needed, so there is no need to include such a provision in the study. Specifically,

	the ILP requires that an applicant produce an ISR that includes the results of the first year of studies, and that if stakeholders believe the first-year studies warrant additional study, the party may request that the study be modified to include an additional data collection.
Request Element #6 – Collect data in compliance with Licensees’ Quality Assurance Program Plan	NOT ADOPTED. USFS and CDFW request the Licensees collect data in compliance with Licensees’ “Quality Assurance Program Plan (QAPP).” USFS and CDFW did not describe what the QAPP is, and Licensees do not have a QAPP. However, the Licensees’ proposed study includes QA/QC of all data, including field and laboratory data, and that Licensees follow laboratory protocols for sample collection and sample transport.
Request Element #7 – Consult with relicensing participants if the Licensees believe a study modification is needed	ADOPTED WITH MODIFICATION. USFS and CDFW request that the Licensees consult with relicensing stakeholders if the Licensees believe a study modification is needed. If the Licensees believe a significant study modification is required the Licensees will attempt to consult in advance with pertinent relicensing stakeholders as necessary and practical. The ILP also provides a process by which an applicant must disclose and explain each study plan variation in its ISR and USR.
Request Element #8 – Provide a study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC’s ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.10 CHANNEL MORPHOLOGY STUDY REQUEST (USFS AND CDFW) AND CHANNEL MORPHOLOGY ASSESSMENT STUDY REQUEST (SWRCB)

USFS requested a study named *Channel Morphology* (USFS, pp. 146 through 155). In general, the goal of the requested study is to “characterize channel morphology, riparian and aquatic habitat conditions that may have been affected, or continue to be affected, by operation and maintenance of project facilities” (USFS, p. 146). The objectives of the study would be to inventory stream reaches to collect consistent region-wide existing stream condition data for stream monitoring. The study area would include Piru Creek upstream of Pyramid Lake and Pyramid reach. USFS estimated the cost to complete its requested study between \$210,000 and \$350,000.

With the exception of resource management goals and the study area, CDFW’s requested study named *Channel Morphology*, (CDFW, Attachment 1) is essentially identical to USFS’ requested study. CDFW’s study area also includes Castaic Creek upstream and downstream of the Project.

With the exception of resource management goals and the cost of the study, SWRCB’s *Channel Morphology Assessment* (SWRCB, Attachment B p. 23-28) is essentially identical to USFS’ requested study. SWRCB estimates the cost of the study between \$110,000 and \$150,000.

NMFS did not request a specific study, but stated it supports other federal and State agencies’ proposals for geomorphology, substrate, and Large Woody Debris (LWD) studies (NMFS, p. 4).

As discussed below, the Licensees did not adopt the USFS’, CDFW’s, and SWRCB’s study requests.

Request Elements	Licensees’ Reply
<p>Request Element #1 – Conduct channel morphology surveys in Piru Creek upstream of Pyramid Lake</p>	<p>NOT ADOPTED. The Licensees did not adopt the USFS’, CDFW’s, and SWRCB’s requests for channel morphology surveys in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream channel morphology and thus there is no Project nexus for the study (Criterion 5).</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’, CDFW’s, and SWRCB’s request regarding channel morphology surveys in Piru Creek upstream of Pyramid Lake.</p>
<p>Request Element #2 – Conduct channel morphology surveys in Castaic Creek upstream of Elderberry Forebay</p>	<p>NOT ADOPTED. The Licensees did not adopt the USFS’, CDFW’s, and SWRCB’s requests for channel morphology surveys in Castaic Creek upstream of check-basin dams for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream channel morphology and thus there is no Project nexus for the study (Criterion 5).</p> <p>Further, CDFW did not describe why existing information is not adequate. As described in Section 3.2.2.2 of the PAD, the Project includes three check-dam basins on Castaic Creek, the sole purpose of which is to collect Castaic Creek sediment before it enters Elderberry Forebay. Further, Section 4.3.10.3 of the PAD describes the United States Army Corps of Engineers CWA Section 404 permit and CDFW Section 1600 agreement that LADWP holds for the operations of the check-dam basins, which include periodic removal of sediment and disposal of the sediment in compliance with the permits and FERC’s approval. In addition, as was done in 2016, LADWP, after obtaining all necessary permits and approvals, periodically dredges Elderberry Forebay. Given this existing information and continuing permits, CDFW has not demonstrated how a channel morphology survey of Castaic Creek upstream of check-dam basins would inform license requirements. (Criterion 5)</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the CDFW’s request that are specifically related to channel morphology surveys in Castaic Creek upstream of check-dam basins.</p>
<p>Request Element #3 – Conduct channel morphology surveys in Castaic Creek downstream of the Project</p>	<p>NOT ADOPTED. CDFW’s study request includes Castaic Creek upstream and downstream of the Project under “Criteria 1 – Goals and objectives of the study,” but does not include Castaic Creek under “6.1. Study Area.” The Licensees assume CDFW is requesting channel morphology surveys in Castaic Creek upstream and downstream of the Project. The Licensees address surveys upstream</p>

	<p>of the Project in the reply to Element #2 and downstream of the Project in this reply.</p> <p>The Licensees did not adopt CDFW’s request for channel morphology surveys in Castaic Creek downstream of the Project (i.e., in Castaic Lake or farther downstream). CDFW did not describe the need for this information (Criterion 4), how the information would be used (Criterion 5), or what methods it proposed (Criterion 6). The portion of Castaic Creek below the Project, is located downstream of Castaic Lake. Castaic Lake would have a much greater effect on Castaic Creek channel morphology than would Elderberry Forebay.</p> <p>Further, Castaic Lake is outside of the geographic scope of the relicensing as described in FERC’s SD1.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the CDFW’s request that are specifically related to channel morphology surveys in Castaic Creek.</p>
<p>Request Element #4 – Conduct channel morphology surveys in Pyramid reach</p>	<p>NOT ADOPTED. The Licensees did not adopt USFS’, CDFW’s, and SWRCB’s request for channel morphology surveys in Pyramid reach for the following reasons: First, as described in Section 1.1.5 of this PSP, the study would not inform license requirements regarding flow in Pyramid reach (Criterion 5).</p> <p>Second, the Licensees have not adopted channel morphology surveys in Pyramid reach because the level of effort and cost is unwarranted given the type of channel and sediment availability that exists in the reach. Sandburg (2005)³⁶ states that tributaries continue to contribute sand and gravels, though the flow regime could affect substrate stratification. Outflow below Pyramid Dam is as close to inflow as possible so no additional change in management would be warranted (Criterion 5). Existing information (Sandburg 2005) suggests that sediment is not limiting in the reach, and USFS, CDFW, and SWRCB have provided no information to suggest otherwise. The agencies have not shown that existing information is insufficient (Criterion 4), or that the information could inform license requirements (Criterion 5).</p> <p>In addition, the Licensees intend to conduct a bathymetric survey of Pyramid Lake in 2017 and will provide the information as available. This information can be used to assess the amount of sediment capture in Pyramid Lake.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’, CDFW’s, and SWRCB’s request that are specifically related to channel morphology surveys in Pyramid reach.</p>

³⁶ Sandburg, N.H. 2005. Middle Piru Creek Arroyo Toad (*Bufo californicus*) clutch surveys 2004. Prepared for United Water Conservation District. 59 pp. Cited in PAD as “Sandburg, Nancy H. 2005. Middle Piru Creek Arroyo Toad (*Bufo californicus*) Clutch Surveys 2005. DWR. February.”

2.11 HYDROLOGIC ALTERATION / FLOW REGIME STUDY REQUEST (USFS AND CDFW) AND INDICATORS OF HYDROLOGIC ALTERATION STUDY REQUEST (SWRCB)

USFS requested a study named *Hydrologic Alteration / Flow Regime* (USFS, pp. 156 through 162). In general, the goal of the requested study is “to characterize various metrics of hydrologic alteration due to project operations and maintenance” (USFS, p. 156). The study area would include Piru Creek upstream of Pyramid Dam, Pyramid reach, and Gorman Creek below Quail Lake. USFS estimated the cost to complete its requested study between \$100,000 and \$120,000.

With the exception of resource management goals and the first study element described below, CDFW’s requested study named *Hydrologic Alteration / Flow Regime* (CDFW, Attachment 1) is essentially identical to USFS’ requested study.

SWRCB requested a study named *Indicators of Hydrologic Alteration*. SWRCB’s request includes only an Indicators of Hydrologic Alteration (IHA) assessment. SWRCB estimated the cost to complete its requested study to be \$30,000.

As described below, the Licensees’ proposed *IHA Study* in Section 3.1.14 of this PSP adopts some, but not all, of the elements in USFS’, CDFW’s, and SWRCB’s requested studies. The study results will describe the relationship between Project inflow into Pyramid Lake and Project outflow into Pyramid reach.

Request Elements	Licensees’ Reply
Request Element #1 – Perform IHA assessment in Piru Creek upstream of Pyramid Lake	<p>NOT ADOPTED. The Licensees did not adopt the USFS’, CDFW’s and SWRCB’s requests for an IHA assessment in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on Piru Creek upstream of Pyramid Lake and thus there is no Project nexus for the study (Criterion 5).</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’, CDFW’s, and SWRCB’s request regarding an IHA assessment in Piru Creek upstream of Pyramid Lake.</p>
Request Element #2 – Perform IHA assessment in Gorman Creek below Quail Lake	<p>NOT ADOPTED. The Licensees did not adopt the USFS’, CDFW’s, and SWRCB’s requests for an IHA assessment in Gorman Creek downstream of Quail Lake because USFS, CDFW, and SWRCB did not describe the need for the information (Criterion 4), or how it would be used to inform license requirements (Criterion 5). Existing flow information is available from a gage, thus, existing information is sufficient.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’, CDFW’s, and SWRCB’s request regarding an IHA assessment in Gorman Creek.</p>
Request Element #3 – Using 15-minute flow data, for 10	<p>ADOPTED WITH MODIFICATION. The Licensees’ proposed <i>IHA Study</i> includes a comparison of 15-minute or hourly flow changes at</p>

discretionary up-ramp and down-ramp events calculate minimum, mean and maximum ramping rates inches per hour and feet per hour at existing gage locations in Pyramid reach	gage 11109375 (Piru Creek upstream of Pyramid Lake), gage 11109395 (Gorman Creek upstream of Pyramid Lake), gage PYM (reservoir storage), and gage 11109525 (Pyramid reach below Pyramid Dam) for up to seven larger flow changes from 2007 through 2014. The Licensees did not include stage changes in the proposed study because USFS and CDFW did not describe the need for this additional information (Criterion 4) and flow rate is adequate for the comparison between the two locations (Criterion 5).
Request Element #4 – Calculate the magnitude, duration and volume of spill events below Pyramid Dam, and the theoretical starting storage necessary to avoid the spills	NOT ADOPTED. USFS and CDFW did not describe the need for this additional information (Criterion 4) or how the information would inform license requirements (Criterion 5). Licensees' spill events at Pyramid Lake are consistent with the requirements of Article 52 in the existing license, and the Licensees have stated their intention to maintain the existing flow regime to avoid unauthorized take of listed arroyo toads. See also Section 1.1.5 of this PSP.
Request Element #5 – Calculate indicators of hydrologic alteration using the IHA methods in Richter et al. (1996) in Pyramid reach	ADOPTED WITH MODIFICATION. The Licensees' proposed <i>IHA Study</i> includes calculating IHA statistics for flow into and out of Pyramid Lake from November 2007 through September 2015. The Licensees did not adopt the 30-year period of analysis requested by USFS, CDFW, and SWRCB because: (1) daily average flow data to perform the analysis is only available from November 2007 through September 2015; (2) using synthesized flow data for a longer period of record would likely add confounding errors into the analysis; and (3) in 2005, Project releases were modified to represent the natural hydrology as prescribed in Article 52. Furthermore, the Licensees did not adopt USFS' and CDFW's request that the IHA data be presented in five different water year types because USFS, CDFW, and SWRCB did not describe what these water year types were, provide any rationale for the water year types (Criterion 4), or state how the data would be used to inform license requirements (Criterion 5). Article 52 does not include any water year types.
Request Element #6 – Using PeakFQ, perform a flood frequency analysis at existing gage locations Piru Creek upstream of Pyramid Dam, Pyramid reach, and Gorman Creek above and below Quail Lake. Calculate reoccurrence interval flows for 1.5, 2, 2.33, 5, 10, 25, 50, 100, 200 and 500 years	NOT ADOPTED. The Licensees did not adopt this request for three reasons. First, USFS and CDFW did not describe the need for this additional information (Criterion 4), or second, describe how the information would be used to inform license requirements (Criterion 5). Third, the information to perform the analysis is unavailable. PeakFQ uses instantaneous annual maximum peak flows. This information is not available at all the existing gages.
Request Element #7 – QA/QC data	ADOPTED. The Licensees' proposed <i>IHA Study</i> includes QA/QC of all data.
Request Element #8 – Prepare study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.12 FISH PASSAGE STUDY REQUEST (USFS, CDFW AND SWRCB)

USFS requested a study named *Fish Passage* (USFS, pp. 163 through 167). In general, the primary goal of the requested study is “to determine the location, nature and characteristics of barriers to fish passage and migration in project-affected reaches in Piru Creek, Castaic Creek, tributaries of these two streams and tributaries of project reservoirs” (USFS, p. 136). A secondary goal is “to identify Project facilities and operations (e.g., diversion structures, instream flow releases, and reservoir water surface elevations) that may affect fish passage” (USFS, p. 163). The USFS states that the information gathered in achieving these goals may be used to inform the development of PM&E measures that may include: facility modifications, instream flow releases, seasonal reservoir elevation constraints, or removal of fish barriers within reservoirs. The study area would include all Project-affected stream reaches (Piru and Castaic Creeks), tributaries to these stream reaches, and tributaries to Project reservoirs and afterbays. USFS estimated the cost to complete its requested study between \$100,000 and \$150,000.

CDFW’s requested study named *Fish Passage* (CDFW, Attachment 1) is essentially identical to USFS’ requested study.

SWRCB’s requested study named *Fish Passage* (SWRCB, Attachment B, pp. 44 through 48) is very similar to USFS’ study request in its goals and methodology, but lacks the detail and specificity of the USFS’s study request.

NMFS did not request a specific study, but stated it supports other federal and State agencies’ requests for studies (NMFS, p. 4).

As described below, the Licensees did not adopt USFS’, CDFW’s, or SWRCB’s study requests.

Request Elements	Licensees’ Reply
Request Element #1 – Perform fish passage assessment in Piru Creek upstream of Pyramid Lake and Castaic Creek upstream of Elderberry Forebay, and their tributaries	<p>NOT ADOPTED. The Licensees did not adopt USFS’, CDFW’s and SWRCB’s requests for a fish passage assessment in Piru Creek upstream of Pyramid Lake and Castaic Creek upstream of check-dam basins, and in their tributaries, for the reasons stated in Section 1.1.4 of this PSP. The Project has no effect on movement of fish upstream of the Project facilities and thus there is no Project nexus for the study (Criterion 5).</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS’, CDFW’s and SWRCB’s requests regarding a fish passage assessment in Piru Creek upstream of Pyramid Lake and Castaic Creek upstream of check-dam basins.</p>
Element #2 – Conduct fish passage surveys in Pyramid reach, and tributaries to Pyramid reach	<p>NOT ADOPTED. The Licensees did not adopt the USFS’, CDFW’s and SWRCB’s request for a fish barriers assessment in Pyramid reach because currently the flows mimic the natural hydrograph to protect an endangered species. In addition, the agencies have not established that there is an issue regarding fish barriers in Pyramid reach (i.e. rainbow trout are found throughout the reach). Nor have the agencies established a nexus between the Project and fish</p>

	<p>barriers if they were to occur in the reach (Criterion 5). In essence the agencies' request appears to be more of a research study.</p> <p>In addition, USFS and CDFW both identify an existing fish passage barrier in the Pyramid reach near Frenchman's Flat in Section 4.0 of their respective requested studies. The barrier was not constructed nor is it maintained by the Licensees. The Licensees acknowledge that this is a known barrier, and as such additional information is not needed regarding the barrier.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS', CDFW's and SWRCB's request that are specifically related to fish passage surveys in Pyramid reach.</p>
<p>Request Element #3 – Identify and Qualitatively Assess Potential Upstream Fish Passage Barriers in Project Reservoirs</p>	<p>NOT ADOPTED. The USFS, CDFW, and SWRCB do not provide any evidence that fish passage from the reservoir to tributaries is a problem in this reservoir. Pyramid Lake operation is currently restricted to protect fish, wildlife, and recreation. Section 3.2.3.2 of the PAD describes several major operational constraints. Per the 1970 Amendment No. 1 to the 1969 Memorandum of Understanding (MOU) between DWR and USFS, during normal operation conditions, water surface level variations do not exceed 14 feet during each 7-day period, and do not exceed 8 feet each day. In addition, the water surface of Pyramid Lake is not lowered below an elevation of 2,560 feet without taking additional safety precautions and making appropriate notifications. Article 58 of the existing license requires the Licensees to maintain Pyramid Lake surface elevations at the highest, most practicable levels commensurate with other Project purposes during the summer recreation season.</p>

2.13 WILDLIFE STUDY PLAN: BATS STUDY REQUEST (USFS), AND WILDLIFE (BATS) STUDY REQUEST (CDFW)

USFS requested a study named *Wildlife Study Plan: Bats* (USFS, pp. 165 through 175). In general, the goal of the requested study is “to document the presence, distribution and roosts of bat species within the study area and their use of project related facilities.” (USFS, p. 165). The study area would include the FERC Project boundary for each Project-affected stream reach in the vicinity of the Project dams including all natural roost sites and Project facilities and developed recreation sites.

CDFW requested a similar study named *Wildlife (Bats) Study* (CDFW, Attachment 1). USFS and CDFW estimated the cost to complete its requested studies as between \$120,000 and \$145,000.

As described below, the Licensees' proposed *Special-Status Terrestrial Wildlife Species – California Wildlife Habitat Relationships [CWHHR] Study* in Section 3.1.7 of this PSP adopts some, but not all, of the elements in USFS' and CDFW's requested studies.

Request Elements	Licensees' Reply
Request Element #1 – Evaluate natural roost sites and Project-related structures within the study area	<p>ADOPTED WITH MODIFICATION. The Licensees' proposed <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> will include an evaluation of potential bat roost sites.</p> <p>The Licensees' proposed study would provide adequate information at no additional cost compared to the study requested by USFS and CDFW. The agencies' requested study methods would include reconnaissance of all potential and known roost sites at Project facilities and known roost sites within the FERC Project boundary for bats, followed by mist-netting, acoustic sampling and long-term acoustic monitoring at all sites with signs of bat activity. The cost to complete the study is estimated to be between \$120,000 and \$145,000. The Licensees' proposed study, which would gather information on all special-status terrestrial wildlife species, would provide adequate information regarding bats at no additional cost. (Criteria 4 and 7)</p>
Request Element #2 – Observed bat activity will be documented with photographs and global positioning system (GPS) coordinates	<p>ADOPTED. The Licensees' proposed <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> specifies that all evidence of special-status terrestrial wildlife, including bats, will be documented by photographs and GPS coordinates will be taken where possible.</p>
Request Element #3 – Conduct focused surveys, including acoustic sampling, mist net sampling, and winter hibernacula evaluation	<p>NOT ADOPTED. The Licensees did not adopt this request element because the Licensees intend to propose in their DLA and FLA a measure to manage bats. The information from the sampling proposed by USFS would not inform the requirements of that measure (Criterion 5).</p>
Request Element #4 – Perform QA/QC of data	<p>ADOPTED. The Licensees' proposed <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> specifies that the Licensees will QA/QC all field data.</p>
Request Element #5 – Prepare a study report	<p>ADOPTED WITH MODIFICATION. A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.</p>

2.14 WILDLIFE STUDY PLAN: LARGE MAMMAL MOVEMENT STUDY REQUESTS (USFS AND CDFW)

USFS requested a study named *Wildlife Study Plan: Large Mammal Movement* (USFS, pp. 176 through 186). In general, the goal of the requested study is “to determine the location, type and number of barriers to wildlife movement due to project conduits or other facilities.” (USFS, p. 176). The study area would include the FERC Project boundary for each Project-affected stream reach in the vicinity of the Project dams, including Project facilities and developed recreation sites. CDFW requested a similar study named *Wildlife Study Plan – Large Mammal Movement Study* (CDFW Attachment 1). USFS and CDFW estimated the cost to complete its requested study as between \$50,000 and \$75,000.

As described below, the Licensees' proposed *Special-Status Terrestrial Wildlife Species – CWHR Study* in Section 3.1.7 of this PSP adopts some, but not all, of the elements in USFS' and CDFW's requested studies.

Request Elements	Licensees' Reply
Request Element #1 – Identify potential Project barriers to wildlife movement	ADOPTED WITH MODIFICATION. As part of the Licensees' proposed <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> , the Licensees will evaluate two Project linear features for wildlife movement: (1) the 2-mile long Lower Quail Canal; and (2) the six 2,400 foot long Castaic Powerplant penstocks. The Licensees have not adopted CDFW's request to evaluate campgrounds, roads, and drinking sites within 5 miles of the Project area because these facilities do not impede movement of large mammals and additional information will not help inform license requirements (Criterion 5).
Request Element #2 – Conduct field assessment of segments	ADOPTED WITH MODIFICATION. As described in the Licensees' reply to Request Element #1, the Licensees will conduct field assessments of the Lower Quail Canal and Castaic Penstocks for barriers to large wildlife movement.
Request Element #3 – Prepare Geographic Information System (GIS) maps	ADOPTED. The Licensees' proposed <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> will include the preparation of GIS maps showing locations of Project facilities that could be wildlife barriers.
Request Element #4 – Analyze data	ADOPTED. The Licensees' proposed <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> will include an analysis of all field data recorded during the study.
Request Element #5 – Prepare a study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.15 WILDLIFE STUDY PLAN: RAPTOR SPECIES STUDY REQUEST (USFS)

USFS requested a study named *Wildlife Study Plan: Raptor Species* (USFS, pp. 187 through 195). In general, the goal of the requested study is “to document the presence, distribution of FSS [Forest Service Sensitive] and CDFW SSC/FP [fully protected] raptor listed [sic] species within the project area and the vicinity of the project area, which includes all suitable habitat within and adjacent to the project or that may be impacted by activities associated with the relicensing or recreational activities.” (USFS, p. 187). The study area would include the FERC Project boundary for each Project-affected stream reach in the vicinity of the Project dams including Project facilities and developed recreation sites. USFS estimated the cost to complete its requested study as between \$150,000 and \$175,000.

As described below, the Licensees' proposed *Special-Status Terrestrial Wildlife Species – CWHR Study* in Section 3.1.7 of this PSP adopts some, but not all, of the elements in USFS's requested studies.

Request Elements	Licensees' Reply
<p>Request Element #1 – Perform the study within the FERC Project Boundary and Project-affected stream reaches in the vicinity of Project dams (e.g., within 5.0 miles or all suitable habitat contiguous in the immediate vicinity of the Project area)</p>	<p>ADOPTED WITH MODIFICATION. The Licensees propose to conduct the <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> within the proposed Project boundary.</p> <p>The Licensees do not propose to perform the study in stream reaches or within 5.0 miles of the Project area for three reasons. Regarding stream reaches, the only potentially affected stream reach is Pyramid reach. As described in Section 1.1.5, Project outflow into Pyramid reach is generally equal to natural inflow into Pyramid Lake. In addition, the Licensees rarely perform Project O&M in Pyramid reach nor are there any Project recreation facilities in Pyramid reach. Therefore the Project will not affect raptor use in this area. Information regarding raptors in the vicinity of Pyramid reach will not inform license requirements (Criterion 5).</p> <p>Collecting raptor information 5.0 miles away from the Project is not necessary because the Licensees will collect raptor information at the Project facilities where potential effects, if any, would occur. The Licensees perform no work 5.0 miles away from the Project. Therefore, the information from 5.0 miles from the Project will not inform license requirements (Criterion 5).</p>
<p>Request Element #2 – Identify and map known occurrences of FSS/SSC raptor species and prepare field maps</p>	<p>ADOPTED. The Licensees' proposed <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> includes this element.</p>
<p>Request Element #3 – Identify study sites</p>	<p>ADOPTED WITH MODIFICATION. The Licensees will identify areas/sites within the proposed Project boundary where Project facilities or activities could potentially affect raptors. The Licensees have not adopted USFS' request for a 1.5 mile buffer around these sites as described in the Licensees' reply to Element #2.</p> <p>Specifically, sampling points will be randomly selected within vegetation types using GIS, and CWHR plot data, an established protocol, will be collected by qualified biologists, before running CDFW's CWHR program. This method will ensure all vegetation types in representative areas will be sampled to gather data sufficient to determine what kinds of habitat for all special-status raptors are available.</p> <p>For clarity, recreational off-highway vehicle (OHV) use is not permitted within Project recreation facilities.</p>
<p>Request Element #4 – Conduct Field Surveys</p>	<p>ADOPTED WITH MODIFICATION. The Licensees propose to conduct field surveys to evaluate potential habitat and document incidental sightings of special-status wildlife including raptors. Protocol level surveys as proposed by USFS will not be conducted: known-nesting areas and CWHR data developed through the Licensees' field survey will determine where raptor habitat is available throughout the Project.</p> <p>The Licensees did not adopt the request for protocol level surveys because the ILP provides a process to determine if more focused studies are needed after studies in year one. Specifically, the ILP</p>

	requires that an applicant produce an ISR that includes the results of the first year of studies, and that if stakeholders believe the first-year studies warrant additional study (i.e. protocol surveys), the party may request that FERC order the applicant to perform the study.
Request Element #5 – Digital photographs, GPS documentation, distance to nearest facility and observed activities in the facility	ADOPTED WITH MODIFICATION. The Licensees will document all incidentally sighted special-status terrestrial species including raptors with photography and GPS locations when possible. All observations of nearby activity and nearby facilities will be recorded and included in field notes. A GIS map of all located special-status raptor species, as well as other special-status terrestrial wildlife species incidentally detected, will be produced.
Request Element #6 – Consult with Licensees’ Project Operations Staff	ADOPTED. The Licensees’ operations staff will be involved, to the extent necessary, in the <i>Special-Status Terrestrial Wildlife Species – CWHR Study</i> .
Request Element #7 – QA/QC Data	ADOPTED. The Licensees will subject all field data to QA/QC control procedures.
Request Element #8 – Prepare a study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC’s ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.16 WILDLIFE STUDY PLAN: ESA TERRESTRIAL SPECIES STUDY REQUEST (USFS), AND SPECIAL-STATUS SPECIES – SPECIAL STATUS TERRESTRIAL SPECIES STUDY REQUEST (AVIAN, MAMMAL, INVERTEBRATE) (CDFW)

USFS requested a study named *Wildlife Study Plan: ESA Terrestrial Species* (USFS, pp. 196 through 203). This requested study would focus on ESA-listed species, including California condor, least Bell’s vireo, southwestern willow flycatcher, coastal California gnatcatcher, western yellow-billed cuckoo, desert tortoise, vernal pool fairy shrimp, and Quino checkerspot butterfly. In general, the goal of USFS’ requested study is “to document the presence, distribution of ESA listed T&E species within the project area and the vicinity of the project area” (USFS, p. 196). The study area would consist of the area within the FERC Project boundary, Project-affected stream reaches in the vicinity of Project dams (e.g., within 1.0 mile or suitable habitat contiguous in the immediate vicinity of the Project area). This includes all Project facilities as well as developed recreation sites. USFS estimated the cost to complete its requested study as between \$150,000 and \$175,000.

With the exception of specifically including in the study area the Pyramid reach and Castaic Creek, CDFW’s requested study named *Special-Status Species – Special Status Terrestrial Species (Avian, Mammal, Invertebrate)* (CDFW, Attachment 1) is essentially identical to USFS’ requested study.

As described below, the Licensees’ proposed *Special-status Terrestrial Wildlife – CWHR Study, ESA-listed Riparian Bird Species – Southwestern Willow Flycatcher,*

Least Bell's Vireo, and Yellow-billed Cuckoo Riparian Habitat Evaluations Study (ESA-listed Riparian Bird Species Study) and ESA-listed Terrestrial Species – CWHR Study in Sections 3.1.7, 3.1.10 and 3.1.18, respectively of this PSP adopts some, but not all, of USFS' and CDFW's requested elements.

Request Elements	Licensees' Reply
Request Element #1 – Perform the study in Pyramid reach	<p>NOT ADOPTED. The Licensees do not propose to perform the study in Pyramid reach. As described in Section 1.1.5, Project outflow into Pyramid reach is generally equal to natural inflow into Pyramid Lake. In addition, the Licensees rarely perform Project O&M in Pyramid reach nor are there any Project recreation facilities in Pyramid reach. Therefore the Project will not affect terrestrial wildlife species use in this area. Information regarding terrestrial wildlife species in the vicinity of Pyramid reach will not inform license requirements (Criterion 5).</p> <p>Given this explanation, the Licensees have not addressed in this reply elements in the CDFW's and USFS' requests that are specifically related to Pyramid reach.</p>
Request Element #2 – Perform the study in Castaic Creek upstream of Elderberry Forebay	<p>NOT ADOPTED. The Licensees did not adopt CDFW's request that the study area include Castaic Creek upstream of check-dam basins for the reasons stated in Section 1.1.4 of this PSP. The Project has no impacts upstream of the check-dam basins.</p> <p>Given this explanation, the Licensees have not addressed in this reply elements in CDFW's requests that are specifically related to Castaic Creek upstream of check-dam basins.</p>
Request Element #3 – Perform the study within the FERC Project Boundary and Project-affected stream reaches in the vicinity of Project dams (e.g., within 1.0 mile or all suitable habitat contiguous in the immediate vicinity of the Project area)	<p>ADOPTED WITH MODIFICATION. The Licensees propose to perform the study within the proposed Project boundary.</p> <p>The Licensees do not propose to perform the study in stream reaches or within 1.0 mile of Project facilities, or within all suitable contiguous habitat. Regarding stream reaches, the only potentially affected stream reach is Pyramid reach. For the reasons stated in reply to Element #1, the Licensees do not propose to modify flows in Pyramid reach: outflow will equal inflow. Therefore, inclusion of Pyramid reach will not inform license requirements (Criterion 5).</p> <p>Performing the study 1.0 mile away from the Project is not necessary because the Licensees address Project facilities where the Project-related effects could potentially occur. The Licensees perform no Project O&M 1.0 miles away from the Project. Therefore, the information will not inform license requirements (Criterion 5).</p>
Request Element #4 – Surveyors conduct protocol level surveys, where one exists, for the ESA-listed terrestrial species	<p>ADOPTED WITH MODIFICATION. CDFW and USFS did not request any specific protocols, instead stating that "established protocols will be used, where one exists."</p> <p>The Licensees will conduct USFWS protocol surveys for two species, southwestern willow flycatcher and least Bell's vireo, which have a reasonable possibility of occurring in the Project area and being affected by Project-related activities. Details of the surveys are</p>

	<p>included in the Licensees' proposed study, <i>ESA-Listed Riparian Bird Species Study</i>.</p> <p>The Licensees have not adopted this element for the remaining ESA-listed species. Instead, the Licensees' proposed <i>ESA-listed Terrestrial Species - California Wildlife Habitat Relationship Study</i> will assess habitat for ESA-listed species unlikely to be affected by Project O&M or for which a habitat assessment is sufficient for compiling the Project-related information needed to develop license measures.</p>
Request Element #5 – Perform QA/QC on data	ADOPTED. The Licensees' proposed studies include QA/QC of all data.
Request Element #6 – Prepare study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.17 WILDLIFE STUDY PLAN: TES REPTILES AND AMPHIBIANS STUDY REQUEST (USFS), AND SPECIAL STATUS SPECIES – REPTILE AND AMPHIBIAN STUDY REQUEST (CDFW)

CDFW requested a study named *Special Status Species – Reptile and Amphibian* (CDFW, Attachment 1). In general, the stated goal would be to “provide information... concerning amphibians and reptiles associated with project upland, reservoir and stream reaches affected by the project...” (CDFW, Attachment 1). The study area would include all of the area within the FERC Project boundary, Pyramid reach, and Castaic Creek upstream of check-dam basins, and Project-affected stream reaches within one mile of the Project. Specific study sites would be selected based on a reconnaissance survey and would change in some unspecified way based on season. The study request does not include a list of target species. CDFW estimated the cost to complete the requested studies as between \$150,000 and \$175,000.

USFS' requested study named *Wildlife Study Plan: TES [Threatened, Endangered and Sensitive] Reptiles and Amphibians* (USFS, pp. 205 through 214) is essentially identical to CDFW's requested study, with the following exceptions: (1) stated resource management goals; (2) inclusion of a list of special-status species, including three ESA-listed species – arroyo toad, California red-legged frog (CRLF), and mountain yellow-legged frog – and 14 other special-status frogs, salamanders, snakes, and lizards; (3) specifying consultation with agencies to determine specific study sites; and (4) describing the sites as all facilities within one mile of suitable habitat for special-status species.

As described below, the Licensees' proposed *Special-Status Terrestrial Wildlife Species – CWHR Study, ESA-Listed Amphibians, California Red-legged Frog Study (ESA-Listed Amphibians, CRLF Study)* and *ESA-Listed Terrestrial Wildlife Species – CWHR Study* in Sections 3.1.7, 3.1.9, and 3.1.18 respectively, of this PSP adopt some, but not all, of CDFW's and USFS' request elements.

Request Elements	Licensees' Reply
Request Element #1 – Perform the study within Pyramid reach and Castaic Creek upstream of Elderberry Forebay	<p><u>NOT ADOPTED.</u> The Licensees did not adopt the USFS' and CDFW's request that the study area includes Pyramid reach and Castaic Creek upstream of check-dam basins for the reasons stated in Sections 1.1.4 and 1.1.5 of this PSP.</p> <p>Further, the Licensees perform no Project-related work, and there is no Project-related recreation in these areas.</p> <p>For these reasons, USFS and CDFW have not established the need for the information (Criterion 4), a Project nexus to the resources in these areas, or how the information from the requested study in these areas would inform license requirements (Criterion 5).</p>
Request Element #2 – Perform the study within the FERC Project boundary, in Project-affected reaches in the vicinity (up to one mile downstream of the dam), and within one mile of the Project area	<p><u>ADOPTED WITH MODIFICATION.</u> The Licensees adopted USFS' and CDFW's request to perform the study within the proposed Project boundary. Specifically, as part of the Licensees' proposed <i>ESA-Listed Amphibians, CRLF, ESA-Listed Terrestrial Wildlife – CWHR Study, and Special-Status Terrestrial Wildlife Species – CWHR Study</i>, the Licensees will conduct field surveys to evaluate potential habitat for CRLF at appropriate aquatic habitats within the boundary, and CWHR evaluations for all ESA-listed and special-status wildlife within the boundary. The CWHR plots will be selected for all vegetation types with more plots in vegetation types that have more area in the boundary.</p> <p>The Licensees did not adopt USFS' and CDFW's request that the study be performed in Project-affected reaches within one mile downstream of the Project dams or within one mile of the Project area because USFS and CDFW have not established the need for the information (Criterion 4), a Project nexus to the resources in these areas, or how the information from the requested study in these areas would inform license requirements (Criterion 5). The Licensees never perform Project O&M activities upstream of the Project and rarely perform Project O&M activities downstream of Pyramid Dam. In addition, no Project-related recreation occurs in these areas.</p>
Request Element #3 – Selected sampling sites based on reconnaissance survey and consultation with agencies	<p><u>NOT ADOPTED.</u> The Licensees did not adopt CDFW's request that specific locations for the study be selected in consultation with agencies and "per a reconnaissance survey...and likely shift between surveys..." The primary reason the Licensees did not adopt this request element is because CDFW did not include in its request any methods related to the reconnaissance survey of how the Licensees and agencies would decide on sites (Criterion 6).</p> <p>In contrast, the Licensees' proposed <i>ESA-Listed Amphibians, CRLF Study, Special-Status Terrestrial Wildlife Species – CWHR Study, and ESA-Listed Terrestrial Wildlife Species – CWHR Study</i> provide details regarding where habitat evaluations for ESA-listed and special-status wildlife species would occur.</p>
Request Element #4 – Conduct established protocol surveys, where one exists, for reptiles and amphibians	<p><u>NOT ADOPTED.</u> The Licensees did not adopt USFS' or CDFW's request that the Licensees conduct protocol surveys, where one exists, for reptiles and amphibians because USFS and CDFW did not describe which protocol surveys they propose, so the Licensees</p>

	<p>cannot comment on whether the protocol would be appropriate or needed (Criterion 6). Further, for most of the species included in the table in the USFS' study request, there are no widely accepted protocols, particularly in regards to "presence/absence surveys" for which non-detection is interpreted as proof of absence. USFS' and CDFW's study requests include no guidance regarding survey methods for species with no established protocols. As such, this request element does not meet Criterion 6 in explaining how the study is consistent with generally accepted practices.</p> <p>Additionally, the Licensee's proposed studies (<i>ESA-Listed Amphibians, CRLF, Special-Status Terrestrial Wildlife Species – CWHR, and ESA-Listed Terrestrial Wildlife Species – CWHR</i>) include adequate information gathering to assess potential impacts to special-status and ESA-listed reptiles and amphibians and to inform license requirements (Criterion 5). Regarding CRLF, a species for which protocol survey methods exist, Licensees' study includes field evaluations of potential habitat, a study approach consistent with accepted practices on other FERC relicensings and sufficient to inform license requirements.</p>
<p>Request Element #5 – QA/QC data</p>	<p>ADOPTED. The Licensees' proposed <i>ESA-Listed Amphibians, CRLF Study, Special-Status Terrestrial Wildlife Species – CWHR Study, and ESA-Listed Terrestrial Wildlife Species – CWHR Study</i> include QA/QC of all data.</p>
<p>Request Element #6 – Prepare study report</p>	<p>ADOPTED WITH MODIFICATION. A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.</p>

2.18 WILDLIFE STUDY PLAN: MIGRATORY BIRD ACT TREATY PROTECTED BIRD SPECIES, FOREST SERVICE SENSITIVE SPECIES, CDFW FULLY PROTECTED AND SPECIES OF SPECIAL CONCERN STUDY REQUESTS (USFS)

USFS requested a study named *Wildlife Study Plan: Migratory Bird Act Treaty Protected Bird Species, Forest Service Sensitive Species, CDFW Fully Protected and Species of Special Concern* (USFS, Appendix A, pp. 215 through 223). In general, the goal of the requested study would be to "document the presence, distribution of FSS, CDFW SSC/FP listed species and migratory bird species within the project area and the vicinity of the project area..." (USFS, p. 215). The study scope would include special-status birds as well as all other migratory songbirds, snakes, lizards, one species of turtle, and mammals. The study area would consist of the area within the FERC Project boundary in the vicinity of Project dams (e.g., within one mile or all suitable habitat contiguous in the immediate vicinity of the Project area), including all Project facilities and developed recreation sites. All Project-affected stream reaches affecting National Forest Service (NFS) lands would also be included in the study area (USFS, p. 221). USFS estimated the cost to complete its requested study as between \$150,000 and \$175,000.

As described below, the Licensees’ proposed *Special-status Terrestrial Wildlife Species – CWHR Study* in Section 3.1.7 of this PSP adopts some of USFS’ request elements.

Request Elements	Licensees’ Reply
<p>Request Element #1 – Perform the study within the FERC Project boundary, in Project-affected reaches in the vicinity (up to one mile downstream of the dam), and within one mile of the Project area</p>	<p>ADOPTED WITH MODIFICATION. The Licensees’ adopted USFS’ request to perform the study within the proposed Project boundary. Specifically, as part of the Licensees’ proposed <i>Special-status Terrestrial Wildlife Species – CWHR Study</i>, the Licensees will conduct field surveys to evaluate potential habitat for Migratory Bird Treaty Act (MBTA) birds and all special-status wildlife within the boundary using CWHR methodology. The CWHR plots will be selected for all vegetation types with more plots in vegetation types that have more area in the boundary.</p> <p>The Licensees did not adopt USFS’ requests that the study be performed in Project-affected reaches within one mile downstream of the Project dams or within one mile of the Project area for the reasons stated in Section 1.1.4 of this PSP, and because USFS has not established the need for the information (Criterion 4), Project nexus to the resources in these areas, or how the information from the requested study in these areas would inform license requirements (Criterion 5). The Licensees never perform Project O&M activities upstream of the Project and rarely perform Project O&M activities downstream of Pyramid Dam. In addition, no Project-related recreation occurs in these areas.</p> <p>The MBTA requires measures to avoid “taking” migratory birds, including eggs and nests, as could occur during required vegetation management along transmission lines, or if Project transmission lines were not in compliance with current guidelines to avoid bird collisions and electrocutions. USFS provided no rationale for the need to perform a general bird survey, including the suggested use of mist netting to sample migratory birds, with no clear purpose in the development of license conditions.</p>
<p>Request Element #2 – Include in study area Project facilities</p>	<p>ADOPTED WITH MODIFICATION. The Licensees’ proposed <i>Special-status Terrestrial Wildlife Species – CWHR Study</i> will assess habitat throughout the proposed Project boundary, including Project roads and recreation areas.</p> <p>The Licensees did not adopt USFS’ request that the study area be expanded beyond the proposed Project boundary for the reasons described in the Licensees’ reply to Request Element #1.</p> <p>Note that the use of recreational OHVs in the Project’s recreation areas is not permitted. Therefore, there is no need to assess the effect of recreational OHV use at Project facilities on MBTA birds and special-status wildlife species.</p>
<p>Request Element #3 – Conduct established protocol surveys, where one exists</p>	<p>NOT ADOPTED. The Licensees did not adopt USFS’ request that the Licensees conduct protocol surveys, where one exists, because USFS did not describe which protocol surveys they propose, so the Licensees cannot comment on whether they would be appropriate or needed (Criterion 4). The USFS only indicated use of mist netting and point count surveys for birds. Mist netting is an intensive survey</p>

	<p>technique for which USFS has not provided justification. No methods are provided for any of the other species groups.</p> <p>Additionally, the Licensees' proposed <i>Terrestrial Wildlife – CWHR Study</i> includes adequate information gathering to assess potential impacts to MBTA birds and special-status wildlife species. The proposed study will evaluate habitat within the proposed Project boundary and Project activities occurring in areas in or near habitat or known MBTA birds and special-status wildlife species occurrences.</p>
Request Element #4 – QA/QC data	ADOPTED. The Licensees' proposed <i>Special-status Terrestrial Wildlife Species – CWHR Study</i> includes QA/QC of all data.
Request Element #5 – Prepare study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.19 BOTANICAL RESOURCES STUDY REQUEST (USFS AND CDFW)

USFS requested a study named *Botanical Resources* (USFS, pp. 224 through 231). The goal of the requested study is to “provide information to determine whether continued Project O&M or recreational use of Project facilities may have an adverse effect on vegetation and special-status plants.” (USFS, p. 224). USFS estimated the cost to complete its requested study as between \$180,000 and \$200,000.

CDFW requested a study named *Botanical Resources* (CDFW, Attachment 1), which is similar to USFS' requested study. CDFW estimated costs to complete its requested study as between \$80,000 and \$100,000.

As described below, the Licensees' proposed *AIS Study* and *Botanical Resources Study* in Sections 3.1.1 and 3.1.5, respectively, of this PSP adopts some, but not all, of the elements in USFS' and CDFW's requested studies.

Request Elements	Licensees' Reply
Request Element #1 – Perform surveys in Pyramid reach	NOT ADOPTED. The Licensees do not propose to perform the study in Pyramid reach. As described in Section 1.1.5, Project outflow into Pyramid reach is generally equal to natural inflow into Pyramid Lake. In addition, the Licensees rarely perform Project O&M in Pyramid reach nor are there any Project recreation facilities in Pyramid reach. Therefore the Project will not affect botanical resources in this area. Information regarding botanical resources in the vicinity of Pyramid reach will not inform license requirements (Criterion 5).
Request Element #2 – Perform surveys within FERC Project boundary and buffer areas	ADOPTED WITH MODIFICATION. The Licensees' proposed <i>Botanical Resources Study</i> specifies that the Licensees will conduct surveys within the proposed Project boundary. The Licensees did not adopt USFS' and CDFW's request for a buffer because the agencies provided no evidence to suggest there is a Project effect (nexus) within that area and therefore the information

	would not inform license requirements (Criterion 5). The Licensees perform no Project O&M outside the proposed Project boundary.
Request Element #3 – Conduct vegetation mapping for all vegetation types	ADOPTED WITH MODIFICATION. The Licensees’ proposed <i>Botanical Resources Study</i> includes mapping wetland and riparian vegetation types, and conducting Proper Functioning Condition assessments of wetland and riparian areas. The Licensees did not adopt USFS’ and CDFW’s request for mapping other vegetation types. The Licensees’ <i>Botanical Resources Study</i> includes a comprehensive survey for special-status plants within the study area. Use of existing USFS Classification and Assessment with Landsat of Visible Ecological Groupings (CalVeg) data in combination with special-status plant surveys as part of Licensees’ <i>Botanical Resources Study</i> will be adequate to develop CWHR.
Request Element #4 – Data QA/QC	ADOPTED. The Licensees’ proposed <i>Botanical Resources Study</i> includes QA/QC of all data.
Request Element #5 – Prepare study report	ADOPTED WITH MODIFICATION. A separate study report is not required by FERC’s ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.20 INVASIVE NOXIOUS WEEDS STUDY REQUEST (USFS) AND COMPREHENSIVE NON-NATIVE PLANT SURVEY (AQUATIC AND TERRESTRIAL) STUDY REQUEST (CDFW)

USFS requested a study named *Invasive Noxious Weeds* (USFS, pp. 232 through 242). The goal of the requested study would be “to provide information to determine whether continued Project O&M or recreational use of Project facilities may have an adverse effect on special-status plants and vegetation by the presence and potential introduction of invasive noxious weeds.” (USFS, p. 232). USFS estimated the cost to complete its requested study as between \$160,000 and \$180,000.

CDFW requested a study named *Comprehensive Non-native Plant Survey (Aquatic and Terrestrial) Study* (CDFW, Attachment 1), which is similar to USFS’ requested study. CDFW estimated costs to complete its requested study as between \$30,000 and \$40,000.

As described below, the Licensees’ proposed *Non-Native Invasive Plants (NNIP) Study* in Section 3.1.6 of this PSP adopts some, but not all, of the elements in USFS’ and CDFW’s requested studies.

Request Elements	Licensees’ Reply
Request Element #1 – Perform surveys in Pyramid reach	NOT ADOPTED. The Licensees do not propose to perform the study in Pyramid reach. As described in Section 1.1.5, Project outflow into Pyramid reach is generally equal to natural inflow into Pyramid Lake. In addition, the Licensees rarely perform Project O&M in Pyramid reach nor are there any Project recreation facilities in Pyramid reach. Therefore the Project will not affect NNIP in this area. Information

	regarding NNIP in the vicinity of Pyramid reach will not inform license requirements (Criterion 5).
Request Element #2 – Perform surveys within FERC Project boundary and buffer areas	<u>ADOPTED WITH MODIFICATION.</u> The Licensees' proposed <i>NNIP Study</i> specifies that the Licensees will conduct NNIP surveys within the proposed Project boundary. The Licensees did not adopt USFS' request for a buffer because the agencies provided no evidence to suggest there is a Project effect (nexus) within that area and therefore the information would not inform license requirements (Criterion 5). The Licensees perform no Project O&M outside the proposed Project boundary.
Request Element #3 – USFS and CDFW provided a list of additional NNIP species with potential to occur in the study area	<u>ADOPTED.</u> The Licensees' proposed <i>NNIP Study</i> will include a search of all NNIP species with the potential to occur in the study area, including those identified in the PAD, and the additional species listed by USFS and CDFW.
Request Element #4 – Conduct Field Surveys	<u>ADOPTED WITH MODIFICATION.</u> The Licensees' proposed <i>NNIP Study</i> will include field surveys in conjunction with the <i>Botanical Resources Study</i> . When performing NNIP surveys on USFS lands, the Licensees will follow USFS protocols, excluding any treatment protocols.
Request Element #5 – Consult with the Licensees' Project Operations Staff	<u>ADOPTED WITH MODIFICATION.</u> The Licensees' operations staff will be involved, to the extent necessary, in the <i>NNIP Study</i> .
Request Element #6 – QA/QC data	<u>ADOPTED.</u> The Licensees' proposed <i>NNIP Study</i> includes QA/QC of all data.
Request Element #7 – Prepare study report	<u>ADOPTED WITH MODIFICATION.</u> A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.21 ENGINEERING STUDY REQUEST (USFS)

USFS requested a study named *Engineering* (USFS, pp.243 through 247). In general, the goal of the requested study would be to assess the condition of buildings, roads, signs, paved surfaces, trails, and other structures in the Project area (including Los Alamos Campground), and on the road from Pyramid Lake to Los Alamos Campground. The study would also determine needed repairs, maintenance, improvements to associated assets, and prepare plans and specifications for the implementation of such repairs, maintenance, and improvements. USFS estimated the cost to complete its requested study to be approximately \$100,000.

As described below, the Licensees' proposed *Recreation Facilities Demand Analysis and Condition Assessment Study (Recreation Study)* in Section 3.1.11 of this PSP adopts some, but not all, of the elements in USFS' requested studies.

Request Elements	Licensees' Reply
Request Element #1 – Perform an engineering assessment of buildings, roads, and other recreational resources in the Project area to meet Forest Plan and health/safety requirements	<p>ADOPTED WITH MODIFICATION. In response to the USFS requested <i>Engineering Study</i>, the Licensees' proposed <i>Recreation Study</i> includes assessment of the conditions of buildings and structures associated with developed recreation sites within the proposed Project boundary. The purpose of the Study is not to prepare plans and specifications for the implementation of noted repair needs or outline potential changes in maintenance or other improvements, but rather to provide data on existing conditions to inform license requirements.</p> <p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS' <i>Engineering Study</i> request.</p>

2.22 LARGE WOODY DEBRIS STUDY REQUEST (USFS AND CDFW)

USFS requested a study named *Large Woody Debris* (USFS, pp. 248 through 255). In general, the two goals of the requested study would be to (1) assess the potential geomorphic effect of reducing LWD supply to, and altering its transport capacity within, Pyramid reach; and (2) provide information required to assess potential effects on habitat for anadromous and land-locked salmonid fish caused by any changes to geomorphic/LWD processes in Pyramid reach resulting from Project facilities or operations. (USFS, p. 248). The objectives are to quantify LWD trapped on an annual basis by Pyramid Dam, quantify LWD stored within the bankfull channel of Piru Creek upstream and downstream of Pyramid Dam, complete a LWD budget, and synthesize results with other studies to evaluate geomorphic and ecological effects of trapping LWD. The study area would include Piru Creek upstream and downstream of Pyramid Lake. USFS estimated the cost to complete its requested study between \$150,000 and \$200,000.

With the exception of resource management goals, CDFW requested a study named *Large Woody Debris*, (CDFW, Attachment 1) that is essentially identical to USFS' requested study.

NMFS did not provide a specific study request, but said it supported other federal and State agencies' proposals for similar geomorphology, substrate and LWD studies (NMFS, p. 4).

The Licensees did not adopt USFS' and CDFW's requested study for the reasons described below.

Request Elements	Licensees' Reply
Request Element #1 – Conduct LWD assessment in Piru Creek upstream of Pyramid Lake	<p>NOT ADOPTED. The Licensees did not adopt the USFS' and CDFW's requests for a LWD assessment in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects on upstream LWD and thus there is no Project nexus for the study.</p>

	<p>Given this explanation, the Licensees have not addressed in this reply the elements in the USFS' and CDFW's request regarding a LWD assessment in Piru Creek upstream of Pyramid Lake.</p>
<p>Request Element #2 – Assess potential geomorphic effect of reducing LWD supply to, and altering its transport capacity within Pyramid reach</p>	<p>NOT ADOPTED. The Licensees did not adopt USFWS' and CDFW's request for two reasons. First, neither USFS nor CDFW provided any evidence to suggest that LWD is lacking in Pyramid reach due to the Project. The majority of the Project area is composed of mixed chaparral and coastal scrub. Montane hardwood, which includes pines, cedar, and fir species, only occurs in a few patches upstream of Pyramid Lake along Piru Creek and near Pyramid Dam (PAD, p. 4-134). Coniferous species that would provide LWD are not present in sufficient quantity to expect a change in channel morphology due to their presence or loss.</p> <p>Second, the Licensees rarely collect any LWD at Pyramid Lake, which supports the conclusion that the production of LWD is low in the basin. Further, it supports the conclusion that the Project has very little effect on LWD in Pyramid reach.</p> <p>Note that the Licensees' proposed <i>Pyramid Reach Fish Populations Study</i> will collect additional information regarding LWD in the reach.</p>
<p>Request Element #3 – Provide information required to assess potential anadromous and land-locked salmonid fish habitat impacts of any changes to geomorphic/LWD processes in the Middle Piru Creek resulting from Project facilities or operations</p>	<p>NOT ADOPTED. The Licensees did not adopt the USFS' and CDFW's requests for information related to salmonids in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.5 of this PSP. The Project has no effects on upstream fish habitat and thus there is no Project nexus for the study (Criterion 5).</p>

2.23 GROUNDWATER STUDY REQUEST (USFS AND CDFW)

USFS requested a study named *Groundwater* (USFS, pp. 256 through 264). In general, the goal of the requested study is “to characterize and understand effects of the Project, or by operation and maintenance of project facilities, on surface water-ground water interactions as they relate to habitat for aquatic species (e.g., fish, riparian vegetation, groundwater dependent ecosystems) and water quality, and water quantity in the Piru Creek and Castaic Creek watersheds” (USFS, p. 256). The study area would include the watersheds and groundwater basins associated with Piru Creek and Castaic Creek. The USFS estimated the cost to complete its requested study between \$350,000 and \$700,000.

With the exception of resource management goals, CDFW requested a study named *Groundwater* (CDFW, Attachment 1) that is essentially identical to USFS' requested study.

As described below, the Licensees did not adopt USFS' and CDFW's requested Groundwater studies.

Request Elements	Licensees' Reply
Request Element #1 – Synthesize existing data	<p>NOT ADOPTED. The Licensees did not adopt the USFS' and CDFW's requests for a <i>Groundwater Study</i> for the reasons stated in Section 1.1.4 of this PSP. In particular, as described in Section 1.1.4, an applicant does not have "a duty to determine if a problem exists."</p> <p>The Licensees did not adopt this element of the requested study because USFS and CDFW provided no evidence to support that the Project in any way adversely affects groundwater, nor do they adequately describe the Project nexus (Criterion 5) between Project operations and effects, and how the study results would inform the development of license requirements. Existing and proposed Project operations do not include groundwater extraction. The overall request is a research study, and essentially addresses the effects of Project construction, which is not within the scope of this relicensing.</p>
Request Element #2 – Evaluate geohydrologic processes and aquifer extent	<p>NOT ADOPTED. The Licensees did not adopt this element of the requested study because USFS and CDFW did not adequately describe the Project nexus to existing conditions (Criterion 5), but rather requested collection of information for comparison to natural flow processes (i.e., pre-Project). The USFS and CDFW have provided no evidence to support that the current Project in any way adversely affects groundwater resources. It is likely the Project has a beneficial effect on groundwater. The Project uses hundreds of thousands of acre-feet per year of imported water as part of the SWP, with daily conveyance of imported water 365 days a year, providing a continuous beneficial effect to groundwater resources in the arid area and related biological communities due to infiltration and aquifer recharge (e.g., springs, stream baseflow and water temperature). This study request would be an exhaustive research study regarding a resource that has not been identified as negatively impacted by the Project, and which essentially would assess Project effects of initial Project construction and operation.</p>
Request Element #3 – Identify Project facilities and impoundments and groundwater flow alteration	<p>NOT ADOPTED. USFS and CDFW did not describe the need for this additional information (Criterion 4) or how the information would inform license requirements (Criterion 5). As stated above, the USFS and CDFW request a very costly groundwater research study that would not inform license requirements, and is outside the purview of relicensing by attempting to assess pre-Project, not existing conditions.</p>
Request Element #4 – Assess groundwater dependent ecosystems	<p>NOT ADOPTED. USFS and CDFW have provided no evidence to support that the Project in any way adversely affects groundwater resources or groundwater-dependent ecosystems (GDE). USFS and CDFW did not describe the need for this additional information (Criterion 4) or how the information would inform license requirements (Criterion 5), especially considering Project operations of continuous daily import of water via the SWP to an arid Project area. This request element would be most applicable to new construction and dewatering activities during construction; however, the Licensees are not proposing any new construction. The Licensees' proposed <i>Botanical Resources Study</i> includes a wetlands and riparian assessment.</p>

<p>Request Element #5 – Identify other shallow groundwater users</p>	<p>NOT ADOPTED. USFS and CDFW did not describe the need for this additional information (Criterion 4) or how the information would inform license requirements (Criterion 5). As mentioned previously in the reply, Project operations do not include groundwater extraction or any proposed construction that would cause dewatering effects; however, the Project’s continuous daily import of water via the SWP provides a beneficial effect regarding groundwater, stream baseflow and water temperature.</p> <p>In addition, the USFS’s and CDFW’s estimated range of \$350,000 and \$700,000, respectively, to complete this study is artificially low. Given the breadth and depth of this study request – including but not limited to basin-wide characterization of aquifers within the Piru Creek and Castaic Creek watersheds (including aquifer depth/extent studies such as ground-penetrating radar, borings, and installation of wells or piezometers), physical models, numerical models, piezometer installations, field studies and monitoring, consultation and reporting – the Licensees estimate the cost of this research study to be between \$1,000,000 and \$2,000,000. The cost could be even greater than the highest estimate due to the uncertainties associated with the requested study (Criterion 7.)</p> <p>To Licensees’ knowledge, FERC has not required such a study for any other California project that proposes no new construction, dewatering or groundwater extraction (Criterion 6).</p>
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2.24 GROUNDWATER DEPENDENT ECOSYSTEMS STUDY REQUEST (USFS AND CDFW)

USFS requested a study named *Groundwater Dependent Ecosystems* (USFS, pp. 265 through 273). In general, the goal of the requested study would be “to inventory and determine effects to the groundwater-dependent ecosystems and adaptively manage these systems within the changing legal and policy framework” (USFS, p. 265). The study area would include GDE sites located within the FERC Project boundary, as well as the sources of GDE sites that may be located outside of the current FERC Project boundary. The USFS estimated the cost to complete its requested study between \$280,000 and \$300,000.

CDFW requested a study named *Groundwater Dependent Ecosystems* (CDFW, Attachment 1), which is similar to USFS’ requested study. CDFW estimated additional costs to complete its requested study would be approximately \$300,000.

As described below, the Licensees did not adopt USFS’ and CDFW’s requested *Groundwater Dependent Ecosystems Study*.

Request Elements	Licensees’ Reply
<p>Request Element #1 – Gather data and select predictive model(s) for determining effects to GDE</p>	<p>NOT ADOPTED. The Licensees did not adopt the USFS’ and CDFW’s requests for a <i>Groundwater Dependent Ecosystem Study</i> for the reasons stated in Section 1.1.4 of this PSP. In particular, as</p>

	<p>described in Section 1.1.4, an applicant does not have “a duty to determine if a problem exists.”</p> <p>The Licensees did not adopt this element (Step 1 of 6 of USFS’ study request) of the requested study because USFS provided no evidence of support that the Project in any way adversely affects GDEs, did not describe the Project nexus (Criterion 5) between Project operations and effects, and did not explain how the study results would inform the development of license requirements. Existing and proposed Project operations do not include groundwater extraction for any purposes nor any new construction or dewatering activities. Requested study Steps 2 through 6 below are contingent upon conducting Step 1. Therefore, Steps 2 through 6 are not adopted as well.</p> <p>See also the Licensees’ reply to USFS’ request for a groundwater study for other reasons why the USFS’ request for this GDE research study was not adopted by the Licensees.</p> <p>To Licensees’ knowledge, FERC has not required such a study for any other California project that proposes no new construction, dewatering or groundwater extraction (Criterion 6).</p>
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2.25 SCENIC INTEGRITY OBJECTIVE STUDY REQUEST (USFS)

USFS requested a study named *Scenic Integrity Objective* (USFS, pp. 274 through 278). In general, the purpose of the study would be to document how Project facilities and features on NFS lands do or do not comply with the Angeles National Forest’s (ANF) scenery goals and objectives, and with a 1969 MOU among DWR, ANF and the Los Padres National Forest (LPNF) to the extent scenic quality is addressed in the MOU (USFS, p. 274). The study area would include “all Project facilities and features on and approaching public land administered by the Forest Service, and their associated viewsheds, within a 4 mile radius” (USFS, p. 277). USFS estimated the cost to complete its requested study would be between \$24,000 and \$30,000.

As described below, the Licensees’ proposed *Visual Quality Study* in Section 3.1.15 of this PSP adopts some, but not all, of the elements in USFS’ requested study.

Request Elements	Licensees’ Reply
Request Element #1 – Identify Project components on NFS lands to be evaluated, and provide list to USFS for approval	<p>ADOPTED WITH MODIFICATION. As requested, the Licensees’ proposed <i>Visual Quality Study</i> proposes that the Licensees prepare a list and photograph all Project facilities and features on NFS lands within the proposed Project boundary. The Licensees did not adopt the requirement to have USFS approve the list and photographs. USFS provided no rationale why the USFS’ approval is needed (Criterion 4). The PAD includes a full list of all Project facilities and features, and shows associated land ownership.</p> <p>Further, the Licensees did not adopt USFS’ proposed 4-mile study radius around each Project facility and feature. The Licensees believe the viewshed for each facility and feature should be specific to the</p>

	unique conditions associated with that facility and/or feature. Defining a viewshed radius (e.g., 4 miles) is arbitrary.
Request Element #2 – Identify and map the identified Project facilities and features, summarize ANF’s scenic objectives and goals, and identify whether each facility is or is not consistent with ANF’s scenic goals and objectives	ADOPTED. The Licensees’ proposed <i>Visual Quality Study</i> includes this request element.
Request Element #3 – Prepare a mitigation report identifying how the Licensees would bring any Project facilities or features that are not in compliance with the ANF’s scenic objectives and goals into compliance with ANF’s goals and objectives immediately and for the foreseeable future. Also consider the 1969 MOU to the extent scenic quality is addressed in the MOU.	NOT ADOPTED. The Licensees did not adopt this element of USFS’s requested study because the purpose of the studies is to fill gaps in existing information so that interested parties may assess Project effects and develop recommendations and requirements for the new license – not to develop mitigation plans. Each interested party could perform its own assessment of potential impacts and develop its own recommendations regarding PM&E measures. As appropriate, the Licensees will propose mitigation in their license application.

2.26 ASSESS PROJECTED RECREATION USE AND DEMAND IN THE PROJECT AREA STUDY REQUEST (USFS)

USFS requested a study named *Assess Projected Recreation Use and Demand in the Project Area* (USFS, pp 279 through 284). In general, the goal of the requested study would be to “project recreation use and demand within the Project area through the term of the new Project license” (USFS, p. 279). The requested study is addressed in the *Recreation Study* and below. USFS estimated the cost to complete its requested study between \$120,000 and \$140,000.

As described below, the Licensees’ proposed *Recreation Study* in Section 3.1.11 of this PSP adopts some, but not all, of the USFS’ requested study.

Request Elements	Licensees’ Reply
Request Element #1 – Assess projected recreation use and demand in the Project area: Limited information regarding recreation visitor characteristics, attitudes, and preference information of Project area recreation visitors is available	ADOPTED WITH MODIFICATION. The USFS did not prescribe any study methods. The Licensees’ proposed <i>Recreation Study</i> includes study methods consisting of six elements: (1) observational survey; (2) visitor use questionnaire; (3) research publications and existing information; (4) assess regional uniqueness and significance of the Project area’s primary recreation opportunities; (5) interview user groups and recreation providers; and (6) regional demand assessment.

2.27 ASSESS RECREATION CARRYING CAPACITY OF THE PROJECT AREA STUDY REQUEST (USFS)

USFS requested a study named *Assess Recreation Carrying Capacity of the Project Area* (USFS, pp.285 through 291). In general, the goal of the requested study would be to “identify the maximum level of recreational facility development and use that the Project area lands and waters can accommodate without significantly affecting sensitive resources or creating undesirable crowded conditions” (USFS, p. 285). USFS estimated the cost to complete its requested study between \$45,000 and \$60,000.

As described below, the Licensees’ proposed *Recreation Study* described in Section 3.1.11 of this PSP adopts some, but not all, of the USFS’ requested study.

Request Elements	Licensees’ Reply
Request Element #1 – Assess the recreation carrying capacity of the Project area	ADOPTED WITH MODIFICATION. The USFS requested the study methods be developed at a later date. The Licensees’ proposed <i>Recreation Study</i> proposes study methods. Three types of capacity considerations are proposed and will be evaluated for each existing recreation facility (as identified in the existing Project recreation plan) in the carrying capacity component of study: (1) ecological/biophysical aspects; (2) management or facility aspects; and (3) social aspects. Qualitative assessments will guide this section of the Demand Analysis except where user and inventory data provide for a more quantitative analysis.

2.28 ASSESS REGIONAL UNIQUENESS AND SIGNIFICANCE OF THE PROJECT AREA’S PRIMARY RECREATION OPPORTUNITIES STUDY REQUEST (USFS)

USFS requested a study named *Assess Regional Uniqueness and Significance of the Project Area’s Primary Recreation Opportunities* (USFS, pp.292 through 297). In general, the goal of the requested study would be to “identify the uniqueness and relative significance of the Project Area’s primary recreational opportunities under existing and future proposed modified Project operations” (USFS, p. 292). USFS estimated the cost to complete its requested study between \$40,000 and \$60,000.

As described below, the Licensees’ proposed *Recreation Study* in Section 3.1.11 of this PSP adopts some, but not all, of the USFS’ requested study.

Request Elements	Licensees’ Reply
Request Element #1 – Assess regional uniqueness and significance of the Project Area’s primary recreation opportunities: limited information regarding regional uniqueness and significance of the Project Area’s primary recreation opportunities is available	ADOPTED WITH MODIFICATION. The USFS requested the study methods be developed at a later date. The Licensees’ proposed <i>Recreation Study</i> proposes study methods. These methods will determine the regional importance and uniqueness of the Project area’s primary recreation opportunities by identifying a range of southern California parks and recreation areas in the greater Los Angeles area, and tabulating what is known about annual visitation, general recreation opportunities and visitor origins. That information can be compared and contrasted in a qualitative and, where possible, quantitative narrative to help understand the uniqueness of Project-

	<p>based recreation opportunities and facilities. Site-specific factors that contribute to the uniqueness of the Project area that may increase user demand over the term of the new license can help inform the construct of questions and possible activities to be more thoroughly evaluated in the Demand Analysis portion of the <i>Recreation Study</i>. The USFS requested GIS data collection and maps to gauge the significance of the regional opportunity for each activity. Existing GIS data will be used for analysis.</p>
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2.29 ASSESS FIRE HAZARDS FROM PROJECT-INDUCED RECREATION STUDY REQUEST (USFS)

USFS requested a study named *Assess Fire Hazards from Project-Induced Recreation* (USFS, pp 298 through 303). The goal of the requested study would be to determine potential fire hazards from recreational use within the study area. The USFS proposes that the study be developed using the recreation use impact inventory and assessment in conjunction with fire history data, fire suppression resource response times and capabilities, and an assessment of existing fuel loading and vegetation profiles within the affected Project area. The requested study corresponds with the objectives identified in USFS’ requested *Assess Existing Recreation Use and Demand in the Project Area Study*. USFS estimated the cost to complete its requested study between \$30,000 and \$40,000.

As described below, the Licensees did not adopt the USFS’ study request.

Request Elements	Licensees’ Reply
Request Element #1 – Perform fire risk assessment study	<p>NOT ADOPTED. The Licensees have adequate existing information for inclusion in the DLA and no additional study is required (Criterion 4). Information is widely available regarding wildfire risks and hazards. Existing literature and data regarding wildfire risks can be obtained without a study. The requested study would not inform license requirements (Criterion 5).</p> <p>Additionally, USFS has provided no evidence that Project fires have been or are a problem on NFS lands. As mentioned in the PAD, the Licensees are unaware of any Project-caused fires on NFS lands. There is no known or demonstrated nexus between Project-related recreation and an increased risk of wildfire hazards (Criterion 5).</p>

2.30 WHITEWATER BOATING STUDY REQUEST (USFS AND NPS) AND WHITEWATER RECREATION STUDY REQUEST (AW)

USFS requested a study named *Whitewater Boating* (USFS, pp. 304 through 308). In general, the goal of the requested study would be “to evaluate the impacts of the hydropower project on existing and potential recreational whitewater boating use in the major stream within the Project, Piru Creek” (USFS, p. 265). USFS’ study area would include NFS lands within the Piru Creek corridor from Frenchman’s Flat Campground to United Water Conservation Districts’ Lake Piru boating takeout. The requested study would include a Level 1 assessment with three request elements and, if needed based

on results of a Level 1 assessment, could include a Level 2 assessment with two request elements, as well as a Level 3 assessment with two request elements. USFS estimated the cost to complete its requested study as between \$50,000 and \$60,000.

With the exception of resource management goals and study area, the United States Department of the Interior, National Park Service (NPS) requested a study named *Whitewater Boating* (NPS, pp. 2 through 4) that is essentially identical to USFS' requested study. NPS estimated the cost to complete its requested study as between \$50,000 and \$60,000.

With the exception of resource management goals and study area, American Whitewater (AW) requested a study named *Whitewater Recreation* (AW, pp. 4 through 7) which is essentially identical to USFS' requested study. AW's study area would include Piru Creek above and below Pyramid Lake. AW estimated the cost to complete its requested study to be \$50,000.

As described below, the Licensees did not adopt USFS', NPS's and AW's study request.

Request Elements	Licensees' Reply
Request Element #1 – Conduct a whitewater boating flow assessment in Piru Creek upstream of Pyramid Lake	<p>NOT ADOPTED. The Licensees did not adopt AW's request for a whitewater boating study in Piru Creek upstream of Pyramid Lake for the reasons stated in Section 1.1.4 of this PSP. The Project has no effects upstream of Pyramid Lake and thus there is no Project nexus for the study. (Criterion 5)</p> <p>Given this explanation, the Licensees have not addressed in this reply elements regarding a whitewater boating assessment in Piru Creek upstream of Pyramid Lake.</p>
Request Element #2 – Conduct a whitewater boating flow assessment in Pyramid reach	<p>NOT ADOPTED. The Licensees did not adopt the USFS', NPS's, and AW's requests for a whitewater boating flow assessment in Pyramid reach for the reasons stated in Section 1.1.5 of this PSP. Because the current flow regime is required by the ESA to prevent unauthorized take of arroyo toads, a study of impacts of alternative flow regimes for whitewater boating is not likely to inform development of new license conditions. (Criterion 5)</p> <p>In addition, the Licensees note that streamflow data at the United States Geological Survey (USGS) flow gaging station below Pyramid dam is available in real time to the public on the Internet.</p> <p>Given this explanation, the Licensees have not addressed in this reply request regarding a whitewater boating assessment in Pyramid reach.</p>

2.31 PROJECT-RELATED ROADS MAINTENANCE AND USE STUDY REQUEST (USFS)

USFS requested a study named *Project-Related Roads Maintenance and Use Study* (USFS, pp.309 through 312). In general, the goal of the requested study would be to “develop the essential additional information necessary to supplement the existing information to address potential maintenance needs of Project-Related Roads.” (USFS, p. 309). To address the potential maintenance needs of Project-related roads, this requested study would be oriented to: (1) determine which roads should be considered primary Project roads and identified as such in the application for a new license; (2) identify road maintenance standards and conduct condition assessments on these roads; and (3) identify any needed improvements for these roads. USFS suggests that information developed in this study could be used to identify and prioritize Project road maintenance and repairs. USFS estimated the cost to complete its requested study as between \$100,000 and \$110,000.

As described below, the Licensees did not adopt the USFS study request.

Request Elements	Licensees’ Reply
Request Element #1 – Perform a road assessment	<p>NOT ADOPTED. The Licensees have included primary Project road descriptions and the proposed Project boundary with mapped roads for the relicensing in the PAD, thus there is no need for an additional inventory. The Licensees will use the PAD documentation to advance consultation with USFS regarding roads used by the Project. USFS’ requested study was not adopted by the Licensees because existing information is adequate (Criterion 4).</p> <p>In addition, the USFS did not provide parameters for the road condition inventory. These are noted as something the Licensees could request later. If a road condition inventory were to be completed, the Licensees would need such parameters to understand potential costs, the level of detailed information desired, and how the study would be consistent with currently accepted scientific practice (Criterion 6).</p>

2.32 WATER TEMPERATURE MONITORING AND DEVELOPMENT OF WATER TEMPERATURE MODEL STUDY REQUEST (USFS), AND WATER TEMPERATURE MODEL STUDY REQUEST (SWRCB)

The SWRCB requested a study named *Water Temperature Model* (SWRCB, Attachment B, pp. 4 through 6). The goal of the requested study would be to “develop a water temperature model that can be used by State Water Board and relicensing participants to simulate current and potential future water temperature conditions” (SWRCB, Attachment B, p. 4). The SWRCB does not define the study area other than saying the model would generally include the “Project streams and reservoirs” and Piru Creek. The SWRCB did provide an estimated cost for the study of \$100,000 to \$150,000. However, the SWRCB did not provide details regarding the study methods.

USFS also requested a study named *Water Temperature Monitoring and Development of Water Temperature Model* (USFS, pp. 313 through 318) with the same goal as stated above by the SWRCB for its *Water Temperature Model Study*. The USFS limited its requested study area to Piru Creek from Pyramid Dam to Blue Point Campground. USFS also requests consultation between the Licensees and relicensing stakeholders at various points during study development and implementation including pushing the model selection criteria definition stage to a later point so it would be unknown in this study planning and evaluation phase. The USFS estimated the cost to complete the requested study would be \$120,000 to \$140,000.

As described below, the Licensees’ proposed *Water Quality and Temperature Study* in Section 3.1.16 of this PSP adopts some, but not all, of the elements in the studies requested by SWRCB and USFS.

Request Elements	Licensees’ Reply
<p>Request Element #1 – Develop a water temperature model that can be used to inform license requirements</p>	<p><u>NOT ADOPTED.</u> The Licensees have not adopted the SWRCB’s and USFS’ request for a water temperature model study. Because the current flow regime is required by the ESA to prevent unauthorized take of arroyo toads, a study of impacts of alternative flow regimes on water temperature is not likely to inform development of new license conditions. Further, temperature was considered in determining the appropriate flow regime for Piru Creek in the 2009 FERC Order and ESA evaluations and the Licensees are not aware of any changes that would warrant reexamining this issue. The SWRCB requests a water temperature model of the entire Project, but the only surface waters into which the Project discharges are Castaic Lake and Pyramid reach. The relative volume of water released through Angeles Tunnel and the resulting temperature effects of the Project’s discharges into Castaic Lake, which are made for water supply, are <i>de minimis</i> when compared to the large volume of the lake. Therefore, a water temperature model is not needed because it would not be useful to inform license requirements regarding water temperature effects on Castaic Lake and related requirements in the new license (Criterion 4 and Criterion 5).</p> <p>In addition, neither the SWRCB nor the USFS provided any evidence to suggest that water temperatures in Pyramid reach, for which information exists, affects any resource. Note that the Licensees’ proposed <i>Water Quality and Temperature Study</i> would gather continuous water temperature at three locations in Pyramid reach for a year. If an interested party believes those data indicate a potential issue, the party could request FERC to direct the Licensees to collect additional information, including developing a water temperature model, at that time. However, the large cost to develop a model (the Licensees anticipate the SWRCB’s and USFS’ expected cost of between \$100,000 and \$150,000 is extremely low), given that it is unlikely to be needed, is not warranted.</p> <p>Given this explanation, the Licensees have not addressed in this reply elements in the SWRCB’s and USFS’ request that are specifically related to the development of a water temperature model (e.g., install and maintain meteorological monitoring stations, develop a water temperature model platform in consultation with relicensing</p>

	stakeholders, calibrate and validate a water temperature model, synthesize water temperatures, develop a base case, and produce model reports).
Request Element #2 – Collect additional water temperature data and consult on sampling locations	ADOPTED WITH MODIFICATION. The Licensees’ <i>Water Quality and Temperature Study</i> includes the collection of additional empirical water temperature data at select locations in Quail and Pyramid lakes and in Piru Creek. The Licensees’ proposed data will be collected for one year.
Request Element #3 – Prepare Study Report	NOT ADOPTED. A separate study report is not required by FERC’s ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.

2.33 FISH ENTRAINMENT RISK ASSESSMENT STUDY REQUEST (CDFW), FISH ENTRAINMENT STUDY REQUEST (SWRCB)

CDFW requested a study named *Fish Entrainment Risk Assessment* (CDFW, Attachment 1). In general, the goal of the requested study would be “to assess the potential effects of entrainment at these facilities [Pyramid Dam outlet pipe intake and radial gates and Angeles Tunnel intake] on fish.” The study area would include Pyramid Lake. CDFW estimated the cost to complete its requested study in the \$50,000 range.

With the exception of resource management goals and the lack of study methods, the SWRCB requested study named *Fish Entrainment Study* (SWRCB, pp. 41 through 43) is essentially identical to CDFW’s requested study.

As described below, the Licensees’ proposed *Fish Entrainment Risk Assessment Study* in Section 3.1.17 of this PSP adopts some, but not all, of the elements in CDFW’s and SWRCB’s requested studies.

Request Elements	Licensees’ Reply
Request Element #1 – Assess entrainment at the Pyramid Dam radial gates and low level outlet, and at the Angeles Tunnel Intake	ADOPTED WITH MODIFICATION. The Licensees’ proposed <i>Fish Entrainment Risk Assessment Study</i> will evaluate the potential for entrainment into the Pyramid Dam low level outlet and the Angeles Tunnel Intake, as requested by CDFW and SWRCB. The Licensees did not adopt CDFW’s and SWRCB’s request to assess fish passage through the Pyramid Dam radial gates. CDFW and SWRCB study requests provide no basis for why this information is needed (Criterion 4) or would be useful to inform license requirements (Criterion 5). The assessment of risk of fish passing through a dam’s radial gates is not consistent with studies performed in other relicensings, including those cited by both CDFW and the SWRCB.
Request Element #2 – The potential for entrainment at these intakes will be analyzed using existing fishery data from the “Fish Populations in Pyramid Lake Study”	NOT ADOPTED. The Licensees did not adopt CDFW’s request that this study focus on fishes found near the low level outlet and Angeles Tunnel intake using gill netting data from the “ <i>Fish Populations in Pyramid Lake Study</i> ” for two reasons. First, it is unclear what “ <i>Fish Populations in Pyramid Lake Study</i> ” CDFW refers to. As stated in the PAD (section 4.5.4.4 Pyramid Lake, p.4-116), the most recent general

	<p>fish surveys in Pyramid Lake were conducted by CDFW in May and October of 2013, but did not include gill netting. Nor did CDFW include in its PAD comments a request that the Licensees perform a “<i>Fish Populations in Pyramid Lake Study</i>” or any gill netting, and the Licensees did not propose such a study.</p> <p>Second, existing information adequately describes the fish species composition in Pyramid Lake, and existing literature on the life history of these fishes can be used to determine the likelihood by lifestage of these fishes occurring in the deep part of Pyramid Lake near the low level intake and Angeles Tunnel intake (Criterion 4). This is the approach in the Licensees’ proposed <i>Fish Entrainment Risk Assessment Study</i>.</p>
<p>Request Element #3 – Use existing information to characterize the location and operation of the Pyramid Dam low outlet intake and the Angeles Tunnel intake, the approach velocities to the intakes, and to estimate the swim speed of fishes that may be near the intakes</p>	<p>ADOPTED. The Licensees’ proposed <i>Fish Entrainment Risk Assessment Study</i> states the Licensees will use existing information to characterize the location and operation of the intakes, calculate approach velocities to the intakes, and estimate the swim speed of fishes that may be near the intakes.</p>
<p>Request Element #4 – Compare fish swim speeds with the approach velocities to the intakes</p>	<p>ADOPTED. The Licensees’ proposed <i>Fish Entrainment Risk Assessment Study</i> provides that the Licensees will compare the swim speeds of the lifestages of fishes that are likely to be near the intakes with the approach velocities to the intakes.</p>
<p>Request Element #5 – QA/QC data</p>	<p>ADOPTED. The Licensees’ proposed <i>Fish Entrainment Risk Assessment Study</i> includes QA/QC of all data.</p>
<p>Request Element #6 – Prepare study report and provide the information to interested parties as soon as possible</p>	<p>ADOPTED WITH MODIFICATION. A separate study report is not required by FERC’s ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.</p>

2.34 COMPREHENSIVE ARGENTINE ANT SURVEY STUDY REQUEST (CDFW)

CDFW requested a study named *Comprehensive Argentine Ant Survey* (CDFW, Attachment 1). In general, the goals of the requested study would be “to document the presence and distribution of Argentine ants, determine if the Project could introduce or spread Argentine ants, and reduce Argentine ant habitat.” (CDFW). The study area would include all Project facilities, Pyramid reach of Piru Creek, Castaic Creek at Elderberry Forebay and developed recreation facilities. CDFW estimated the cost to complete its requested study as between \$35,000 and \$65,000.

As described below, the Licensees did not adopt the CDFW study request for the reasons stated below.

Request Elements	Licensees' Reply
<p>Request Element #1 – Gather information necessary to answer six questions on the presence and distribution of the Argentine ant</p>	<p>NOT ADOPTED. The Licensees did not adopt the CDFW's requests for an <i>Argentine Ant Study</i> for the reasons stated in Section 1.1.4 of this PSP. In particular, as described in Section 1.1.4, an applicant does not have "a duty to determine if a problem exists." As discussed below, CDFW has not provided any evidence to suggest the Project contributes to the spread of Argentine ants.</p> <p>CDFW's goal for the study is to address some specific questions regarding Argentine ant's trophic structure and biodiversity displacements, impacts on native ants and other insects, impacts to pollination, seed dispersal and fruit set or factors that influence the size and distribution of Argentine ants. CDFW's recommended methods would not provide the information to answer these questions. In addition, based on CDFW's expressed study goal of answering these questions, it appears CDFW's requested study is more of a research study on Argentine ants than an informative study that could help inform license conditions (Criterion 5).</p> <p>In addition, CDFW has not shown a demonstrative Project nexus (Criterion 5). While the Argentine ant is widespread in California, CDFW has provided no evidence that it is a nuisance at the Project as compared to anywhere else where it occurs in California, or that the Project has caused Argentine ant to invade the area or spread into new areas</p>
<p>Request Element #2 – Initial reconnaissance and study site selection to develop and implement a study to assess the level of invasion by Argentine ants...and where their impacts are greatest</p>	<p>NOT ADOPTED. The Licensees did not adopt this element as CDFW did not adequately address the Project nexus (Criterion 5) for the proposed study area upstream and downstream of the Project. Section 1.1.4 of this PSP details the reasons why these areas would not be adopted into any study plans.</p> <p>Also, the study does not meet Criterion 6, as it was not designed for such a large study area. Per the proposed protocol, a hectare is broken up into a grid and 32 index cards containing cookies or tuna oil are spread throughout the area. Surveyors leave the cards in place for an hour in the morning and then check each one. The protocol was originally implemented on a single hectare (USGS 2015). Per the protocol, a single hectare can be done in a day, since the protocols recommends the surveys be performed in the morning. The FERC Project boundary contains approximately 1,515 hectares and could not easily be pared down to meet a 'comprehensive survey' that covers the proposed study area. Again, this appears to suggest that CDFW's requested study is more of a research study than a relicensing study.</p>
<p>Request Element #3 – Develop and implement an Argentine ant rapid assessment</p>	<p>NOT ADOPTED. CDFW requests the Licensees use the USGS 2015 protocol, which is not consistent with generally acceptable protocols (Criterion 6). The protocol was originally part of a larger study of the ESA-listed Pacific pocket mice (<i>Perognathus longimembris pacificus</i>) at Camp Pendleton (USGS 2015) – it is not a protocol that was designed solely for an ant survey.</p>

<p>Request Element #4 – Prepare a report that includes development and implementation of control measures for Argentine ants</p>	<p>NOT ADOPTED. The Licensee did not adopt this measure because the CDFW did not adequately address how information from the study would be used to inform license conditions (Criterion 5). The study would not inform license requirements since at this time; and there is no effective strategy for managing Argentine ants over large areas, particularly those not specifically tied to buildings (University of California, Riverside 2015). Therefore, the study would not provide information that would inform a long-term management approach for Argentine ants, as suggested by CDFW.</p>
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2.35 HERBICIDE, PESTICIDE AND RODENTICIDE EFFECTS ON VEGETATION AND WILDLIFE STUDY REQUEST (CDFW)

CDFW requested a study named *Herbicide, Pesticide and Rodenticide Effects on Vegetation and Wildlife* (CDFW, Attachment 1). In general, the goal of the requested study would be “to determine if Project-related uses of pesticides cause deleterious effects to vegetation and wildlife and determine known poisonings of wildlife from rodenticide...” (CDFW, Attachment 1). No specific study area was described. The requested study did not describe any specific elements, beyond conducting a study to meet the stated goals. CDFW estimated the cost to complete its requested study as between \$20,000 and \$40,000.

As described below, the Licensees did not adopt the CDFW study request for the reasons stated below.

Request Elements	Licensees’ Reply
<p>Request Element #1 – Conduct study to determine potential harm to document secondary poisoning</p>	<p>NOT ADOPTED. The Licensees did not adopt this request element because CDFW did not adequately describe the proposed study to determine if it’s consistent with accepted practice (Criterion 6). In addition, no specific protocols were described in the CDFW request, although CDFW noted it has done secondary rodenticide studies. However, any methods from such studies were not described, nor was information given to describe the benefit of such previous studies that could justify the need for this type of study for a hydropower relicensing project. There was no mention of studies to determine if pesticides are causing deleterious effects to wildlife and vegetation.</p> <p>Furthermore, the letter said “...CDFW could not find an example of previous FERC studies of this kind...” (CDFW).</p> <p>Additionally, the PAD described the uses of pesticides on the Project. Pesticide use at the Project by the Licensees is governed by well-known recommended application practices that are deemed to be best practices for protecting the environment. This existing data is sufficient for determining license conditions (Criterion 5).</p> <p>Finally, the CDFW did not adequately address Criterion 7, since there were no details of the study from which to make a determination of cost, leaving the assumed cost of \$20,000 to \$40,000 unsupported.</p>

2.36 WATER BALANCE / OPERATIONS MODEL STUDY REQUEST (SWRCB)

SWRCB requested a study named *Water Balance / Operations Model* (SWRCB, Attachment B, pp. 1 through 4). In general, the goal of the requested study would be “to develop a water balance and operations model that can be used to simulate current and potential future Project operations over a range of hydrologic conditions (e.g., range of water year types),” (SWRCB, Attachment B, pp. 1 through 2). SWRCB estimated the cost to complete its requested study as between \$100,000 and \$150,000.

NMFS did not request a specific study, but did indicate it supported other federal and State agencies’ proposals regarding additional flow/temperature gages and water temperature and flow modeling studies for Pyramid reach.

As explained below, the Licensees did not adopt SWRCB’s requested study.

Request Elements	Licensees’ Reply
Request Element #1 – Develop a water balance and operations model that can be used to simulate current and potential future Project operations over a range of hydrologic conditions (e.g. range of water years types)	<p>NOT ADOPTED. The Licensees did not adopt this request for three reasons. First, the only natural watercourse that the Project discharges into is Pyramid reach and as described in Section 1.1.5 of this PSP, the current flow regime in the reach is required by the ESA to prevent unauthorized take of arroyo toads, a study of impacts of alternative flow regimes using a water balance model is not likely to inform development of new license conditions.</p> <p>Second, the elevation of the main water storage reservoir, Pyramid Lake, is limited by the current operating agreements to the upper 19 feet under normal operating conditions.</p> <p>Third, the water that passes through the Project for generation is moved downstream for water supply purposes on a schedule determined by the downstream water supply users.</p> <p>For these reasons a water balance operations model would not inform license requirements.</p>

2.37 FISH POPULATIONS (RESERVOIRS) STUDY REQUEST (SWRCB)

SWRCB requested a study named *Fish Populations (Reservoirs)* (SWRCB, pp. 39 through 44). In general, the goal of the requested study would be “to provide information concerning the distribution, occurrence, and condition of fish in the Project reservoirs.” (SWRCB, p. 32). The study area would include Pyramid Lake and Quail Lake. SWRCB estimated the cost to complete its requested study to be similar to the Licensees’ proposed *Quail Lake Fish Populations Study* (\$150,000).

As described below, the Licensees’ proposed *Quail Lake Fish Populations Study* in Section 3.1.2 of this PSP adopts some, but not all, of the elements in SWRCB’s requested studies.

Request Elements	Licensees' Reply
Request Element #1 – Sample fish populations in Pyramid Lake	<u>NOT ADOPTED.</u> The Licensees did not adopt SWRCB's request to conduct fish populations sampling in Pyramid Lake because existing information is adequate (Criterion 4). Section 4.5.4.4 of the PAD includes data from general fish surveys conducted by CDFW in 2012 and 2013. In addition, the most current stocking records and creel survey data from 2014 and 2015 were also reported for Pyramid Lake in sections 4.5.4.5 and 4.5.4.6 respectively. This information will be updated in the draft license application as DWR is scheduled to continue to collect it in the coming years.
Request Element #2 – Sample fish populations in Quail Lake	<u>ADOPTED WITH MODIFICATION.</u> The Licensees' proposed <i>Quail Lake Fish Populations Study</i> is detailed in this PSP. Proposed methods include electrofishing the entire shoreline of the lake and conducting up to 50 days of creel surveys. This approach is consistent with the data collected for Pyramid Lake by the Licensees and CDFW. There is no need for consultation on study sites as the entire shoreline will be surveyed.
Request Element #3 – QA/QC data	<u>ADOPTED.</u> The Licensees' proposed <i>Quail Lake Fish Populations Study</i> includes QA/QC of all data.
Request Element #4 – Prepare study report	<u>ADOPTED WITH MODIFICATION.</u> A separate study report is not required by FERC's ILP regulations. Available information will be provided to interested parties in the ISR, USR, DLA, and FLA. See Section 4.0 for additional information on reporting of study results.
Request Element #5 – Study Specific Consultation	<u>NOT ADOPTED.</u> The Licensees did not adopt SWRCB requests that the Licensees consult with relicensing stakeholders to determine final sampling sites and methodology in one day or multiple day meetings. The Licensees' proposed <i>Quail Lake Fish Populations Study</i> proposes locations and sampling methods.

3.0 STUDY PLANS

3.1 LICENSEES' PROPOSED STUDY PLAN

In developing this PSP, the Licensees carefully reviewed the requests for additional studies, comments provided to FERC, and existing information presented in the PAD. Stakeholder recommendations and study requests received from governmental agencies and other stakeholders have been considered and, where appropriate, have been included in this PSP. Complete versions of the individual study plans are provided below.

3.1.1 Aquatic Invasive Species Study

3.1.1.1 *Project Nexus*

Continued Project O&M and Project-related recreation activities have potential to introduce and propagate AIS. For the purpose of this *AIS Study*, AIS is defined as aquatic, non-native nuisance organisms that invade ecosystems beyond the species' natural, historic range or are native but are considered "nuisance" species because they cause environmental, recreational, or economic harm (e.g. cyanobacteria).

3.1.1.2 *Existing Information and Need for Additional Information*

Existing, relevant, and reasonably available information regarding AIS within the proposed Project boundary is provided in Section 4.5.1.1 of the Licensees' PAD. As a summary, the Licensees found records of two AIS in the Project reservoir or impoundments, and concluded 15 AIS have potential to occur in the Project reservoir and impoundments. Cyanobacteria (algae) are known to occur in Pyramid Lake, and in December of 2016, after the filing of the Licensees' PAD, adult quagga mussels were located in the Angeles Tunnel between Pyramid Lake and Elderberry Forebay. These mussels were located during a tunnel inspection by the Licensee's staff and were removed at that time. CDFW was notified of the finding. Los Angeles County Department of Parks and Recreation in conjunction with DWR and CDFW instituted boating restrictions on Pyramid Lake. Notifications were also sent to the Metropolitan Water District of Southern California (MWD) and the USFS.

Currently, the Licensees conduct plankton-tow surveys once to twice monthly depending on the time of year, and visual surveys periodically for quagga and zebra mussels in Pyramid Lake. With the recent finding of quagga mussels in the Angeles Tunnel, the Licensees will be expanding their monitoring per established regulations for the management of quagga and zebra mussels, including implementing DWR's *Quagga and Zebra Mussel Rapid Response Plan* for the SWP and developing a containment plan. Los Angeles County Department of Parks and Recreation also conducts pre-entry boat inspections at Pyramid Lake for quagga and zebra mussels. The Licensees also conduct monitoring and management on Pyramid Lake for cyanobacteria. No formal surveys for other AIS are conducted in Pyramid Lake, Quail Lake or Elderberry Forebay.

Additional information is needed to determine if AIS are present in the study area for the *AIS Study*. If found, their locations in relation to Project facilities, Project O&M, and Project-related recreation activities will be identified to determine if these locations might facilitate the propagation of AIS within Pyramid Lake, Quail Lake and Elderberry Forebay.

3.1.1.3 Study Goals and Objectives

The goal of this *AIS Study* is to determine if continued Project O&M and Project-related recreation activities could increase the abundance of AIS or spread them to new areas if they are present within the study area for the *AIS Study*. This may occur if:

- An AIS is located within the study area for the *AIS Study*, and
- A specific Project O&M or recreation activity has a reasonable possibility of spreading AIS.

The objective of this *AIS Study* is to gather sufficient data necessary to fill recognized information gaps about the presence and location of AIS within the proposed Project boundary.

3.1.1.4 Study Methods

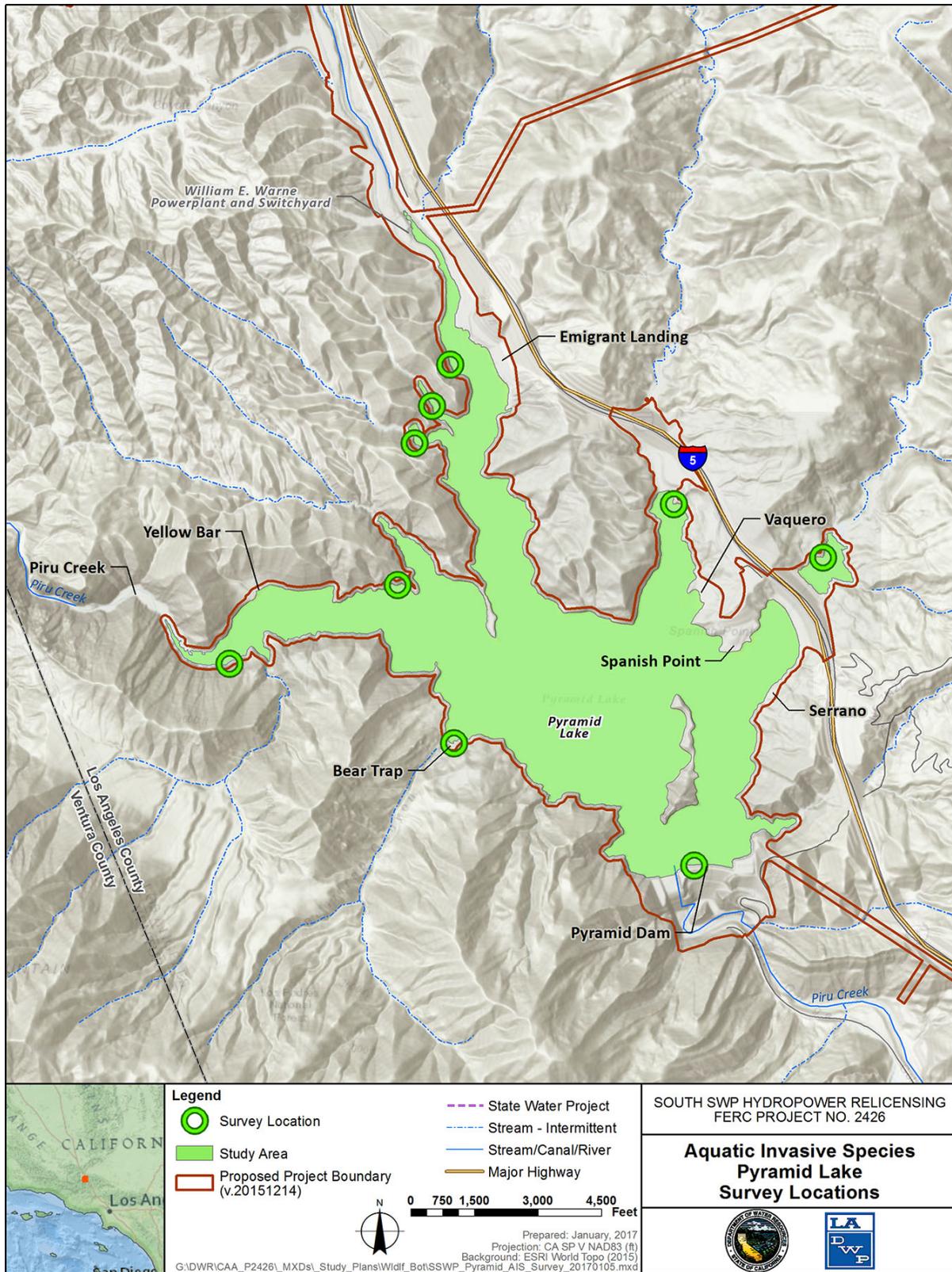
Study Area

The study area for the *AIS Study* consists of Pyramid Lake, Quail Lake and Elderberry Forebay.

General Concepts and Procedures

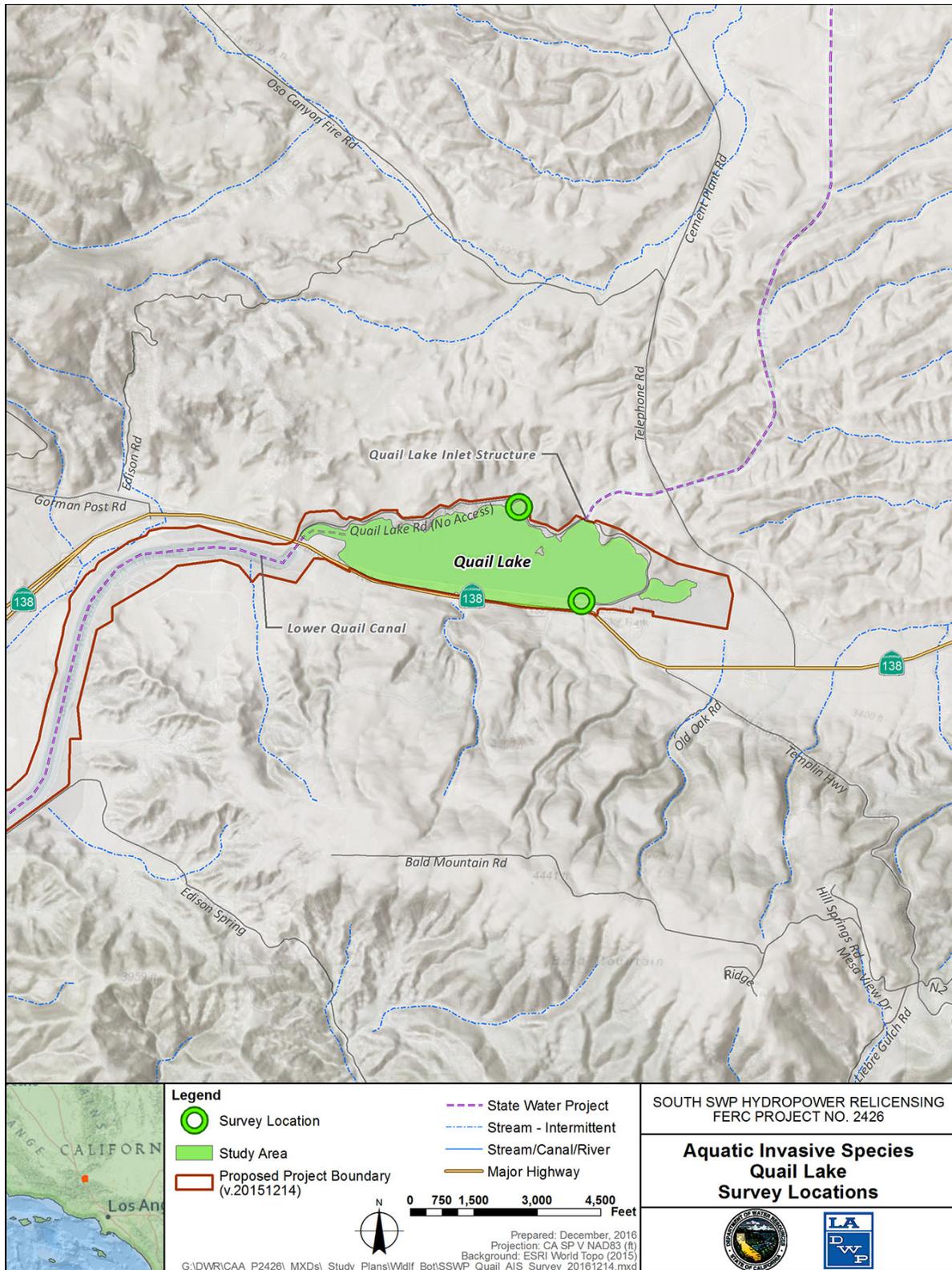
- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *AIS Study* will begin after FERC issues its Study Plan determination.
- The *AIS Study* does not include the development of requirements for the new license, which will be addressed outside the *AIS Study*.
- The *AIS Study* focuses on AIS within the proposed Project boundary, but the study area for the *AIS Study* is specific to that resource.
- If required for the performance of the *AIS Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the *AIS Study*. The Licensees will only enter private property if permission has been provided by the landowner.

- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *AIS Study*.
- Field crews may make variances to the *AIS Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *AIS Study* will be noted in the data resulting from the *AIS Study*.



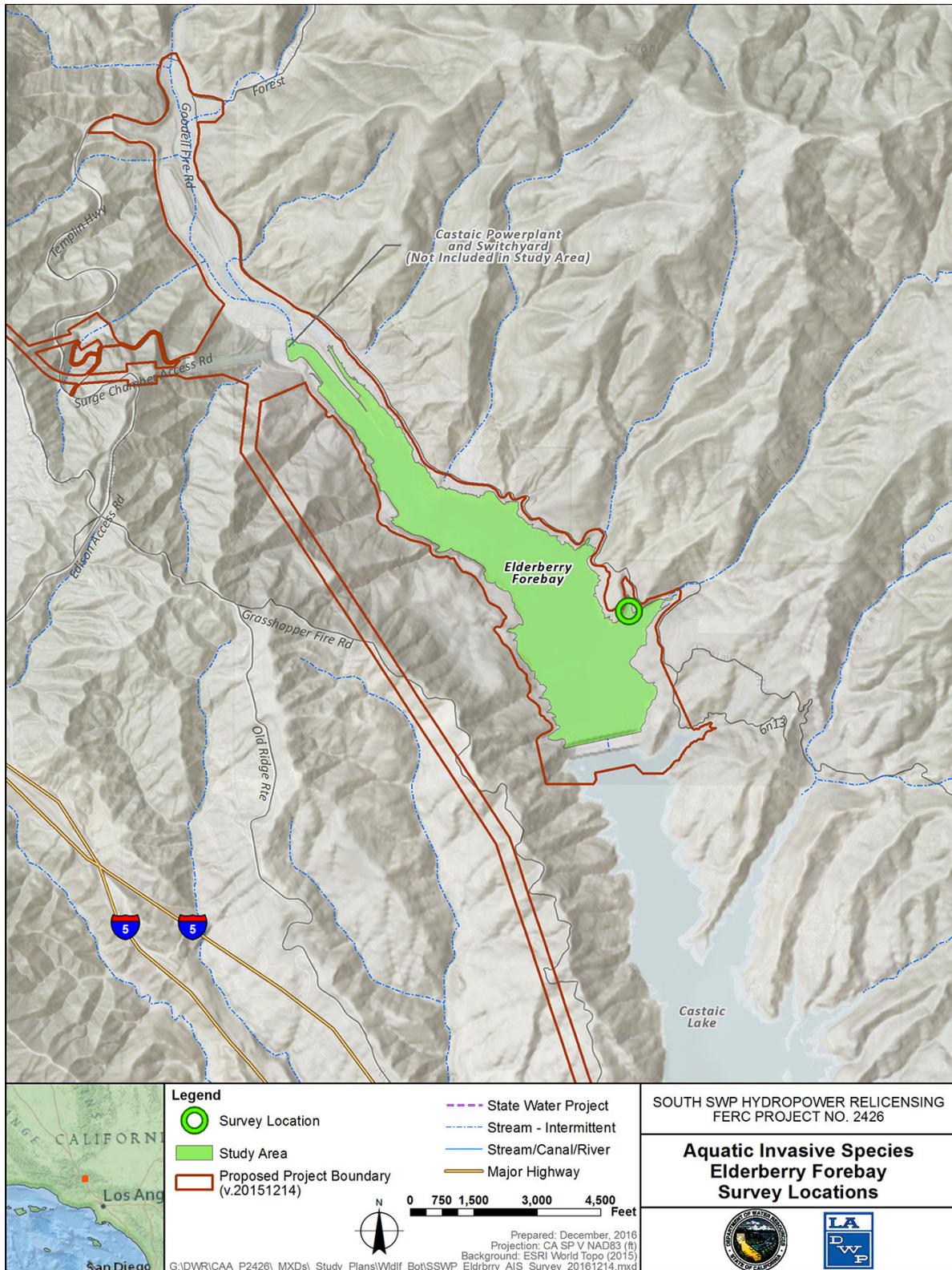
Note: The entire reservoir will be surveyed for invasive plants.

Figure 3.1-1. Map of Focused Survey Locations for Aquatic Invasive Species on Pyramid Lake



Note: The entire reservoir will be surveyed for invasive plants.

Figure 3.1-2. Map of Focused Survey Locations for Aquatic Invasive Species on Quail Lake



Note: The entire reservoir will be surveyed for invasive plants.

Figure 3.1-3. Map of Focused Survey Locations for Aquatic Invasive Species on Elderberry Forebay

Methods

The *AIS Study* will consist of three steps: (1) gather data and prepare for field effort; (2) conduct surveys; and (3) prepare final report. These steps are described below.

Step 1 – Gather Data and Prepare for Field Effort. The Licensees will prepare field maps for the *AIS Study*, depicting aerial imagery and Project features. Field preparation will include review of the *AIS Study Plan*, development of data sheets and determination of the survey period. This effort will include coordination with staff at Pyramid Lake, Quail Lake and Elderberry Forebay, including the Los Angeles County Department of Parks and Recreation, Los Angeles County Sheriff, and the Pyramid Lake concessionaire, Parks Management Company.

Step 2 – Conduct Surveys. The Licensees will conduct specific surveys for aquatic invasive snails and clams (Asian clam, European ear snail, and New Zealand mudsnail), red-eared sliders, and aquatic invasive plant species (sago pondweed, Eurasian watermilfoil, coontail, water primrose, water hyacinth, hydrilla, and parrot's feather milfoil). The Licensees currently conduct monitoring for zebra and quagga mussels at Pyramid Lake, so they are not proposed for inclusion in the field surveys. Staff from the Environmental Assessment Branch of DWR's Division of Operations and Maintenance monitor and sample for cyanobacteria, so cyanobacteria monitoring is not proposed for additional monitoring in this study. However, if any AIS that are not specifically targeted during this *AIS Study* are observed, they will be recorded as incidental sightings.

Surveys for aquatic invasive snails and clams will be performed at nine locations on Pyramid Lake (see Figure 3.1-1). To the extent practical, survey sites will coincide with sites currently sampled for AIS by DWR. Two locations on Quail Lake will also be selected per Figure 3.1-2. All safely accessible areas of Elderberry Forebay will also be surveyed for invasive snails and clams, with one transect selected along the shoreline (see Figure 3.1-3).

Specific survey sites will be located in areas where AIS are more likely to be introduced or in areas with potential habitat for AIS snails and/or clams. In general, areas with silt, sand, or gravel substrate and a relatively low gradient will be targeted for the focused survey.

At each focused survey site, surveyors will establish a 320-foot transect along the shoreline. The Licensees will collect general site information, including the geographical extent of the site (using a map-grade GPS unit), the date and time of the survey, field crew members present, and general characterization of the weather. Representative photographs of each site will be taken.

The Licensees will record the dominant and sub-dominant substrate, the average water depth, and the maximum water depth encountered during the survey. Basic water quality parameters will be collected including water temperature, dissolved oxygen (DO), pH, conductivity, and turbidity using a hand-held probe (e.g., HydroLab or YSI)

and measure water clarity using a Secchi disc. For purposes of characterizing the aquatic plant species composition along each transect, all aquatic vegetation will be identified to the species level within the littoral zone using a presence/absence protocol. The littoral zone is the near shore area where sunlight penetrates to the sediment and allows aquatic plants (macrophytes) to grow.

At each focused survey location, the presence or absence of Asian clams, European ear snail, New Zealand mudsnail, and channeled apple snail will be evaluated using two methods: visual surveys and a sediment sieve.

First, a visual inspection of the shoreline aquatic vegetation and immediate shallow water will occur at each survey site to determine the presence of snails, clams, or other mollusks. Depending on gradient, water level and clarity, staff will also visually inspect an area of the shoreline up to 33 feet from the wetted edge.

Additionally, up to 10 unique sediment samples will be collected and sieved within each focused site. Five samples will be collected along the shoreline (approximately 66 feet apart), and five more will be collected approximately 33 feet offshore, following the same spacing as the onshore samples (Grohs and Klumb 2010). The samples collected along the shoreline will involve shoveling substrate directly into a five-gallon bucket with a stainless steel wire cloth affixed to the bottom (Figure 3.1-4). Each sample will consist of enough sediment to fill the bucket to a predetermined volume (approximately two to three shovel loads). The substrate sample will be rinsed to remove the fine sediment, and staff will note the presence or absence of snails and clams of interest in each subsample. Other bivalves and mollusks will be identified to the extent possible.

Samples taken offshore will be collected using an Ekman dredge or similar device (Figure 3.1-5) and will follow the same process described above.



Figure 3.1-4. Example Sieve and Bucket System



Figure 3.1-5. Example Ekman Dredge

The Licensees will also conduct surveys for the red-eared slider. Basking and visual encounter surveys will be conducted in the nine focused locations in Pyramid Lake, the

two sites on Quail Lake and the one site on Elderberry Forebay identified for the aquatic invasive snail and clam surveys. The Licensees will survey suitable habitat within focused locations. Surveys will be performed with binoculars and a tripod-mounted spotting scope. Additionally, surveys will be conducted for a period of up to one hour per survey site and will occur at dawn. The following data will be recorded: date, time, observer, GPS location, weather description, presence or absence of slow-moving water, basking substrate type, percent submergent and emergent vegetation, estimated water depth, and description of nearby upland habitat. Additional reptile or amphibian species seen during these surveys will be recorded as incidental sightings.

To document the presence of aquatic invasive plants (including alligatorweed, water hyacinth, hydrilla, water primrose, parrotfeather, etc.) in the open water (as compared to the shoreline surveys described above), the Licensees will survey the portions of the reservoir open to motorized boats, following pre-established survey transects spaced approximately 96 feet apart. The water surface will be surveyed for aquatic plants. In addition to the boat operator, there will be two surveyors, one on either side of the boat, each scanning a 48-foot-wide area. A weed rake will be used along the transect and checked periodically to retrieve aquatic weeds that are not visible from the surface.

All aquatic plant species documented during the open water surveys will be identified to species level, if possible. If necessary for identification, plants will be collected and keyed using the Jepson Manual (Baldwin et. al. 2012).

If an AIS plant species is identified, the following information will be collected:

- Digital photos to document the occurrence
- GPS delineated point or polygon
- Estimated phenology and descriptions of reproductive state
- Potential Project-related activities in the vicinity of the specimen
- Estimated size of occurrence (i.e. number of individuals)

AIS plant surveys will be conducted in the late summer or early fall.

To prevent the introduction and transmittal of amphibian chytrid fungus and invasive invertebrates (e.g., quagga mussels, zebra mussel, and Asian clams), field crews will be trained on, provided with, and use materials (e.g., Quat) and will follow DWR's *Quagga and Zebra Mussel Rapid Response Plan* for decontaminating their boots, waders, and other equipment between water-based study sites. All boats used during the study will follow clean protocols, including inspections before and after use. All decontamination requirements in place at Project reservoirs will be strictly followed.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures including rechecking field data sheets, spot-checking data, and reviewing electronic data, including GIS products, for completeness.

Analysis

Following the surveys, the Licensees will prepare GIS maps depicting AIS occurrences, Project facilities, Project-related recreation activities and other data collected during surveys. Water quality will be reviewed, where applicable and as relevant to the potential introduction or establishment of AIS in the study area for the *AIS Study*.

Reporting

The Licensees will compile *AIS Study* results for incorporation, to the extent completed into the ISR, USR, DLA, and FLA. A map showing the locations of AIS found in the reservoir will be included in the summary.

Specific AIS will be reported to relevant agencies within three days of being located as follows:

- CDFW, if quagga or zebra mussels, New Zealand mudsnail, or channel apple snail are located
- California State Parks, Division of Boating and Waterways, if water hyacinth is observed
- California Department of Food and Agriculture (CDFA), if hydrilla is observed

3.1.1.5 Consistency of Methodology with Generally Accepted Scientific Practices

The *AIS Study* methodology is consistent with recently performed surveys for AIS, including 2014 and 2016 surveys for Asian clams in New York and New Bullards Bar Reservoir in California respectively; 2010 surveys for New Zealand mudsnails in Washington; and 2012 surveys for aquatic invasive plants, snails and bivalves in the Umpqua National Forest in Oregon.

3.1.1.6 Schedule

The *AIS Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *AIS Study*.

Fieldwork Preparation	June 2017 – July 2017
Fieldwork	August 2017 – November 2017
Data QA/QC	October 2017 – January 2018
Data Analysis and Reporting	February 2018 – June 2018

3.1.1.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *AIS Study* will range between \$140,000 and \$181,000.

3.1.1.8 References

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, editors. 2012. *The Jepson Manual: Vascular Plants of California*, second edition. University of California Press, Berkeley.

CDFW. 2008. Quagga/Zebra Mussel Artificial Substrate Monitoring Protocol. Available online: <<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=4953&inline>>.

Grohs, K. and R. Klumb. 2010. Asian clam sampling on five South Dakota Reservations. USFWS. Accessed October 17, 2016. Last updated October 7, 2010. Available online: <<https://www.fws.gov/mountain-prairie/fisheries/gpFWCODocs/GrohsandKlumbSDReservationsAsianClamReport2010.pdf>>. USFWS. Pierre, South Dakota.

3.1.2 Quail Lake Fish Populations Study

3.1.2.1 Project Nexus

Continued Project O&M and Project-related recreation activities have the potential to affect fish populations in Quail Lake, which is used by the public for non-contact recreation, including fishing.

3.1.2.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding fish populations in Quail Lake is provided in Section 4.5 of the Licensees' PAD. As a summary, the Licensees found mostly outdated, anecdotal information regarding fish populations or the fishery in Quail Lake. A DWR brochure (DWR 1997) describes six species of fish that can be found there, including striped bass (*Morone saxatilis*), channel catfish (*Ictalurus punctatus*), Sacramento blackfish (*Orthodon microlepidotus*), tule perch (*Hysterocarpus traskii*), threadfin shad (*Dorosoma* sp), and Sacramento hitch (*Lavinia exilicauda exilicauda*). Neither the Licensees nor CDFW stock fish in Quail Lake. This *Quail Lake Fish Populations Study* will supplement existing information by providing current information regarding fish populations and the fishery in Quail Lake.

3.1.2.3 Study Goals and Objectives

The goals of this *Quail Lake Fish Populations Study* are to characterize: (1) fish species composition and relative abundance (i.e., not quantitative abundance estimates); (2) fish size and condition factor; and (3) the angling resources present at Quail Lake.

The objective of this *Quail Lake Fish Populations Study* is to gather sufficient data necessary to fill recognized gaps in information concerning the distribution, occurrence, and condition of fish in Quail Lake, and the current status of the recreational fishery in Quail Lake.

3.1.2.4 Study Methods

Study Area

The study area for the *Quail Lake Fish Populations Study* will consist of the area within the proposed Project boundary surrounding Quail Lake. The study area for the *Quail Lake Fish Populations Study* is shown below in Figure 3.1-6.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Quail Lake Fish Populations Study* will begin after FERC issues its Study Plan determination.
- The *Quail Lake Fish Populations Study* does not include the development of requirements for the new license, which will be addressed outside the Study.
- The *Quail Lake Fish Populations Study* focuses specifically on fish populations within Quail Lake, but the study area for the *Quail Lake Fish Populations Study* is specific to that resource.
- If required for the performance of the *Quail Lake Fish Populations Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Quail Lake Fish Populations Study*.
- Field crews may make variances to the *Quail Lake Fish Populations Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances in the *Quail Lake Fish Populations Study* will be noted in the data resulting from the *Quail Lake Fish Populations Study*.

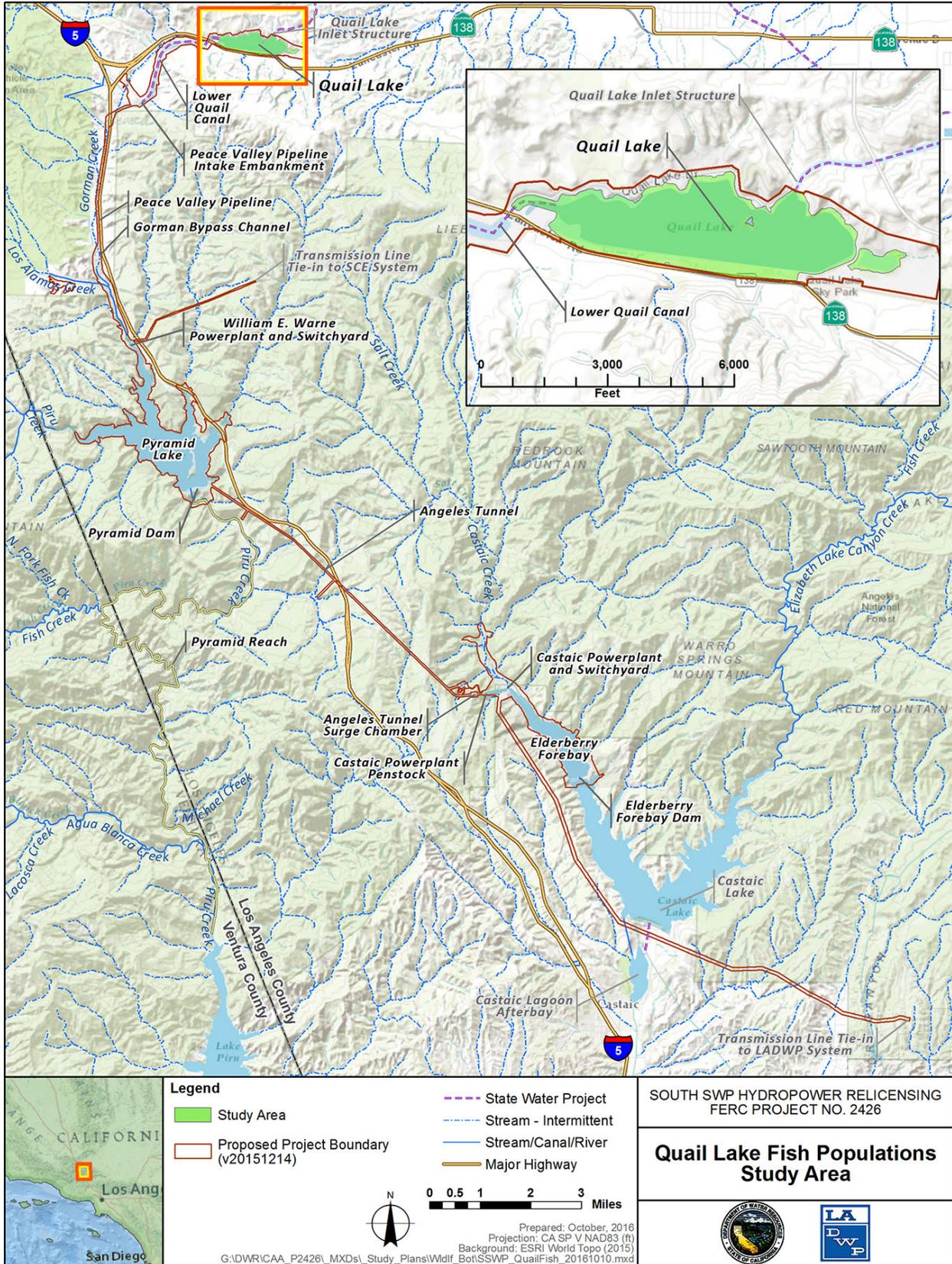


Figure 3.1-6. Quail Lake and the Related Project Vicinity

Methods

This *Quail Lake Fish Populations Study* will consist of two core steps: (1) data gathering and planning; and (2) fieldwork, primarily electrofishing and creel surveys. These steps are described below.

Step 1 – Data Gathering and Planning. Prior to fieldwork being conducted, GIS data will be used to divide the Quail Lake shoreline into six segments of approximately 0.5 mile each, which will cover the entire shoreline of the reservoir. These segments will be treated as individual sites to divide the electrofishing into more manageable amounts and reduce the holding time for captured fish.

Planning for the creel surveys will include the selection of 50 days by stratified random sampling (16 high use days and 34 low use days) from October 1, 2017 through July 31, 2018, and will be limited to roughly 5 days per month (Pollock et al. 1994; Malvestuto 1996). Weekends and major holidays are considered high use days, and weekdays and the winter season are considered low use days.

Step 2 – Fieldwork. Fieldwork will consist of two elements: boat electrofishing and creel surveys, as described below.

Boat Electrofishing: Electrofish sampling will be conducted from the shoreline out to a depth that coincides with the radius of the electrofishing field. The radius of the electrofishing field will be estimated by measuring the maximum distance from the anode at which a voltage can be measured by a multimeter while the electrofishing unit is on. This will be measured prior to sampling activities each day and recorded. Water quality data for Quail Lake will be reviewed to ensure the proper electrofishing equipment is prepared and deployed for the work. Fish sampling will be conducted by boat electrofishing at night to provide data regarding species composition and relative abundance. This activity requires a CDFW-issued scientific collection permit, which will be applied for once the *Quail Lake Fish Populations Study* is approved by FERC. Restrictions and limitations imposed by the scientific collecting permit may result in modifications to the methods used in this *Quail Lake Fish Populations Study* in order to meet the permit requirements. Any variances from the study methods resulting from permit restrictions or limitations will be noted. The shoreline of Quail Lake will be sampled one night in October, using boat electrofishing beginning one hour after civil twilight. Boat electrofishing will take place using methods detailed by Reynolds (1996) and Temple and Pearsons (2007). Sampling will employ an approach similar to that used by CDFW in 2013 at Pyramid Lake. The six sites selected in Step 1 will be sampled for a minimum of 10 minutes (600 seconds) of pulsed direct current (or alternating current depending on the water quality) applied to the water, and this time will be recorded. A generator powered pulsator (GPP) (Smith-Root 5.0 or similar) electrofishing unit will be used with one or two electrode booms to apply the appropriate current to the water. The sampling crew will include three team members: one boat operator, and two netters. Sampling will be conducted in a “leap frog” manner, in which a short portion of shoreline is fished followed by a “leap” of approximately 50 feet in order to limit herding or moving fish. Fish will be held in live wells with adequate

aeration during sampling and processing. Once the captured fish from each site are processed, they will be released near the end of the site where sampling began in order to temporarily segregate them from electrofishing sampling at the next site.

All collected fish will be identified to species and counted. General condition (e.g., muscle tone, vigor, color) will be noted and any external parasites will be documented and photographed. Up to 50 individuals of each species will be measured to the nearest millimeter (fork length) and weighed by digital scale to the nearest gram. Additional fish will be examined and counted.

General information recorded will include impoundment name, GPS sample site locations (beginning and end of each site), crew member names, weather conditions, air temperature, and water chemistry at approximate fish sampling location (i.e., water temperature, DO, and conductivity). Minimum, maximum, and mean water depths at the location will be recorded.

Creel Surveys: A stratified random sample of 16 high use days and 34 low use days will be selected for sampling between October 1, 2017 and July 31, 2018. High use days are weekends and major holidays and low use days are weekdays and the winter season. On average, 5 days per month will be sampled over the ten-month period. Additionally, a schedule of A.M. (9:00 – 12:00) or P.M. (1:00 – 4:00) surveys will be randomly selected for each survey day. This will provide for a total of 75 hours of potential survey time over the five months (3 hours per day for 25 days).

Creel surveys will be conducted at the parking area adjacent to Highway 138 (the parking area is the only access point to Quail Lake). The access and lack of boat launch will limit the area that anglers spread out around the reservoir and effectively funnel anglers to surveyors, which will aid in making sure all anglers are surveyed. Anglers will be interviewed as they return from their fishing trip.

Information to be collected in each interview will include the following:

- Start and end time of angling outing and the time of the interview
- Number of fish caught by species (including fish harvested and released)
- Targeted fish species
- Angler age by category (<16, 16–55, >55 years old)
- Angler gender (male, female)
- Angler distance traveled by category (<20 miles, 20–50 miles, >50 miles)
- Angler satisfaction ranking for number of fish caught, size of fish caught, and overall fishing experience (1=poor, 2=fair, 3=good, 4=excellent)
- Whether angling was the primary reason for their visit to Quail Lake

- Zip code of residences

Additional information that will be recorded each day will include:

- Date, day of the week
- Approximate air temperature
- General description of the weather
- A.M. or P.M. survey
- Harvested fish measured to the millimeter (fork or standard length depending on species); harvested fish will not be weighed

Similarly, catch per unit effort (CPUE) will be calculated for game fish species for which creel data are collected. Length information will be compared to the weight-length relationships developed from the electrofishing data to evaluate which stratum of the fish population are impacted by angling. The results of the qualitative angling interview questions will be summarized and presented with the electrofishing analysis.

To prevent the introduction and transmittal of amphibian chytrid fungus and invasive invertebrates (e.g., quagga mussels, zebra mussel, and Asian clams), field crews will be trained on, provided with, and use materials (e.g., Quat) for decontaminating their boots, waders, and other equipment between water-based study sites. All boats used during the study will follow clean protocols, including inspections before and after use. All decontamination requirements in place at Project reservoirs will be strictly followed.

Quality Assurance and Quality Control

Field data gathered during *Quail Lake Fish Populations Study* will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC for sample collection equipment, procedures, and cross-checking of data. As part of the QA/QC procedures, extreme care will be taken to ensure the data collected is accurate and maintained in a safe environment.

Analysis

Boat electrofishing results will be documented both as total catch and in terms of CPUE. CPUE for fishes captured by boat electrofishing will be calculated by dividing number of fish of each species captured by the length of time fished (e.g., fish per minute). CPUE will be summarized by species. Weight-length relationships, relative weight, proportional stock density, and relative stock density (RSD) (Anderson and Neumann 1996) will be calculated for special-status species, and any species captured that is recognized as game fish by CDFW.

Reporting

Quail Lake Fish Populations Study methods and results will be prepared and included, to the extent completed in the Licensees' ISR, USR, DLA, and FLA.

3.1.2.5 Consistency of Methodology with Generally Accepted Scientific Practices

The *Quail Lake Fish Populations Study* methodology is generally consistent with recently performed electrofishing studies and creel surveys performed by CDFW and its contractors and the annual creel surveys being conducted by Environmental Science Associates, Inc. at Pyramid Lake. The level of effort (number of sampling days) is less than those being done at Pyramid Lake because Quail Lake is a much smaller and less trafficked reservoir.

3.1.2.6 Schedule

The *Quail Lake Fish Populations Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *Quail Lake Fish Populations Study*:

Fieldwork Preparation	June 2017 – October 2017
Fieldwork	October 2017 – July 2018
Data QA/QC	August 2018
Data Analysis and Reporting	August 2018

3.1.2.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Quail Lake Fish Populations Study* will range between \$188,000 and \$251,000.

3.1.2.8 References

DWR. 1997. *The State Water Project: Quail Lake (Brochure)*. Sacramento, CA.

Malvestuto, S.P. 1996. "Sampling the Recreational Creel," pages 591–623 in *Fisheries Techniques*, Second Edition, B.R. Murphy and D.W. Willis, editors. American Fisheries Society, Bethesda, Maryland.

Pollock, K.H., C.M. Jones, and T.L. Brown. 1994. *Angler Survey Methods and Their Application in Fisheries Management*. American Fisheries Society Special Publication 25.

Temple, G.M. and Pearsons, T.N., 2007. Electrofishing: backpack and drift boat. *Salmonid field protocols handbook: techniques for assessing status and trends in salmon and trout populations*. American Fisheries Society, Bethesda, Maryland, pp.95-132.

3.1.3 Pyramid Reach Fish Populations Study

3.1.3.1 Project Nexus

Continued Project O&M and Project-related recreation activities have the potential to affect fish populations in Pyramid reach (i.e., the 18.4-mile-long section of Piru Creek from Pyramid Dam to the NMWSE of Lake Piru).

3.1.3.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding fish populations in Pyramid reach is provided in Section 4.5 of the Licensees' PAD. As a summary, surveys conducted by CDFW in Pyramid reach in 1987 detected two native species (rainbow trout and prickly sculpin) and five introduced fishes (bluegill, green sunfish, largemouth bass, catfish, and brown trout). CDFW stocked Pyramid reach with rainbow trout and largemouth bass in the 1930s, and with rainbow trout from the 1940s to August 2008.

Additional information, which will be provided by this *Pyramid Reach Fish Populations Study*, is needed to determine the presence and locations of the fish community that occur in Pyramid reach that could be affected by the Project.

3.1.3.3 Study Goals and Objectives

The goals of this *Pyramid Reach Fish Populations Study* are to: (1) characterize fish species composition and relative spatial distribution; (2) estimate abundance (i.e., fish per mile in areas feasible for electrofishing) or relative abundance of fish by species; (3) analyze fish population size-structure and age-class structure; and (4) calculate the fish condition factor in Pyramid reach. The objective of this *Pyramid Reach Fish Populations Study* is to fill recognized gaps in existing information on the presence and extent of fishes in Pyramid reach.

3.1.3.4 Study Methods

Study Area

The study area for the *Pyramid Reach Fish Populations Study* includes Pyramid reach as shown in Figure 3.1-7 below.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Pyramid Reach Fish Populations Study* will begin after FERC issues its Study Plan determination.

- The *Pyramid Reach Fish Populations Study* does not include the development of requirements for the new license, which will be addressed outside the Study.
- The *Pyramid Reach Fish Populations Study* focuses specifically on fish populations within Pyramid reach, but the study area for the *Pyramid Reach Fish Populations Study* is specific to locations that can support that resource.
- If required for the performance of the *Pyramid Reach Fish Populations Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Pyramid Reach Fish Populations Study*.
- Field crews may make variances to the *Pyramid Reach Fish Populations Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances in the *Pyramid Reach Fish Populations Study* will be noted in the data resulting from the *Pyramid Reach Fish Populations Study*.

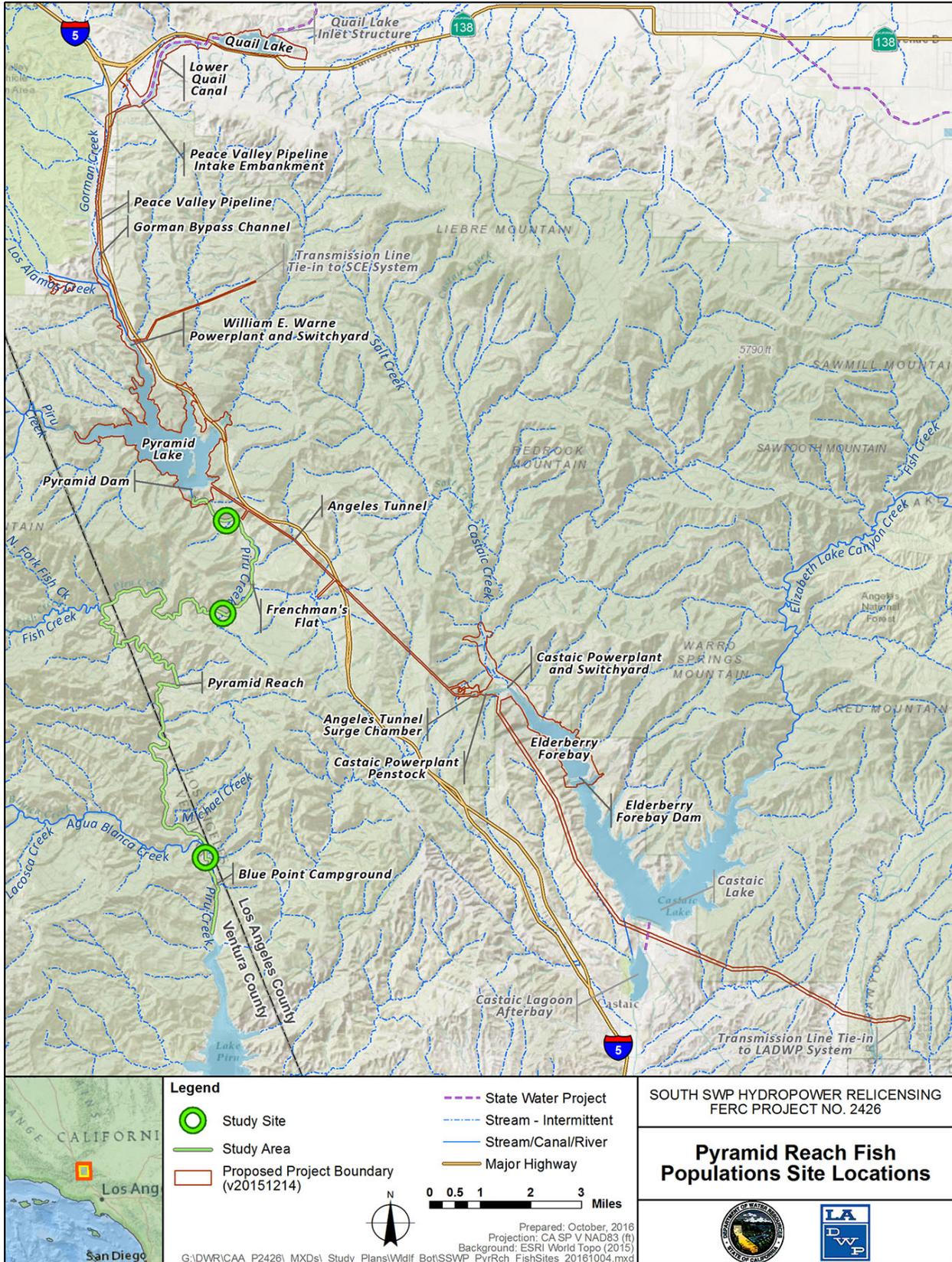


Figure 3.1-7. The Pyramid Reach of Piru Creek with Potential Sampling Locations

Methods

Data collection for the *Pyramid Reach Fish Populations Study* will consist of four steps: (1) classify mesohabitat and channels; (2) conduct eDNA sampling; (3) select sampling sites for fish population sampling; and (4) sample fish population, as described below. Fish sampling will be predicated on the Licensees obtaining necessary federal and State of California permits for sampling. Required permits will include a CDFW scientific collecting permit for streams that do not contain federal ESA-listed species and an ESA section 10(a)(1)(A) authorization from the USFWS for arroyo toad.

Step 1 – Classify Mesohabitat and Channels. Mesohabitat will be classified from the NMWSE of Lake Piru upstream to Pyramid Dam. A three-tiered habitat mapping classification system developed by Hawkins et al. (1993) will be used to assist in the identification of individual habitat units in the field. Level III categories are generally modified/adopted from McCain et al. (1990) and Flosi and Reynolds (1994). Figure 3.1-8 shows the relationship among the three levels. At the broadest level, Level I categorizes habitats as “fast water” and “slow water.” In Level II, fast water and slow water are each subdivided into two categories: turbulent and non-turbulent, and scour pool and dammed pool, respectively. Level III includes the 18 distinct mesohabitat types that will be used to classify habitat for the study. These expand on the Level II classification by separating each habitat type by either gradient, physical structure, or geomorphic process.

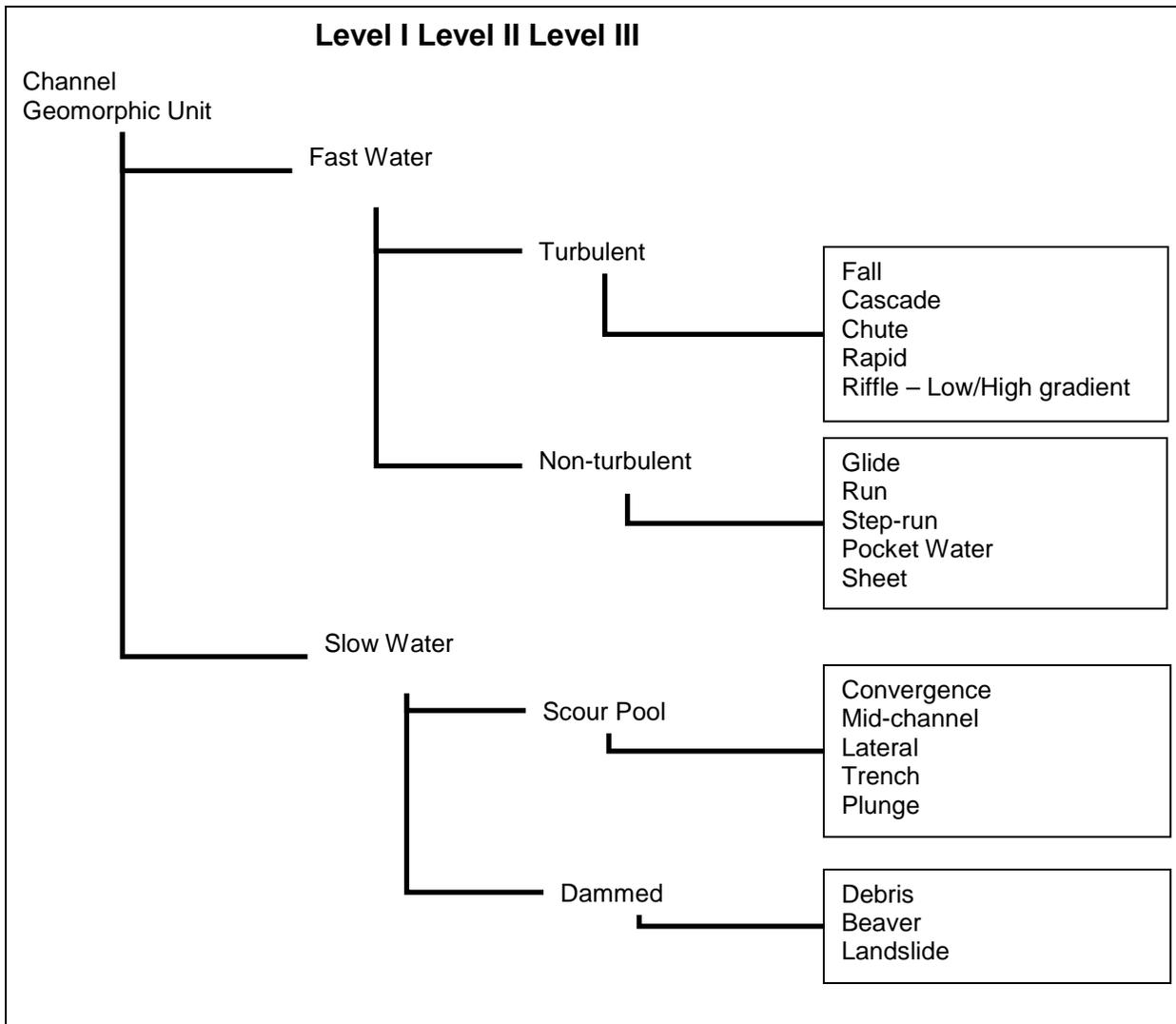


Figure 3.1-8. Key to Habitat Types

Each distinct habitat unit will be numbered consecutively in an upstream direction. Habitat type descriptions are listed in Table 3.1-1 below. Channel and habitat characteristics shown in Figure 3.1-8 and Table 3.1-1 will be assessed in all ground surveys, and the aerial imagery will be used to assess channel and habitat types when streams are clearly visible.

The extent of the ground-based habitat mapping surveys will be determined based on the visibility of the stream from aerial imagery, the length of the sub-reach to be surveyed, and whether the reach is accessible by field crews. Ground-based mapping will be conducted in those stream segments where habitat characteristics are not adequately discernible in the aerial imagery.

Limited ground-based mapping will also be conducted in stream segments that are conducive to mapping using aerial imagery to establish a baseline for mapping the remainder of the reach. Ground-based mapping in streams visible in the aerial imagery will be used to “calibrate the eye” by physically measuring and typing specific habitat units observed in the aerial imagery. Mesohabitat units assessed on the ground will then be “typed” in the remainder of the stream sub-reach using the aerial imagery.

The physical parameters (e.g., bankfull width, pool depth, substrate) measured for each mesohabitat unit during ground-based mapping are expected to be similar for those same mesohabitat units throughout the remainder of the sub-reach. Additional habitat information, such as counting LWD (any un-rooted wood with a minimum length of three feet and minimum diameter or four inches at the large end) in the channel, trout spawning gravel and spawning gravel patch size, and potential fish passage barriers, will be documented during ground based mapping at each fish sampling site.

Table 3.1-1. Habitat Types

I. Fast Water:		Riffles, rapid, shallow stream sections with steep water surface gradient.
	A. Turbulent:	Channel units having swift current, high channel roughness (large substrate), steep gradient, and non-laminar flow and characterized by surface turbulence.
	1.Fall:	Steep vertical drop in water surface elevation. Generally not modelable.
	2.Cascade:	Series of alternating small falls and shallow pools; substrate usually bedrock and boulders. Gradient high (more than 4%). Generally not modelable.
	3.Chute:	Narrow, confined channel with rapid, relatively unobstructed flow and bedrock substrate.
	4.Rapid:	Deeper stream section with considerable surface agitation and swift current; large boulder and standing waves often present. Generally not modelable.
	5.Riffles:	Shallow, lower-gradient channel units with moderate current velocity and some partially exposed substrate (usually cobble). <ul style="list-style-type: none"> • Low gradient – Shallow with swift flowing, turbulent water. Partially exposed substrate dominated by cobble. Gradient moderate (less than 4%). • High gradient – Moderately deep with swift flowing, turbulent water. Partially exposed substrate dominated by boulder. Gradient steep (greater than 4%). Generally not modelable.
	B. Non-turbulent:	Channel units having low channel roughness, moderate gradient, laminar flow, and lack of surface turbulence.
	1.Sheet:	Shallow water flowing over smooth bedrock.
	2.Run / Glide:	Shallow (glide) to deep (run) water flowing over a variety of different substrates.
	3.Step Run	A sequence of runs separated by short riffle steps. Substrates are usually cobble and boulder dominated.
	4.Pocket Water:	Swift flowing water with large boulder or bedrock obstructions creating eddies, small backwater, or scour holes. Gradient low to moderate.
II. Slow Water:		Pools; slow, deep stream sections with nearly flat water surface gradient.
	A. Scour Pool:	Formed by scouring action of current.
	1.Trench:	Formed by scouring of bedrock.
	2.Mid-channel:	Formed by channel constriction or downstream hydraulic control.
	3.Convergence	Formed where two stream channels meet.
	4.Lateral:	Formed where flow is deflected by a partial channel obstruction (stream bank, rootwad, log, or boulder).
	5.Plunge:	Formed by water dropping vertically over channel obstruction.
	B. Dammed Pool:	Water impounded by channel blockage.
	1.Debris:	Formed by rootwads and logs.
	2.Beaver:	Formed by beaver dam.
	3.Landslide:	Formed by large boulders.
	4.Backwater:	Formed by obstructions along banks (recorded as a comment or note to mapping).
	5.Abandoned Channel:	Formed along main channel, usually associated with gravel bars (not part of the main active channel; recorded as a comment or note to mapping).

Note: Adapted from McCain et al. 1990, and Hawkins et al. 1993.

Step 2 – Conduct eDNA Sampling. The eDNA sampling will be conducted at 1,640-foot intervals using a Garmin GPSMAP 60CSx (or similar) to determine sampling locations, from Pyramid Dam to the NMWSE of Lake Piru. Sampling will be conducted by biologists trained in eDNA collection. Sample collection will occur once during the spring run-off period (expected to follow a storm event in February or March). Sampling will be consistent with the protocol described in Bergman et al. (2016). For each sample, between 2 and 10 liters of water will be filtered using sterile tubing and a portable peristaltic pump. No water other than sample blank water will be transported or stored for sampling. Water samples will be filtered through a 0.45 micrometer sterile filter, and stored on ice for transport back to the lab. Samples will be labeled with sampling location, volume of water filtered, and any other information necessary for tracking and chain of custody purposes.

To prevent cross contamination of samples, new filters, tubing, and nitrile gloves will be used for each sample. In addition, after collection each sample filter will be returned to its original packaging and sealed in a sterile secondary container prior to storage in a separate, dedicated transport container. All filters will be kept in the secondary storage container and placed in a -20 degrees Celsius (°C) laboratory freezer until DNA extraction is performed. Any filters that are opened but not used will be considered contaminated and discarded. Field (negative) controls will be taken at the beginning and end of each field day.

eDNA samples will be tested for the presence of DNA from Santa Ana sucker (SSC), arroyo chub (SSC), prickly sculpin, speckled dace, unarmored three spine stickleback (FE), and rainbow trout. These fish represent the community of native fishes, although the occurrence of several species have only been documented anecdotally. Any incidental sightings of those fish species will be noted.

Step 3 – Select Sampling Sites for Fish Population Sampling. Three representative sample sites will be selected: one in the 2-mile-long section of Pyramid reach between Pyramid Dam and the concrete structure upstream of Frenchman’s Flat; one within a mile downstream of Frenchman’s Flat; and one just upstream of the confluence with Agua Blanca Creek. The sites will be selected at locations accessible to field crews and will represent the overall habitat ratios found in the reach using the mesohabitat mapping data created for the reach.

Prior to site selection in the field, preliminary sites will be selected using existing aerial imagery and habitat mapping data. Final sampling sites will be selected in consultation with USFS, USFWS, SWRCB, and CDFW. The Licensees will make a good faith effort to schedule the consultation on a day or days convenient to the Licensees and interested relicensing stakeholders, and will provide an email notice at least 30 days in advance of the meeting or site visit.

Sample sites are expected to vary in length, but typically range between 325 and 1,000 feet. Site length will be sufficient to include habitat that represents the ratio of riffle, run, and pool habitat present in the stream segment in which the site is located. Exact site length will be determined in the field by the Licensee.

Step 4 – Sample Fish Population. Multiple-pass depletion sampling (Reynolds 1996 and Temple et al. 2007) using backpack electrofishing equipment will be performed where permitted to capture fish and develop population estimates at the sampled sites for select species. This sampling is expected to occur in the fall (September or October). Upstream and downstream ends of each site will be blocked with fine mesh nets or a fish passage barrier. If required, the nets or passage barrier would span the full width and depth of the stream except where an upstream fish passage barrier obviates the need for head-end blocking or where edge or stream margin habitat is to be sampled. If necessary, salt blocks will be placed in the stream immediately above the electrofishing station to increase conductivity. Salt blocks will be used when fish are observed escaping the direct path of the electric field generated by the electrofishing unit at elevated settings.

Field crews will consist of at least two netters for each shocker. The Licensees will follow Temple, et al. (2007), who recommends one backpack electroshock crew for streams less than 24.6 feet wide and two backpack electrofish crews for streams 24.6 – 49.2 feet wide. In wadeable streams wider than 49.2 feet, the number of electroshocking crews will be expanded as necessary to assure effective and accurate sampling. Electrofishing will be conducted by a qualified professional biologist who is trained in electrofishing techniques, and will be implemented only where permitted by USFWS and CDFW.

Captured fish will be retained in aerated buckets and/or live cars until each pass is completed. Fish will be sedated as required in accordance with generally accepted scientific methodology and regulatory approvals. All fish will be identified to species and counted. Up to 50 individuals of each species will be measured to the nearest millimeter (fork length) and weighed by digital scale to the nearest gram. Effort will be made to measure representative fish species in all size classes, within the subsample of the measured species. The actual number of measured species will be determined through professional judgment based upon the size class homogeneity of the sample (i.e., number of size classes represented).

Scale samples will be collected on a subsample of larger, less abundant game fish for validating length-age indices. Captured fish will be released downstream of the sampling area following completion of each electrofishing pass. Effort will be made to ensure sampling activities in the field will minimize potential injury or mortality to aquatic species. Mortalities and fish condition (spinal trauma, bruising) will be noted and recorded prior to release.

General information and habitat/channel metrics will be collected at each sample site. This information will include a distinct site identification marker, number of shockers, date and time, air and water temperature, conductivity, weather conditions, and GPS location of each end of the site. Metrics collected at each mesohabitat unit within the sample site will include mesohabitat type, estimated average and maximum depth, estimated average wetted and bankfull width, dominant cover type, dominant and subdominant substrate, and sampling effort, in seconds. Habitat data collected will be consistent with that collected in Step 1.

Prior to electrofishing at a site, the Licensees will walk the stream bank to directly look for the presence of known sensitive species, including western pond turtles, arroyo toad, CRLF, or foothill yellow-legged frog (FYLF). If any sensitive species individuals are observed, the Licensees will note the observation and maintain a safe distance so as to not disturb the individual(s). The field lead will then relocate the site a safe distance upstream or downstream to a location that includes similar habitat types as the selected site, and repeat the procedure.

Precautions to guard against the incidental take of arroyo toad will be determined during the application for an ESA 10(a)(1)(A) permit from the USFWS. Restrictions and limitations imposed by this authorization may have a significant impact on the methods used for this *Pyramid Reach Fish Populations Study*. Any such changes will be noted in the final technical memorandum.

The Licensees will adhere to accepted decontamination protocols to minimize the likelihood of transmitting aquatic diseases (USFWS 2005) as well as implement CDFW-approved methods for preventing the spread of quagga and zebra mussels. Field crews will be trained on and provided with materials (e.g., Quat-128 [didecyl dimethyl ammonium chloride], scrub brush, etc.) for decontaminating their boots, waders, and other equipment between study sites. Major concerns are amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), and invasive invertebrates (e.g., New Zealand mud snail, *Potamopyrgus antipodarum*). This is of primary importance when moving: (1) between tributaries and mainstem reaches; (2) between subwatersheds (e.g., Pyramid Lake, Cañada de Los Alamos, and Piru Creek/Snowy Creek, Piru Creek/Fish Creek, Agua Blanca Creek, and Lake Piru); and (3) between isolated wetlands or ponds and river or stream environments.

Quality Assurance and Quality Control

Field data gathered during this *Pyramid Reach Fish Populations Study* will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC for sample collection equipment, procedures, and cross-checking of data. As part of the QA/QC procedures, extreme care will be taken to ensure the data collected is accurate and maintained in a safe environment.

Analysis

Individual Fish Condition Factor

Fish size and weight data will be summarized by species and sample site. Similarly, standard metrics including minimum, maximum, and mean fork length and weight will be reported. Length and weight data will be used to calculate a relative condition factor (Anderson and Gutreuter 1983) and to provide a general indication of the health of individuals, where factors greater than 1 indicate more healthy individuals. Relative condition factors for electrofishing sites will be calculated for length and weight data collected at all quantitative electrofishing sites.

Fish Species Populations and Biomass

Standing stock estimates in terms of fish population numbers and biomass will be calculated by species for each site and analyzed by age class. Electrofishing data will be analyzed using a scientific software package (e.g., Microfish or other similar program). Capture probabilities (the proportion of fish captured on a given electrofishing pass), size statistics, and biomass will be generated for each sample site using fish capture data. Biomass will be calculated based upon total weight measured for each species. Standing stock estimates will be reported as: (1) numbers and weight (grams) of fish by species per 328 feet (100 meters) of stream; (2) numbers of fish by species per mile; (3) pounds of fish by species per acre of stream surface; and (4) kilograms of fish by species per hectare.

Fish species population analysis will include size structure based on relative stock densities (RSD). To provide an index of size structure for each site, traditional RSD of each species will be calculated. The RSD will be presented on a scale of 0 to 100 (Anderson and Neumann 1996). RSD will be calculated as the proportion of fish sampled greater than 6 inches, such that: $RSD = (\# \text{ of fish } > 6\text{-inch in sample}) / (\# \text{ of fish in sample}) \times 100$. The 6-inch length was chosen because it is often used as the smallest size where fish are desired by anglers. A high RSD indicates that a greater proportion of the population consists of fish in the size class desirable to anglers.

Fish species population will also include an analysis by age class. Existing length-age indices will be used to determine the age class. Length-age indices are relatively accurate for smaller fish; however, confidence intervals reduce with larger fish. Scales collected as described above will be analyzed to assist in identifying age class breaks. Regression analysis will be used to analyze the data and, if necessary, adjust the indices.

Fish Community Analysis

The fish community analysis will also include species composition and relative abundance of the fish community (i.e., percent composition). In addition, the diversity of fish species will be assessed. Possible statistical analysis could include the Shannon Weaver Diversity Index, a means of characterizing species diversity.

The condition of fish communities will also be evaluated at three levels of biological organization: individual level, population level, and community level. Moyle et al. (1998) and Moyle and Marchetti (1998) provided the following descriptions of fish health at these levels:

Individual Level

Most fish in a healthy stream should: (1) have a robust body; (2) be free of disease, parasites, and lesions; (3) possess reasonable growth rates for the region; and (4) exhibit appropriate behavioral patterns.

Population Level

Fish populations in healthy stream environments: (1) exhibit multiple age classes indicating that reproduction is regularly occurring; (2) achieve a viable population size (i.e., occur in adequate numbers to maintain a self-sustaining population and the long-term persistence of the population); and (3) consist of mostly healthy individuals.

Community Level

Fish communities considered in good health in California: (1) are typically dominated by co-evolved species; (2) have a predictable structure as indicated by limited niche overlap among species and trophic levels; (3) are resilient in recovering from extreme events; (4) consist of a persistent species membership; and (5) are replicated geographically (i.e., can be found in similar habitats within the drainage or in other similar drainages).

Reporting

Pyramid Reach Fish Populations Study results will be included, to the extent completed in the Licensees' ISR, USR, DLA and FLA.

3.1.3.5 Consistency of Methodology with Generally Accepted Scientific Practices

The methods are consistent with the methods used for recent FERC hydroelectric relicensing efforts in California, including the Drum-Spaulding Project (FERC Project No. 2310), the Yuba-Bear Hydroelectric Project (FERC Project No. 2266), and the Yuba River Development Project (FERC Project No. 2246), with the following exception: eDNA is a newly emerging monitoring tool that will augment the ability for surveys to detect rare, cryptic, and elusive species that are unlikely to be found using conventional methods.

3.1.3.6 Schedule

The *Pyramid Reach Fish Populations Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *Pyramid Reach Fish Populations Study*.

Fieldwork Preparation	January 2017 – May 2017
Fieldwork	July 2017 – June 2018
Data QA/QC	July 2018
Data Analysis and Reporting	July 2018

3.1.3.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Pyramid Reach Fish Populations Study* is between \$136,000 and \$181,000.

3.1.3.8 References

- Anderson, R.O., and S.J. Gutreuter. 1983. Length, weight, and associated structural indices. In *Fisheries Techniques*, edited by L. A. Nielson, D. L. Johnson and S. S. Lampton. Bethesda: American Fisheries Society.
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3.1.4 Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study

3.1.4.1 Project Nexus

Continued Project O&M and Project-related recreation activities have potential to affect the following special-status aquatic amphibians and semi-aquatic snake species, each of which is classified as a State SSC by CDFW: western spadefoot (*Spea hammondi*), FYLF (*Rana boylei*), two-striped garter snake (*Thamnophis hammondi*), and South Coast garter snake (*Thamnophis sirtalis infernalis*).

3.1.4.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding special-status aquatic amphibians and semi-aquatic snake species and their habitat within the proposed Project boundary is provided in Section 4.5 of the Licensees' PAD. As a summary, the Licensees determined that two aquatic-breeding special-status amphibians and two semi-aquatic snake species have the potential to occur within the proposed Project boundary. Three of these species have been documented in the vicinity of the Project by the California Natural Diversity Database (CNDDDB) (CDFW 2015) or other sources (i.e., Project and adjacent areas covered by USGS 7.5-minute topographic quadrangle maps). However, only the two-striped garter snake has a reasonable probability of occurring, with recent observations documented in areas adjacent to Piru and Castaic creeks, including observations each year during annual sensitive species surveys performed by the Licensees in Pyramid reach (ESA 2010, 2011, 2012, 2013, 2014, 2015). South Coast garter snake is currently considered a geographic isolate (i.e., Ventura County to San Diego County) of the more widely distributed California red-sided garter snake (Humboldt County to San Diego County). Jennings and Hayes (1994) describe habitats of the South Coast garter snake as "marsh and upland habitats near permanent water that have good strips of riparian vegetation." Most records of South Coast garter snake are from the coastal plain; however, the range may extend an unknown distance into the adjacent foothills (Jennings and Hayes 1994). Table 3.1-2 below summarizes habitat requirements and known occurrences of the four species.

Table 3.1-2. Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Potentially Occurring in the Proposed Project Boundary

Species	Habitat Requirements	Known Occurrences in Project Vicinity (USGS Quadrangle Maps)
Western spadefoot	Breeds in vernal pools and other ponds that dry seasonally (rarely in permanent ponds), including stock ponds, storm-water detention basins, and pools on compacted soil, and occasionally in pools within intermittent streams. Non-breeding habitat is terrestrial in grasslands, oak woodlands, and occasionally chaparral.	Mint Canyon, Newhall, Val Verde, and Whitaker Peak. (No known occurrences within proposed Project boundary.)
Foothill yellow-legged frog	Aquatic in low to moderate-gradient, permanent streams and seasonal tributaries. Eggs are deposited in locations with low water velocity, including edgewater, pools, and pool tail-outs, and usually on cobble/boulder substrates and in shallow water. Generally not abundant in habitats where introduced fish and American bullfrog occur.	Cobblestone Mountain and Piru. (Documented in Piru Creek, but no recent records.)
Two-striped garter snake	Aquatic-feeding specialist closely associated with areas of permanent water, especially in and along rocky streams and ponds with riparian vegetation. Habitat suitability likely related to presence of aquatic vertebrate prey (i.e., amphibians and small fish).	Green Valley, Lebec, Piru, Mint Canyon, Val Verde, and Whitaker Peak. (Known along parts of Piru and Castaic creeks.)
South Coast garter snake	Shallow, permanent, low gradient water and associated dense, multi-storied vegetation. Closely associated with marshes and adjacent upland habitat. May be an aquatic-feeding specialist.	No records in CNDDDB. Jennings and Hayes (1994) shows a record from Piru Creek south of Lake Piru (Piru quad).

Additional information, which will be provided by this *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study*, is needed to determine presence or absence of these special-status species within the study area for the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study*.

3.1.4.3 Study Goals and Objectives

The goals of this *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* are to: (1) identify habitats suitable for special-status aquatic amphibians and semi-aquatic snake species; and (2) perform surveys to determine if these special-status species occur in the proposed Project boundary.

The objective of this *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* is to gather sufficient data necessary to fill gaps in existing information about the species' likely presence or absence.

3.1.4.4 Study Methods

Study Area

The study area for the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* consists of the area within the proposed Project boundary, excluding lands overlying the Angeles Tunnel on which the Licensees do not perform any Project O&M activities. In addition, the study area for the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* will include Pyramid reach (Figure 3.1-9).

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* will begin after FERC issues its Study Plan determination.
- The *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* does not include the development of requirements for the new license, which will be addressed outside this Study.
- The *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* focuses specifically on special-status aquatic amphibians and semi-aquatic snakes within the proposed Project boundary, but the study area for the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* is specific to locations that can support that resource.
- If required for the performance of the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study*.
- Field crews may make variances to the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* will be noted in the data resulting from the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study*.

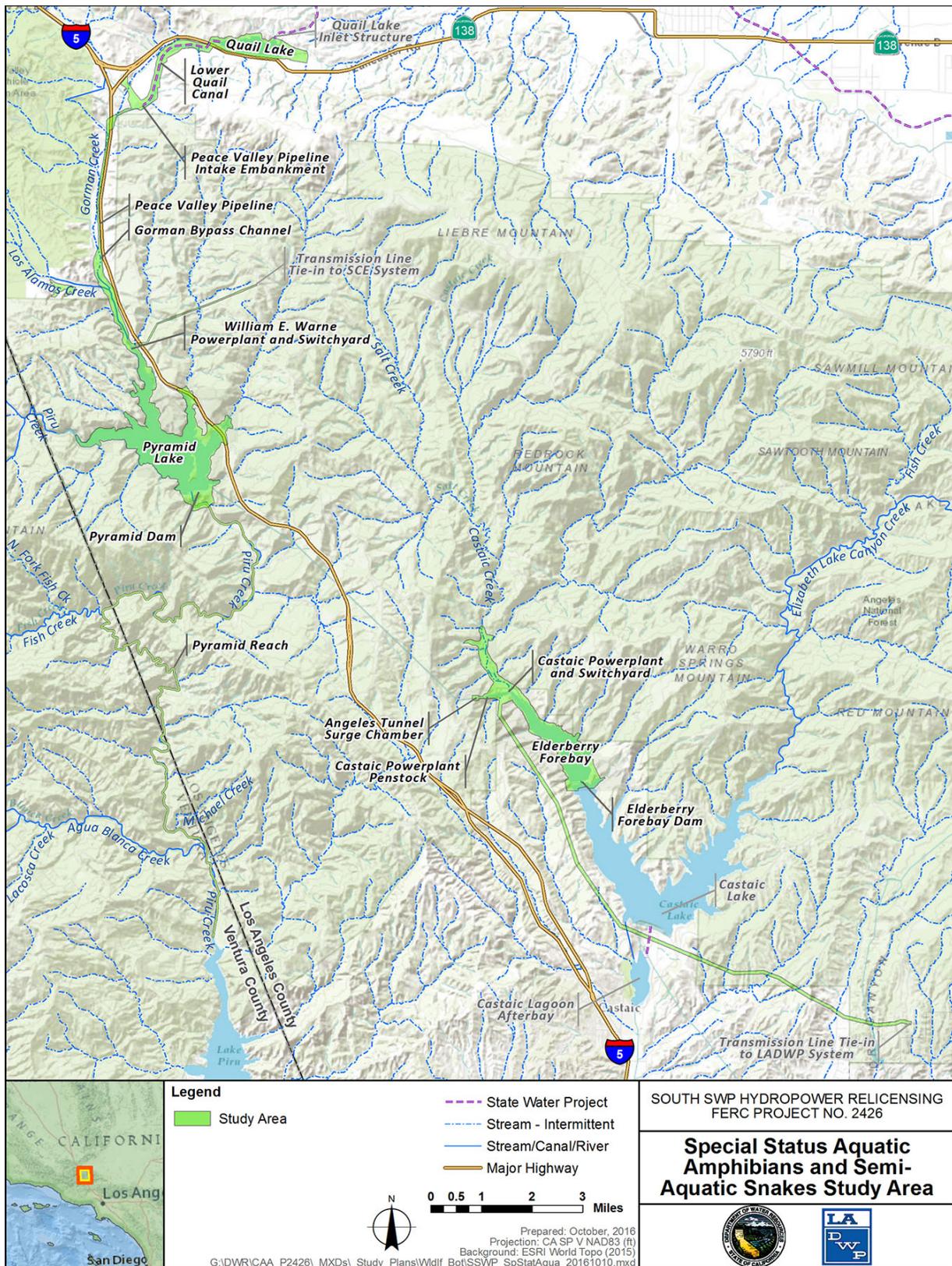


Figure 3.1-9. Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study Area

Methods

The *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* will consist of three steps: (1) identify potential habitat; (2) conduct field reconnaissance and surveys; and (3) prepare results. These steps are described below. Prior to the start of surveys, the Licensees will obtain a Section 10(a)(1)(A) species recovery permit from the USFWS for arroyo toad in order to perform special status species surveys in areas where arroyo toad may occur. Biologists performing the surveys will have the necessary permits.

Step 1 – Identify Potential Habitat. The Licensees will use existing information, including known habitat requirements of the four target species, records of occurrence, aerial photographs, and ground photographs of the study area for the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* where available, to identify and map potential habitat that could support each of the species.

Step 2 – Conduct Field Reconnaissance and Surveys. Where additional information is needed to assess habitat suitability the Licensees will perform field reconnaissance of accessible potential habitat identified in Step 1. The information to be collected during field reconnaissance will include evidence that aquatic habitats are sufficient in duration to support the species, incidental observations of garter snake prey species (especially amphibians and small fish), presence of vernal pools or other flooded depressions too small to detect on aerial photographs, and potential egg deposition habitat for FYLF. Based in this information, the Licensees will determine survey sites for each species. Survey sites will be a representative set of sites determined to have potentially suitable habitat.

The selection of survey sites will also take into account site-specific conditions, including safety, accessibility (i.e., road or trail access, topography), and permission from landowners to survey on private lands. Surveyors will include biologists or scientists that are qualified to identify amphibians, snakes, and their habitats.

Survey methods will be appropriate to each species. FYLF is a diurnally active, stream species easily differentiated from other frog species and detectable by observation of one or more life stages (i.e., adults, juveniles, larvae, or egg masses) in suitable habitat. Visual encounter surveys for FYLF consisting of up to three survey periods will be performed in the upper portion of Pyramid reach, if suitable habitat is documented. Two surveyors working in tandem will search along both banks of streams, back channel areas, and potential instream habitats for FYLF walking slowly while one observer scans ahead. Habitats along each bank will be searched. To aid in the detection of eggs and larvae, surveyors will use a viewing box in shallow margin areas. Surveyors will exercise care to avoid disturbing egg masses and tadpoles of arroyo toad in areas where this species occurs. Each FYLF detection will be recorded by life stage along with water temperature, water depth, and substrate characteristics.

Western spadefoot is a fossorial species during terrestrial life stages and breeds somewhat unpredictably by season and location. Accordingly, surveys will focus on

potential breeding habitats identified by the Licensees, which will be visually searched and dip-netted for larvae. Dip-netting will not occur in areas where arroyo toad individuals or arroyo toad egg masses are present. Up to two surveys will be performed.

Both garter snake species are semi-aquatic, closely associated with streams and wetlands, particularly where amphibians and small fish occur, and are diurnally active. Therefore, although there are no established survey protocols, these species are likely to be detected, if present, by multiple visual inspections of potential habitat while walking and scanning suitable basking locations with binoculars. The Licensees will perform up to three visual surveys of potential habitat, covering representative habitat, and up to two surveys of entire habitat patches, if few suitable sites exist.

To prevent the introduction and transmittal of amphibian chytrid fungus and invasive invertebrates (e.g., quagga mussels, zebra mussel, and Asian clams), field crews will be trained on, provided with, and use materials (e.g., Quat) for decontaminating their boots, waders, and other equipment between water-based study sites. If used during the study, boats will follow clean protocols, including inspections before and after use. All decontamination requirements in place at Project reservoirs including procedures specified by DWR's *Quagga and Zebra Mussel Rapid Response Plan* for the SWP (which include heat treatment and use of chemical solutions as part of the decontamination process) will be strictly followed.

Step 3 – Prepare Results. Following the surveys, the Licensees will develop summary text from field notes describing survey results and GIS maps depicting survey locations, special-status species occurrences, Project facilities, features, and specific Project O&M and Project-related recreation activities.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures, including spot-checks of transcription and comparison of GIS maps with field notes to verify locations of sensitive habitats and species.

Analysis

Once the location of the special-status species in the study area for the *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* is determined, the Licensees will identify any Project O&M and Project-related recreation activities that occur in the vicinity where the species were documented.

Reporting

Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study methods and results will be summarized and included, to the extent completed, in the Licensees' ISR, USR, DLA, and FLA.

3.1.4.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* is consistent with the goals, objectives, and methods outlined for special-status species on recent FERC hydroelectric relicensing efforts in California, including the Don Pedro Project (FERC Project No. 2299), the Yuba River Development Project (FERC Project No. 2246), and the Merced River Hydroelectric Project (FERC Project No. 2174). Survey methods for the two garter snake species, for which no standard survey protocols exist, follow general practices accepted by the scientific community.

3.1.4.6 Schedule

The *Special-Status Aquatic Amphibians and Semi-Aquatic Snakes Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the Study.

Fieldwork Preparation	January 2018 – March 2018
Fieldwork	March 2018 – September 2018
Data QA/QC	October 2018
Data Analysis and Reporting	October 2018 – June 2019

3.1.4.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this Study is between \$101,000 and \$135,000.

3.1.4.8 References

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3.1.5 Botanical Resources Study

3.1.5.1 Project Nexus

Continued Project O&M and Project-related recreation activities have the potential to affect vegetation communities, including special-status plant species, and wetland and

riparian habitats. For the purpose of this *Botanical Resources Study*, a special-status plant species is a plant that meets one or more of the following criteria: (1) listed as a USFS Sensitive Species and occurs on NFS lands; (2) listed by the United States Department of the Interior, Bureau of Land Management (BLM) as Sensitive and occurs on federal lands administered by BLM; (3) listed under the California Endangered Species Act (CESA) as an endangered, threatened, or rare plant; (4) State-listed rare or a State candidate for listing species under the Native Plant Protection Act of 1977 (CDFW 2015); or (5) listed by the California Native Plant Society (CNPS) on its Inventory of Rare and Endangered Plants, including species that are rated as CNPS 1A through 4B (CNPS 2015). Furthermore, wetland habitat is defined as areas that are inundated or saturated by surface or groundwater at a duration and frequency sufficient to support vegetation typically adapted for saturated soil conditions (United States Army Corps of Engineers 1987). Wetland areas can include marshes, shallow swamps, lakeshores, and wet meadows, which often occur along or adjacent to perennial or intermittent water bodies. Riparian habitat is defined as vegetated zones that form a transition between permanently saturated areas and upland areas, and that typically exhibit vegetation and physical characteristics associated with permanent sources of surface water or groundwater. Plants listed as federal threatened (FT) under the federal ESA, or as candidates or species proposed for listing under the ESA are addressed in a separate study for this relicensing effort that is specific to those resources.

3.1.5.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding vegetation mapping and special-status plants within or with the potential to occur within the proposed Project boundary is provided in Sections 4.6.1 and 4.6.3 of the Licensees' PAD. As a summary, the Licensees found that no comprehensive special-status plant surveys have been performed recently within the proposed Project boundary, but 44 special-status plant species have the potential to occur (Table G-2 in the PAD). Existing, relevant, and reasonably available information regarding wetland and riparian habitats within the proposed Project boundary is provided in PAD Sections 4.7.1 and 4.7.2. The Licensees also found that no recent comprehensive riparian or wetland habitat assessment has been performed within the proposed Project boundary. This *Botanical Resources Study* will augment existing, relevant, and reasonably available information by conducting botanical resources studies in the proposed Project boundary.

3.1.5.3 Study Goals and Objectives

The goals of this *Botanical Resources Study* are to: (1) map and assess the condition of wetland and riparian areas in the proposed Project boundary, which will support data needs for the Special-Status Terrestrial Wildlife Species and ESA-listed Riparian Bird studies; (2) perform surveys to identify locations of special-status plant species in the proposed Project boundary; and (3) collect ancillary data related to these sensitive habitats and species, including geographic extent and indications of potential threats resulting from Project O&M and recreation.

The objective of this *Botanical Resources Study* is to gather sufficient data necessary to fill recognized gaps in existing information about wetland and riparian habitats and the presence of special-status plants in the area.

3.1.5.4 Study Methods

Study Area

The study area for the *Botanical Resources Study* will consist of the land area within the proposed Project boundary, excluding lands overlying the Angeles Tunnel on which the Licensees do not perform any Project O&M. The study area for the *Botanical Resources Study* is shown in Figure 3.1-10.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Botanical Resources Study* will begin after FERC issues its Study Plan determination.
- The *Botanical Resources Study* does not include the development of requirements for the new license, which will be addressed outside the Study.
- The *Botanical Resources Study* focuses specifically on the resource within the proposed Project boundary, but the study area for the *Botanical Resources Study* is specific to the areas within the proposed Project boundary containing ecological conditions suitable for that resource.
- If required for the performance of the *Botanical Resources Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Botanical Resources Study*.
- Field crews may make variances to the *Botanical Resources Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances to the *Botanical Resources Study* will be noted in the data resulting from the *Botanical Resources Study*.

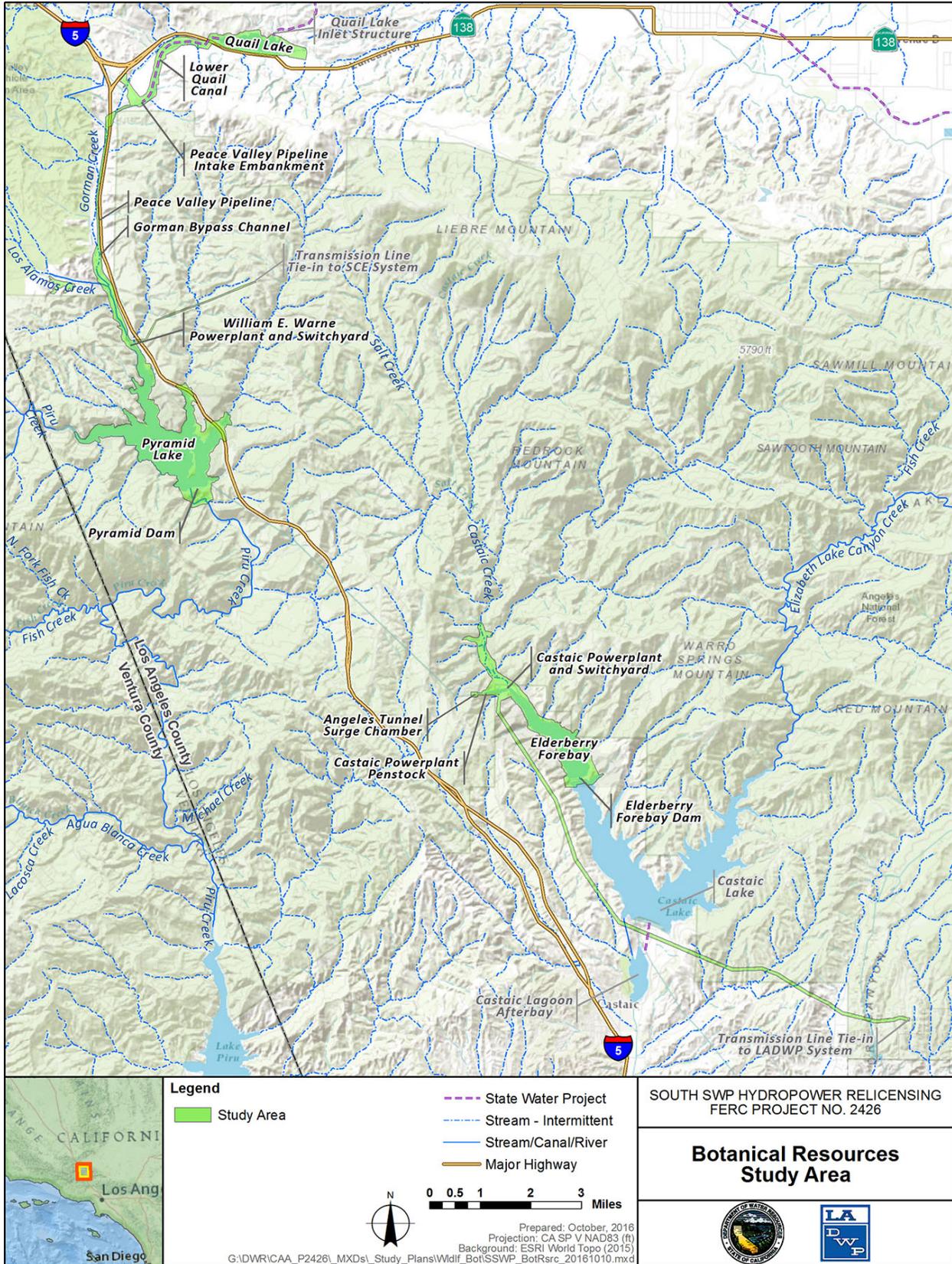


Figure 3.1-10. Botanical Resources Study Area

Methods

Floristic surveys require that all species encountered are identified to the extent necessary to determine listing status. The *Botanical Resources Study* will consist of three steps: (1) existing data assembly; (2) wetland and riparian assessment; and (3) special-status plant surveys. These steps are described below.

Step 1 – Existing Data Assembly. Prior to implementing field studies, the Licensees will review existing data, including CWHR classifications from CalVeg (USFS 2016), National Wetlands Inventory (NWI) data (USFWS 2016), aerial imagery, and other relevant data that may be identified during this *Botanical Resources Study*. Field maps will be prepared with suitable aerial imagery that displays the CWHR habitat and will use these maps for field navigation and data collection.

Step 2 –Wetland and Riparian Assessment. Field staff will assess the condition of wetland and riparian habitat following the Proper Functioning Condition (PFC) qualitative methods for wetland (Prichard et al. 1993) and riparian areas adjacent to flowing water (Dickard et al. 2015). Surveyors will identify areas to be evaluated prior to field surveys during the review of existing information, as described in Step 1. Additional areas may be identified during the Special-Status Plant Surveys (see Step 3). Field staff will traverse, or survey by boat, the entire length of riparian vegetation for each area to be assessed and will collect data at representative areas. Surveyors will determine the locations where PFC data will be collected (sample points) while in the field based on site observations. Surveyors will collect data at a minimum of one sample location per each discrete wetland or riparian area. For wetland or riparian areas that span a sufficiently large area such that physical and biological features vary significantly (as determined in the field based on best professional judgment by the Licensees' field staff), up to three sample points will be evaluated. Field staff will complete the Reach Information Form and PFC Assessment Form (lentic or lotic). The Reach Information Form records key information that must be included with the assessment, and the PFC Assessment Form records the assessment information that will be used for other studies dependent upon this data, as stated in Section 3.1.3. Surveyors will also collect GPS points, take photographs in the four cardinal directions at each sample point, and photograph features at other locations to document conditions within each wetland and riparian area. The Licensees will review and verify field data and create a wetland and riparian area digital data layer that captures relevant data.

To prevent the introduction and transmittal of amphibian chytrid fungus and invasive invertebrates (e.g., quagga mussels, zebra mussel, and Asian clams), field crews will be trained on, provided with, and use materials (e.g., Quat) for decontaminating their boots, waders, and other equipment between water-based study sites. All boats used during the study will follow clean protocols, including inspections before and after use. All decontamination requirements in place at Project reservoirs including those of DWR's *Quagga and Zebra Mussel Rapid Response Plan* for the SWP will be strictly followed (DWR 2010).

Step 3 –Special-Status Plant Surveys. Prior to implementing special-status plant surveys, field staff will review and print the list of special-status plants that are known or have potential to occur within the study area for the *Botanical Resources Study* (Table G-2 in the PAD).

The Licensees will conduct a botanical survey in the study area for the *Botanical Resources Study* to identify the locations of special-status plant species, if present. The Licensees will conduct special-status plant surveys that will follow the methodology described in the botanical survey section of the CDFW *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (2009). The *Botanical Resources Study* will be conducted using systematic field techniques, including the “random meander” technique, to ensure thorough coverage of plant communities that could support sensitive plant species. Additional efforts will focus on habitats with a higher probability of supporting special-status plants. Documentation of surveys on NFS lands will include completion of USFS’ *2008 Plant Survey Field Form* (USFS 2008a).

Field staff will plan to perform surveys between March and August, encompassing the period within which the potentially occurring special-status species flower, with at least two survey visits being performed in all suitable habitats to maximize the likelihood of detection of all plant species. Surveyors will be botanists or scientists that are qualified to identify plant species likely to occur in the study area for the *Botanical Resources Study*. Taxonomy and nomenclature will be based on *The Jepson Manual* (Baldwin et al. 2012). If a special-status plant is identified, the survey team will prepare a California Native Species Field Survey Form so the occurrence can be added to the CNDDDB. Surveyors will collect and record the following data associated with each occurrence (either to the edge of the occurrence, or to the edge of the study area for the *Botanical Resources Study*, whichever is less):

- Digital photographs to document the occurrence, phenology, reproductive state, associated habitat, and indications of potential threats
- Location and approximate extent of the special-status plant population delineated using a handheld GPS device and the estimated number of plants in the population
- Habitat description, including dominant and subdominant vegetation in the area
- Activities observed in the area that have a potential to adversely affect the population (e.g., recreational trails and uses)

If an ESA-listed or candidate plant species is found on NFS lands, the occurrence will be reported using the USFS *Threatened, Endangered and Sensitive Plants Element Occurrence Field Guide* (USFS 2008b) protocol. The Licensees will review and verify field data and create a digital data layer depicting the locations of special-status plant species.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures, including spot-checks of transcription and comparison of GIS maps with field notes to verify locations of sensitive habitats and species.

Analysis

After completion of wetland and riparian habitat mapping and assessment and special-status plant species surveys, the Licensees will evaluate data and identify sensitive and unique areas. Areas that are, or may be, susceptible to disturbance by Project O&M or Project-related recreation activities will be noted.

Reporting

Botanical Resources Study results will be incorporated, to the extent completed into the Licensees' ISR, USR, DLA, and FLA. If any special-status plants are found, a report will be developed and considered Privileged, and will be provided only to FERC, USFWS, and CDFW. If any of these occurrences are found on NFS lands, this Privileged report will also be provided to the USFS and reported using the USFS' *Threatened, Endangered and Sensitive Plants Element Occurrence Field Guide* (USFS 2008b) protocol.

3.1.5.5 Consistency of Methodology with Generally Accepted Scientific Practices

Elements of this *Botanical Resources Study* are consistent with the goals, objectives, and methods outlined for most recent FERC hydroelectric relicensing efforts in California, including the Don Pedro Project (FERC No. 2299), the Yuba River Development Project (FERC No. 2246), and the Merced River Hydroelectric Project (FERC No. 2174), and will use standard botanical survey methods as defined by CDFW (2009) and USFS (2008a).

3.1.5.6 Schedule

The *Botanical Resources Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *Botanical Resources Study*.

Fieldwork Preparation	May 2017– June 2017
Fieldwork	June 2017 – April 2018
Data QA/QC	July 2017 – April 2018
Data Analysis and Reporting	October 2017 – June 2018

3.1.5.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Botanical Resources Study* will range between \$477,000 and \$636,000.

3.1.5.8 References

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3.1.6 Non-Native Invasive Plants Study

3.1.6.1 Project Nexus

Continued Project O&M and Project-related recreation activities may facilitate the spread of NNIP. For the purpose of this *NNIP Study*, an NNIP is a plant species defined as an A-, B-, C- or Q-listed species by the CDFG (CDFG 2010), is identified as invasive by the California Invasive Plant Council (Cal-IPC) (2015), or is included on the USFS' LPNF or ANF weed lists and occurs on NFS lands (USFS 2005; USFS 2015).

3.1.6.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding NNIP within the proposed Project boundary is provided in Section 4.6 and Section 4.7 of the Licensees' PAD. As a summary, the Licensees found that no comprehensive NNIP surveys have been performed recently in the proposed Project boundary, but 71 NNIPs have the potential to occur (Table G-3 in the PAD). This *NNIP Study* will augment existing information by providing current information regarding NNIP within the proposed Project boundary.

3.1.6.3 Study Goals and Objectives

The goals of this *NNIP Study* are to: (1) identify and map the locations of NNIP in the study area for the *NNIP Study*; and (2) to collect ancillary data related to NNIP, including geographic extent of occurrences and/or number of individuals, and indications of the potential threats for NNIP to expand in the study area for the *NNIP Study*.

The objective of this *NNIP Study* is to gather sufficient data necessary to fill recognized gaps in existing information on the presence and extent of NNIP in the study area for the *NNIP Study*.

3.1.6.4 Study Methods

Study Area

The study area for the *NNIP Study* will consist of the area within the proposed Project boundary, excluding lands overlying the Angeles Tunnel on which the Licensees do not perform any Project O&M. The study area for the *NNIP Study* is shown in Figure 3.1-11.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *NNIP Study* will begin after FERC issues its Study Plan determination.
- The *NNIP Study* does not include the development of requirements for the new license, which will be addressed outside the Study process.
- This *NNIP Study* focuses specifically on non-native invasive plants within the proposed Project boundary, but the study area for the *NNIP Study* is specific to the areas that can support that resource.
- If required for the performance of the *NNIP Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the *NNIP Study*. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *NNIP Study*.
- Field crews may make variances to the *NNIP Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *NNIP Study* will be noted in the data resulting from the *NNIP Study*.

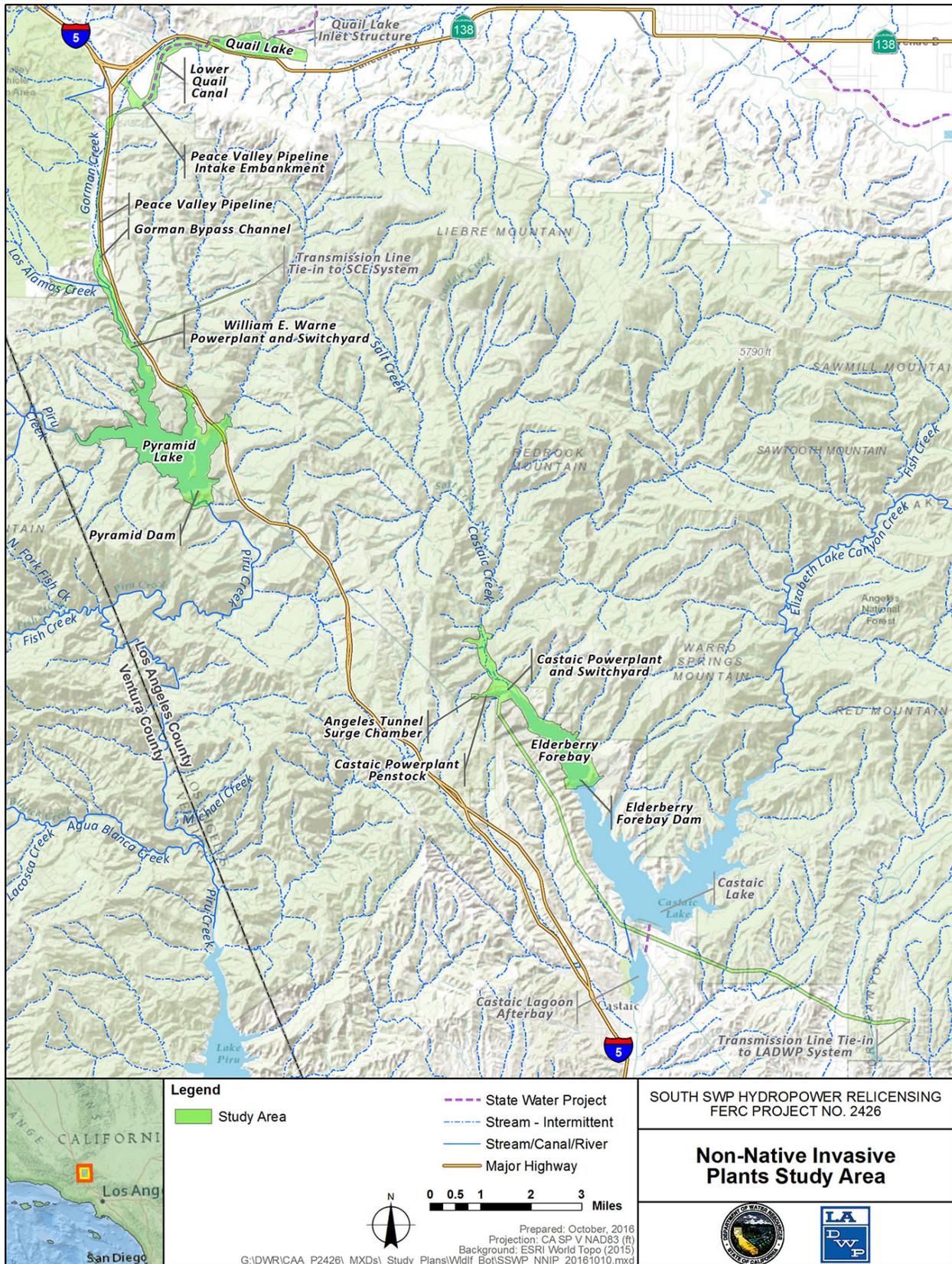


Figure 3.1-11. Non-Native Invasive Plants Study Area

Methods

Fieldwork for the *NNIP Study* will be performed in conjunction with the Licensees' *Botanical Resource Study*, a separate study being undertaken as part of this relicensing effort, which includes a comprehensive floristic survey within the same study area. Floristic surveys require that all species encountered are identified to the extent necessary to determine listing status. The *NNIP Study* will consist of three steps: (1) gather data and prepare for field effort; (2) conduct field surveys; and (3) prepare data. These steps are described below.

Step 1 – Gather Data and Prepare for Field Effort. The Licensees will prepare field maps for use by survey teams. The maps will be prepared with suitable aerial imagery and depict CWHR classifications from CalVeg (USFS 2016) in the study area for the *NNIP Study* on an aerial imagery base and will include the location of Project features. Pre-field planning activities will include preliminary identification of vegetation and habitats that could support NNIP.

Step 2 – Conduct Field Surveys. Surveys will follow the methodology described in the botanical survey section of the CDFW *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. This protocol uses systematic sampling techniques, including the “random meander” technique, to ensure thorough coverage of plant communities that could support NNIPs. When performing NNIP surveys on USFS lands, the Licensees will follow USFS protocols, excluding treatment protocols. Special attention will be paid to disturbed areas, including road edges, recreation areas, and maintenance areas (i.e., target areas). Field staff will perform surveys that encompass the period within which most NNIP are expected to flower, with at least two survey visits performed in all target areas to maximize the likelihood of detection of NNIP. Surveyors will be botanists or scientists that are qualified to identify NNIPs likely to occur in the study area for the *NNIP Study*. Taxonomy and nomenclature will be based on *The Jepson Manual* (Baldwin et al. 2012). If an NNIP occurrence is identified, the survey team will record the following data associated with the occurrence to the edge of the occurrence or to the edge of the study area for the *NNIP Study*, whichever is less:

- Estimate of the number of individual plants
- Location and approximate areal extent of the NNIP population delineated using a handheld GPS unit, and the estimated number of individual plants in the population
- Habitat description, including dominant and subdominant vegetation in the area
- Activities observed in the area that have a potential to spread the NNIP

Step 3 – Prepare Data. Following the surveys, the Licensees will develop GIS maps depicting NNIP population occurrences and Project facilities, features, and specific

Project-related activities (e.g., hiking or picnicking) and other related information collected during the *NNIP Study*.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results and will be subject to appropriate QA/QC procedures, including spot-checks of transcription and comparison of GIS maps with field notes to verify locations of NNIPs. QA/QC will also include measures to prevent spreading the NNIP by survey personnel.

Analysis

Following the surveys, the Licensees will analyze the developed GIS maps and other relevant information collected during the *NNIP Study*.

Reporting

NNIP Study results and other existing and relevant information, to the extent completed, will be included in the Licensees' ISR, USR, DLA, and FLA.

3.1.6.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *NNIP Study* is generally consistent with the goals, objectives, and methods outlined for the most recent FERC hydroelectric relicensing efforts in California, including the Don Pedro Project (FERC No. 2299), the Yuba River Development Project (FERC No. 2246), and the Merced River Hydroelectric Project (FERC No. 2174), and uses standard botanical survey methods as defined by CDFW.

3.1.6.6 Schedule

The *NNIP Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *NNIP Study*.

Fieldwork Preparation	May 2017– June 2017
Fieldwork	June 2017 – April 2018
Data QA/QC	July 2017 – April 2018
Data Analysis and Reporting	October 2017 – June 2018

3.1.6.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate that the current cost to complete this *NNIP Study* will range between \$182,000 and \$243,000.

3.1.6.8 References

- C DFA. 2010. Pest Ratings of Noxious Weed Species and Noxious Weed Seed. January 2010. Available online: https://www.cdfa.ca.gov/phpps/ipc/weedinfo/winfo_pestrating_2010.pdf
- CDFW. 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. November 24, 2009. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline_
- Cal-IPC. 2015. California Invasive Plant Inventory Database and CalWeedMapper spatial data, downloaded November 20, 2015. Available online: <http://www.cal-ipc.org/>
- DWR and LADWP. 2016. PAD. South SWP Hydropower. FERC Project No. 2426
- Environmental Science Associates. 2014. SWP Copper Sulfate Application. Biological Resources Technical Report. Prepared for DWR. March 2014.
- POWER Engineers. 2009. Castaic Power Plant Sediment Removal Project, Arroyo Toad Survey Report. Prepared for LADWP. October 2009.
- POWER Engineers. 2013. Castaic Creek Check Dam Repair Project Arroyo Toad Survey Report. October 2013
- USFS. 2005. Final Environmental Impact Statement, Volume 2 (Appendices) Land Management Plans: Angeles National Forest, Cleveland National Forest, Los Padres National Forest, San Bernardino National Forest. September 2005.
- USFS. 2015. Invasive Weeds by Ranger District. Mt. Pinos Ranger District. Available online: <http://www.fs.usda.gov/detailfull/lpnf/learning/nature-science/?cid=stelprdb5106114>

3.1.7 Special-Status Terrestrial Wildlife Species – California Wildlife Habitat Relationships Study

3.1.7.1 Project Nexus

Continued Project O&M and Project-related recreation have the potential to affect special-status terrestrial wildlife species. For the purpose of this *Special-Status Terrestrial Wildlife Species – CWHR Study*, a special-status terrestrial wildlife species is defined as a terrestrial species that meets one of the following criteria: (1) is listed under CESA as threatened, endangered or a candidate for listing; (2) is classified as Fully Protected by the State of California; (3) is designated by CDFW as an SSC; (4) is designated as a USFS Sensitive Species and found on NFS lands; (5) is listed under the MBTA; or (6) is listed by the USFWS as a Bird of Conservation Concern or protected under the Bald and Golden Eagle Protection Act. Terrestrial wildlife species listed under the federal ESA as threatened or endangered, or as a candidate for listing

are addressed in a separate study for this relicensing effort that is specific to those resources.

3.1.7.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding special-status terrestrial wildlife species and their habitat within the proposed Project boundary is provided in Section 4.6 of the Licensees' PAD. As a summary, the Licensees found no recent special-status terrestrial wildlife species survey information. The CNDDDB is a statewide inventory of special-status species that is continually updated. However, the CNDDDB is limited to locations where surveys have been performed and contains only those records that have been submitted to CDFW. Based on available information, there were 56 special-status terrestrial wildlife species identified with the potential to occur on the Project.

In order to meet the goals of the study, the Licensees have identified the following additional information needs: (1) collection of further CWHR data for each special-status wildlife species that may occur in the proposed Project boundary; and (2) a list of Project O&M activities that includes location and duration of the activity.

3.1.7.3 Study Goals and Objectives

The goals of this *Special-Status Terrestrial Wildlife Species – CWHR Study* are to: (1) determine the quality and suitability of potential habitat for special-status terrestrial wildlife species within the proposed Project boundary; and (2) determine if either the Lower Quail Canal or Castaic Penstocks constitute barriers to wildlife movement.

The objective of this *Special-Status Terrestrial Wildlife Species – CWHR Study* is to gather sufficient data necessary to fill recognized gaps in existing information regarding the potential for special-status terrestrial wildlife species to occur within the proposed Project boundary and to determine if Project penstocks and canals are barriers to wildlife movement.

3.1.7.4 Study Methods

Study Area

The study area for the *Special-Status Terrestrial Wildlife Species – CWHR Study* consists of the area within the proposed Project boundary. The lands overlying the Angeles Tunnel are not included, because the Licensees do not perform any Project-related maintenance activities nor allow any recreation there. The study area for the *Special-Status Terrestrial Wildlife Species – CWHR Study* is shown below in Figure 3.1-12.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Special-Status Terrestrial Wildlife Species – CWHR Study* will begin after FERC issues its Study Plan determination.
- The *Special-Status Terrestrial Wildlife Species – CWHR Study* does not plan to include the development of requirements for the new license, which will be addressed outside the Study.
- The *Special-Status Terrestrial Wildlife Species – CWHR Study* focuses specifically on special-status terrestrial wildlife within the proposed Project boundary, but the study area for the *Special-Status Terrestrial Wildlife Species – CWHR Study* is specific to locations that can support that resource.
- If required for the performance of the *Special-Status Terrestrial Wildlife Species – CWHR Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Special-Status Terrestrial Wildlife Species – CWHR Study*.
- Field crews may make variances to the *Special-Status Terrestrial Wildlife Species – CWHR Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *Special-Status Terrestrial Wildlife Species – CWHR Study* will be noted in the data resulting from the *Special-Status Terrestrial Wildlife Species – CWHR Study*.

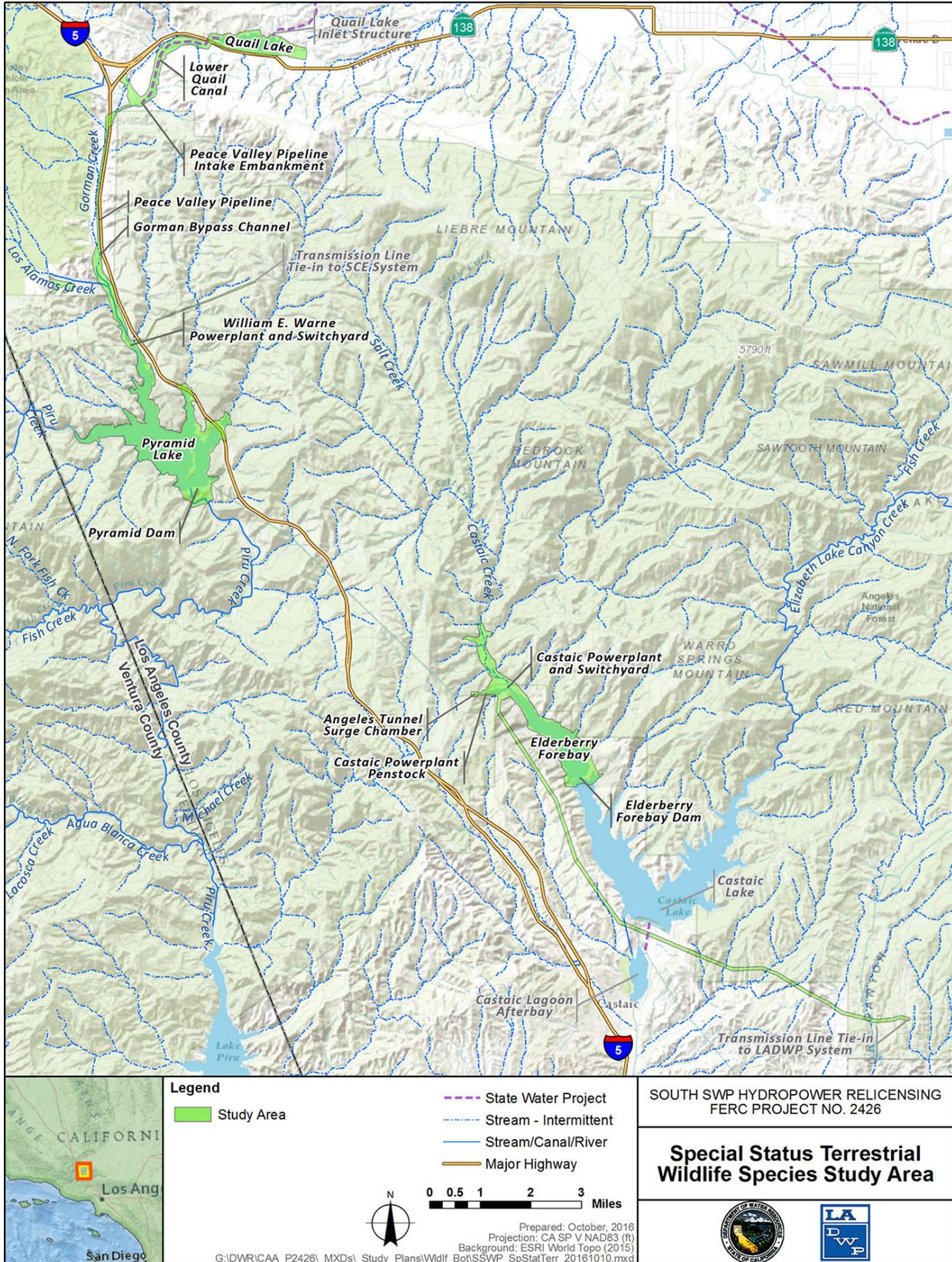


Figure 3.1-12. Special-Status Terrestrial Wildlife Species – CWHR Study Area

Methods

This *Special-Status Terrestrial Wildlife Species – CWHR Study* consists of two steps: (1) select sampling locations and create field study maps; and (2) conduct field habitat assessments to evaluate habitat, document potential movement barriers at the Lower Quail Canal and Castaic Penstocks, and incidentally document special-status terrestrial wildlife. These steps are described below.

Step 1 – Select Sampling Locations and Create Field Study Maps. There were 15 terrestrial CWHR vegetation types identified in the proposed Project boundary, as shown in Table 3.1-3 below. Of these, the most common are Mixed Chaparral (563 acres), Coastal Scrub (545 acres), and Sagebrush (286 acres). There are also four riparian and wetland vegetation types identified in the proposed Project boundary: Montane Riparian (39 acres), Valley Foothill Riparian (54 acres), Wet Meadow (53 acres), and Freshwater Emergent Wetland (39 acres) (USFS 2014). Using GIS, the Licensees will select sampling points in representative habitats, with more points in areas with higher potential for special-status wildlife species (e.g., Wet Meadow and Montane Riparian) and larger acreage inside the proposed Project boundary. Table 3.1-3 shows the 15 terrestrial vegetation types and the number of sampling points for each.

Table 3.1-3. California Wildlife Habitat Relationship Acreages in the Proposed Project Boundary and Sampling Points

California Wildlife Habitat Relationship Type	Acreage ¹	Percentage of Study Area	Number of Sampling Points ²
<i>Tree-Dominated Habitats</i>			
Pinyon-Juniper (PJN)	5	<1	1
Montane Hardwood (MHW)	<1	<1	1
Coastal Oak Woodland (COW)	3	<1	1
Montane Riparian (MRI)	39	2	2
Valley Foothill Riparian (VRI)	54	2	2
<i>Shrub-Dominated Habitats</i>			
Sagebrush (SGB)	286	11	4
Mixed Chaparral (MCH)	563	22	5
Chamise-Redshank Chaparral (CRC)	130	5	3
Coastal Scrub (CSC)	545	22	5
Desert Wash (DSW)	63	2	2
<i>Herbaceous-Dominated Habitats</i>			
Annual Grassland (AGS)	208	8	3
Wet Meadow (WTM)	53	2	2
Freshwater Emergent Wetland (FEW)	39	2	2
<i>Developed Habitats</i>			
Urban (URB)	293	12	4
<i>Non-vegetated Habitats</i>			
Barren (BAR)	226	9	3
Total	2,507	100	40

¹Acreages include underground features.

²Sampling points are the same as those in the ESA-listed Terrestrial Wildlife Species – CWHR Study and information collected will be used for both studies.

The Licensees will produce as part of the study updated maps that will include CWHR habitat types, sampling points, CNDDDB occurrences or other known locations of special-status wildlife species, Protected Activity Centers and Home Range Areas, and all Project facilities, including the Lower Quail Canal and Castaic Penstocks.

Step 2 – Conduct Field Habitat Assessments to Evaluate Habitat, Document Potential Movement Barriers at the Lower Quail Canal and Castaic Penstocks, and Incidentally Document Special-Status Terrestrial Wildlife.

Field habitat assessments and characterizations will be conducted at representative sampling points, using the CDFW's CWHR System data forms (CDFW 2016). Information collected on these forms includes species composition, stages, structure, percent cover, and habitat elements, as well as diameter at breast height of wooded habitats. Evidence of Project O&M activities and Project-related recreation activities in the vicinity of the sampling points will also be documented. Photographs of all sampling points will be taken in each cardinal direction from the center point of the plot.

Two Project facilities will be examined for their potential to inhibit wildlife passage: (1) the two-mile-long Lower Quail Canal; and (2) the six 2,400-foot-long Castaic Penstocks. The length of these features will be walked and areas with at least a 2.5 foot clearance will be marked by GPS. (A 2.5 foot clearance is a height all known large mammals can pass under.) A photograph of each passage feature will also be collected.

If a special-status terrestrial wildlife species is incidentally identified, the survey team will prepare a California Native Species Field Survey Form, which records data for submittal to CDFW for addition to the CNDDDB.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures, including spot-checks of transcription and comparison of GIS maps with field notes.

Analysis

Field data will be used in conjunction with CWHR to refine the list and habitats of special-status terrestrial wildlife potentially occurring in the study area for the *Special-Status Terrestrial Wildlife Species – CWHR Study*. The Licensees will then use the maps created in Step 1 to identify areas within the study area for the *Special-Status Terrestrial Wildlife Species – CWHR Study* in which special-status wildlife habitat and Project facilities and O&M overlap.

For the Lower Quail Canal and Castaic Penstocks, a map will be developed showing any areas that would restrict large mammal passage for more than a 0.5 mile stretch along the facilities.

Reporting

The Licensees will compile and summarize results of this *Special-Status Terrestrial Wildlife Species – CWHR Study*, as well as other existing and relevant information, to the extent completed for incorporation into the Licensees' ISR, USR, DLA, and FLA.

3.1.7.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *Special-Status Terrestrial Wildlife Species – CWHR Study* is consistent with the goals, objectives, and methods outlined for the most recent FERC hydroelectric relicensing efforts in California, including the Yuba River Development Project (FERC Project No. 2246), French Meadows Transmission Line Project (FERC Project No. 2479), Camp Far West Transmission Line Project (FERC Project No. 10821), Drum-Spaulding Project (FERC Project No. 2310) and Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

3.1.7.6 Schedule

The *Special-Status Terrestrial Wildlife Species – CWHR Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *Special-Status Terrestrial Wildlife Species – CWHR Study*.

Fieldwork Preparation	January 2017 – March 2017
Fieldwork	March 2017 – Sept 2017
Data QA/QC	October 2017
Data Analysis & Reporting	July 2017 – June 2018

3.1.7.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Special-Status Terrestrial Wildlife Species – CWHR Study* will range between \$212,000 and \$318,000.

3.1.7.8 References

CDFW. 2016. California Wildlife Habitat Relationships. Available online: <<https://www.wildlife.ca.gov/Data/CWHR>>. Accessed December 16, 2016. Last updated 2016. CDFW, Sacramento, CA.

USFS. 2014. Classification and Assessment with Landsat of Visible Ecological Groupings (CalVeg) data. Updated in 2014. Available on-line: <<http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192>>.

3.1.8 ESA-Listed Plants Study

3.1.8.1 *Project Nexus*

Continued Project O&M and Project-related recreation activities have potential to affect plants listed as FT or FE under the ESA, or as candidates for listing under the ESA. There are species proposed for listing under the ESA with a potential to occur within the proposed Project boundary.

This *ESA-listed Plants Study* does not address other types of special-status plants (e.g. CESA-listed plants), which are addressed in the *Botanical Resources Study*, a separate study being undertaken by the Licensees as part of this relicensing effort. If a plant is listed under the ESA and also meets another definition of a special-status plant, that plant species is addressed under this *ESA-listed Plants Study*.

3.1.8.2 *Existing Information and Need for Additional Information*

Existing and relevant information regarding known or potentially occurring ESA-listed plants within the proposed Project boundary is available from the CNPS online Inventory of Rare and Endangered Vascular Plants of California (CNPS 2015), the CNDDDB (CDFW 2015), and the CalFlora website. Based on this information, as summarized in Section 4.8 of the Licensees' PAD, the Licensees identified six plant species listed as FT or FE and one candidate plant species with a potential to occur within the proposed Project boundary, if suitable habitat occurs (Table 3.1-4). As detailed in Section 4.8 of the PAD, there are no known records of these or other ESA-listed plants within the proposed Project boundary, although most have been documented in some form in the areas covered by USGS 7.5-minute topographic quadrangle maps in which the proposed Project boundary is located as well as adjacent quadrangle maps.

Additional information, which will be provided by this *ESA-listed Plants Study*, is needed to identify whether ESA-listed plant species or candidate plant species occur in the proposed Project boundary and to determine if those species could be affected by the Project O&M and/or Project-related recreation activities.

Table 3.1-4. ESA-listed and Candidate Plant Species Potentially Occurring within the South SWP Hydropower Proposed Project Boundary

Common Name Scientific Name	Status	Habitat	Flowering Period	Known Occurrences in Project Vicinity Quadrangle Maps
Slender-horned spineflower <i>Dodecahema leptoceras</i>	FE, SE	Floodplain terraces and sandy benches which flood infrequently; associated with alluvial fan scrub between about 650 to 2,470 feet elevation.	Apr-Jun	Mint Canyon
San Fernando Valley spineflower <i>Chorizanthe parryi</i> var. <i>fernandina</i>	FC, SE, FSS	Mostly in openings within coastal sage scrub (500 - 4,000 feet elevation).	Apr-Jul	Newhall, Val Verde
Marsh sandwort <i>Arenaria paludicola</i>	FE, SE	Historically in scattered sites in swamps and freshwater marshes (sea level to 1,480 feet).	May-Aug	None
Nevin's barberry <i>Berberis nevinii</i>	FE, SE	Chaparral, cismontane woodland, coastal and riparian scrub in sandy or gravelly soils between about 1,400 to 1,700 feet elevation (rarely to 2,000 feet). Also occurs from transplants.	Feb-Jun	Newhall, Warm Springs Mountain
Gambel's watercress <i>Nasturtium [Rorippa] gambelii</i>	FE, ST	Found historically at scattered sites in freshwater marshes and near streams in southern California (from near sea level to 1,100 feet elevation).	Apr-Oct	None
Spreading navarretia <i>Navarretia fossalis</i>	FT	Vernal pools and poorly drained, seasonally flooded, alkali playas (100 to 2,200 feet elevation).	Apr-Jun	Mint Canyon
California orcutt grass <i>Orcuttia californica</i>	FE, SE	Deep vernal pools with clay soils in Ventura, Los Angeles, Riverside, and San Diego counties (50-2,150 feet elevation).	Mar-Aug	Mint Canyon

Key:

FE = federal endangered

FT = federal threatened

FC = federal candidate

FSS = listed by USFS as Sensitive

SE = California State endangered

ST = California State threatened

3.1.8.3 Study Goals and Objectives

The goals of the *ESA-listed Plants Study* are to: (1) perform surveys to identify locations of ESA-listed or candidate plant species in the proposed Project boundary; and (2) collect ancillary data related to these occurrences, including geographic extent of each occurrence and indications of potential threats.

The objective of this *ESA-listed Plants Study* is to gather sufficient data necessary to fill recognized gaps in existing information for ESA-listed plant species.

3.1.8.4 Study Methods

Study Area

The study area for the *ESA-listed Plants Study* consists of certain habitat types within the proposed Project boundary that have potential to contain ESA-listed or candidate plant species, excluding lands overlying the Angeles Tunnel on which the Licensees do not perform any Project O&M (Figure 3.1-13).

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *ESA-listed Plants Study* will begin after FERC issues its Study Plan determination.
- The *ESA-listed Plants Study* does not include the development of requirements for the new license, which will be addressed outside the Study.
- This *ESA-listed Plants Study* specifically focuses on plants listed as FT or FE, or candidates for listing under the ESA within the proposed Project boundary, but the study area for the *ESA-listed Plants Study* is specific to locations that may contain those resources.
- If required for the performance of the *ESA-listed Plants Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *ESA-listed Plants Study*.
- Field crews may make variances to the *ESA-listed Plants Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *ESA-listed Plants Study* will be noted in the data resulting from the *ESA-listed Plants Study*.

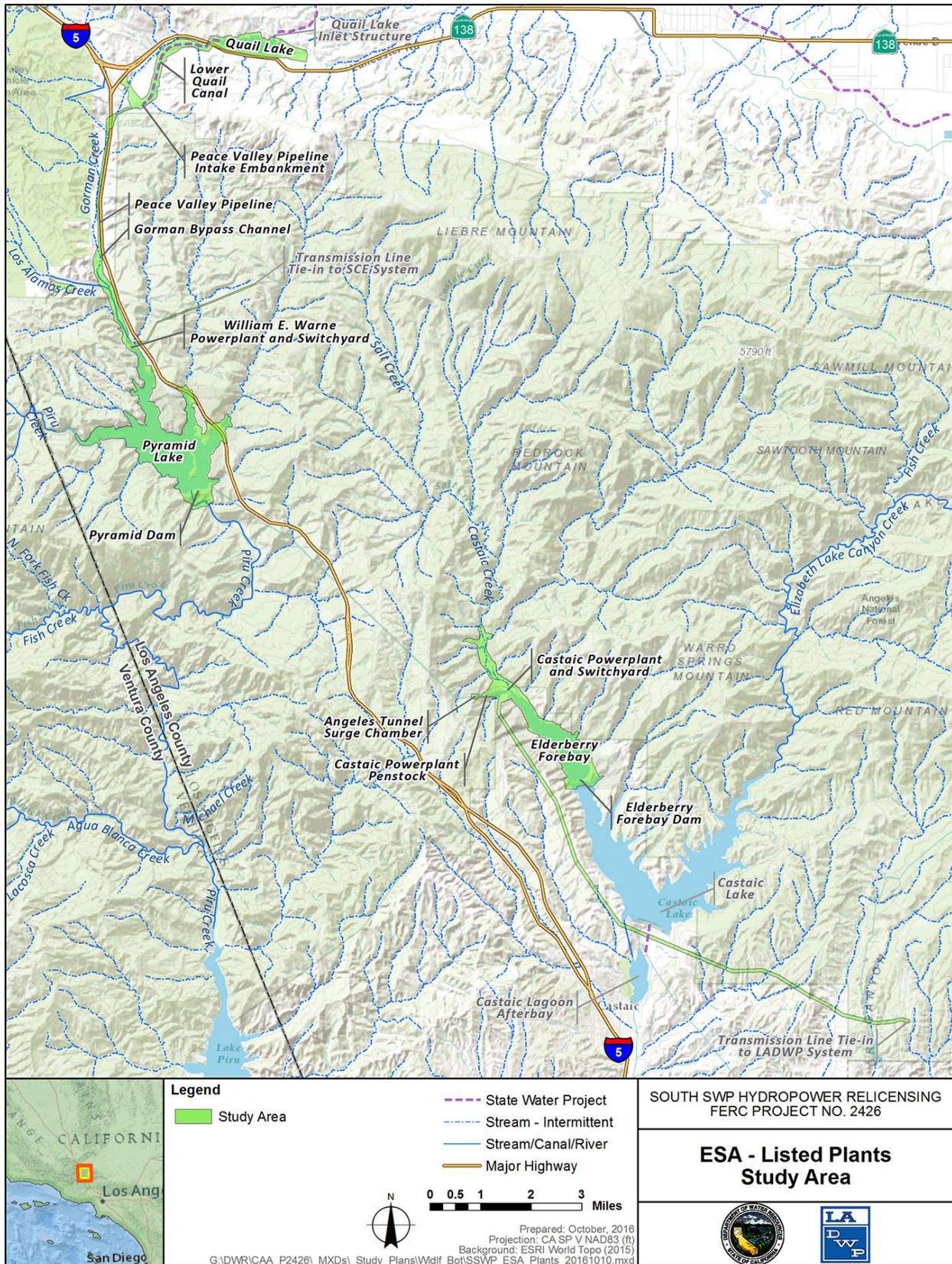


Figure 3.1-13. ESA-listed Plants Study Area

Methods

Floristic surveys require that all species encountered are identified to the extent necessary to verify listing status of each taxa. The *ESA-listed Plants Study* will consist of three steps: (1) gather data and prepare for field effort; (2) conduct field surveys; and (3) prepare data. These steps are described below.

Step 1 – Gather Data and Prepare for Field Effort. The Licensees will prepare field maps for use by field survey teams. The maps will depict aerial imagery, Project features, and the area boundary. Field planning will include preliminary identification of habitats that could support ESA-listed and candidate plant species that may occur in the area and a review of existing herbarium specimen collection dates and floristic data regarding the seasonal life stages of the vegetation being surveyed to develop an appropriate survey schedule.

Step 2 – Conduct Field Surveys. The Licensees will conduct ESA-listed plant surveys that will generally follow the methodology described in the botanical survey section of CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* and be consistent with USFWS (2000) guidelines for surveys. The protocol uses systematic field techniques including a random meander technique to ensure thorough coverage of each plant community that could support ESA-listed and candidate plant species. Additional efforts will focus on habitats with a higher probability of supporting ESA-listed and candidate plants. Documentation of surveys on NFS lands will include completion of USFS TES Plant Survey Field Forms (USFS 2008b). Dependent upon the timing of the FERC-issued Study Plan determination, the Licensees anticipate the surveys will be performed between June 2017 and April 2018, encompassing the period within which the potential ESA-listed and candidate plant species flower, with at least two survey visits of suitable habitats to maximize the likelihood of detection of all ESA-listed and candidate plant species. Surveyors will include botanists or other scientist and biologists qualified to identify ESA-listed and candidate plant species likely to occur in the area. Taxonomy and nomenclature will be based on *The Jepson Manual* (Baldwin et al., 2012). If an ESA-listed or candidate plant species is identified, the survey team will prepare a California Native Species Field Survey Form and record the following data associated with the occurrence to the edge of the occurrence, or to the edge of the proposed Project boundary, whichever is less:

- Digital photographs to document the occurrence, phenology, and reproductive state, associated habitat, and indications of potential threats
- Location and approximate extent of the ESA-listed or candidate plant species population delineated using a handheld GPS and the estimated number of plants in the population
- Habitat description, including dominant and subdominant vegetation in the area

- Activities or evidence of human activities observed in the area that have a potential to adversely affect the population (e.g., recreational trails and uses)

If an ESA-listed or candidate plant species is found on NFS lands, the occurrence will be reported using the USFS TES Plant Element Occurrence Field Guide (USFS 2008a, as may be updated). The Licensees will notify USFWS and CDFW within three working days if ESA-listed or candidate plant species are detected.

Field crews will be trained on, provided with, and use materials (e.g., Quat) for decontaminating their boots, waders, and other equipment between water-based study sites. All boats used during the study will follow clean protocols, including inspections before and after use. All decontamination requirements in place at Project reservoirs will be strictly followed. Major concerns are introduction and transmittal of amphibian chytrid fungus and invasive invertebrates (e.g., quagga mussels, zebra mussel, and Asian clams).

Step 3 – Prepare Data. Following the surveys, the Licensees will develop GIS maps depicting ESA-listed and candidate plant species occurrences, Project facilities, features, specific Project-related activities (e.g., user-created dispersed hiking or day-use), and other related information collected during the *ESA-listed Plants Study*. The data will be included in the documents discussed below.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results and will be subject to appropriate QA/QC procedures, including spot-checks of transcription for accuracy and completeness and comparison of GIS maps with field notes to verify locations of sensitive habitats and species.

Analysis

Once the locations of ESA-listed and candidate plant species occurrences in the study area for the *ESA-listed Plants Study* are determined, the Licensees will describe known Project-related potential threats to these species, including NNIP, Project O&M activities, and Project-related recreation activities.

Reporting

ESA-listed Plants Study methods and results will be prepared and included, to the extent completed, in the Licensees' ISR, USR, DLA, and FLA. If any ESA-listed or candidate plants are found, a report will be developed and considered Privileged, and will be provided only to FERC, USFWS, and CDFW. If any of these occurrences are found on NFS lands, this Privileged report will also be provided to the USFS and reported using the USFS TES Plant Element Occurrence Field Guide (USFS 2008a, as may be updated).

3.1.8.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *ESA-listed Plants Study* is consistent with the goals, objectives, and methods outlined for most recent FERC hydroelectric relicensing efforts in California, including the Don Pedro Project (FERC No. 2299), the Yuba River Development Project (FERC No. 2246), and the Merced River Hydroelectric Project (FERC No. 2174), and will use standard botanical survey methods as defined by CDFW, USFWS, and USFS.

3.1.8.6 Schedule

This *ESA-listed Plants Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the Study.

Fieldwork Preparation	May 2017 – June 2017
Fieldwork	June 2017 – April 2018
Data QA/QC	July 2017 – April 2018
Data Analysis and Reporting	October 2017 – June 2018

3.1.8.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this Study will range between \$54,000 and \$72,000.

3.1.8.8 References

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, editors. 2012. *The Jepson manual: vascular plants of California*, second edition. University of California Press, Berkeley.

California Department of Fish and Game. 2009. Protocols for surveying and evaluating impacts to special status native plant populations and natural communities. November 24, 2009. Available online at: https://www.dfg.ca.gov/biogeodata/cnddb/pdfs/Protocols_for_Surveying_and_Evaluating_Impacts.pdf.

CDFW. 2015. CNDDDB. RareFind Version 5. Available online: nrmsecure.dfg.ca.gov/cnddb/view/query.aspx. Accessed July 31, 2015. Last updated July 7, 2015. CDFW, Biogeographic Data Branch. Sacramento, CA.

CNPS, Rare Plant Program. 2015. Inventory of Rare and Endangered Plants (online edition, v8-02). CNPS, Sacramento, California. Available online at: <http://www.rareplants.cnps.org>. Accessed: August 2015.

2008a. USFS Threatened, Endangered and Sensitive Plants Element Occurrence Field Guide.

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USFWS. 2000. Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants. January 2000. Available on-line at: http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/.

3.1.9 ESA-Listed Amphibians, California Red-legged Frog Study

3.1.9.1 Project Nexus

Continued Project O&M and Project-related recreation activities may have potential to affect CRLF, an amphibian listed as threatened under the federal ESA.

3.1.9.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding CRLF within the proposed Project boundary is provided in Section 4.8 of the Licensees' PAD. In summary, CRLF is an aquatic frog primarily associated with perennial ponds or pools, and slow-moving perennial or seasonal streams or pools within streams where water remains continuously for a minimum of 20 weeks beginning in the spring (i.e., sufficiently long enough for breeding to occur and larvae to complete development) (Jennings and Hayes 1994; 71 Federal Register [FR] 19244). Suitable aquatic habitats include natural and manmade ponds, backwaters within streams and creeks, marshes, lagoons, and dune ponds. Deep lacustrine habitats larger than 50 acres do not represent breeding or dispersal habitat (75 FR 12816). Juvenile and adult CRLF may also utilize terrestrial habitats for foraging, aestivation, and seasonal dispersal. During wet periods, long-distance dispersal of one mile or more may occur between aquatic habitats, including movement through upland habitats or ephemeral drainages (71 FR 19244). Table 3.1-5 summarizes CRLF habitat requirements by life stage.

Table 3.1-5. California Red-legged Frog Habitat Requirements by Life Stage

Egg Masses	Larvae	Juveniles and Adults
<p>In ponds or backwater pools within streams, usually attached to emergent vegetation (cattail [<i>Typha</i> spp.] and bulrush [<i>Schoenoplectus</i> spp.]). Sometimes found at sites without emergent vegetation (e.g., some stock ponds). The presence of dense riparian vegetation (particularly willows [<i>Salix</i> spp.]) is also a positive indicator of suitable breeding habitat. Permanently or seasonally flooded water bodies may be used.</p>	<p>Same habitat as eggs; also in slow-moving, shallow riffle zones, and shallow margins of pools. Larvae spend most time in submerged vegetation or organic debris. Emergent vegetation, undercut banks, and semi-submerged root wads may provide hiding cover. Larvae typically metamorphose between July and September</p>	<p>Frogs may stay at breeding sites or move to summer habitats. Emergent and/or riparian vegetation, undercut banks, semi-submerged root masses; open grasslands with seeps or springs with dense growths of woody riparian vegetation; cattail, bulrush, and willow are good indicators for suitable habitat. Associated with deep (<0.7 – 1.5 meters), still or slow-moving water. Juveniles prefer open, shallow aquatic habitats with dense submerged vegetation. In seasonally dry areas, frogs may aestivate in moist spaces (e.g., under boulders, logs, watering troughs, and small-mammal burrows).</p>

CRLF has not been reported to occur within the proposed Project boundary. However, USFWS (2002) indicates the presence of CRLF in Pyramid reach, but describes the population as being in decline. Hubbert and Murphey (2005) did not detect CRLF in Pyramid reach or its tributary, Agua Blanca Creek, about 16.5 miles downstream of Pyramid Lake during surveys performed for the USGS from 1999 to 2000. Critical habitat unit VEN-2 is located in the Pyramid reach and its tributary Agua Blanca Creek. Sandburg (2006) found larval CRLF in 2005 in a 7-foot-deep pool with cattails in Pyramid reach more than 10 miles downstream of Pyramid Lake and in a 3-foot-deep pool in Agua Blanca Creek. However, annual surveys performed by the Licensees from 2010 to present did not indicate the presence of the species in the 1.3 mile section of Agua Blanca Creek, or the 4.5 mile segment of the Pyramid reach between Ruby Canyon and the Blue Point Campground.

Information in addition to that provided by the Licensees' annual surveys is needed and will be gathered during this *ESA-listed Amphibians, CRLF Study* to determine locations of habitat suitable for CRLF that could be affected by the Project within the proposed Project boundary.

3.1.9.3 Study Goals and Objectives

The goals of this *ESA-listed Amphibians, CRLF Study* are to: (1) identify and map known CRLF locality records and the distribution of suitable habitats for CRLF within the proposed Project boundary and aquatic habitat within the surrounding one-mile radius from the proposed Project boundary; (2) perform a desktop site assessment to characterize mapped upland and aquatic habitats supplemented by field reconnaissance; and (3) evaluate the likelihood that CRLF currently exists in the proposed Project boundary based on the historical records and the descriptive site assessment.

The objective of this *ESA-listed Amphibians, CRLF Study* is to gather sufficient data necessary to fill recognized information gaps.

3.1.9.4 Study Methods

Study Area

The study area for the *ESA-listed Amphibians, CRLF Study* consists of the area within the proposed Project boundary, excluding lands overlying the Angeles Tunnel on which the Licensees do not perform any Project O&M activities. For the purpose of developing the desktop assessment map described below, aquatic habitats and existing locality records will also be mapped within a one-mile radius of the proposed Project boundary. The study area for the *ESA-listed Amphibians, CRLF Study* is shown in Figure 3.1-14 below.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *ESA-listed Amphibians, CRLF Study* will begin after FERC issues its Study Plan determination.
- The *ESA-listed Amphibians, CRLF Study* does not include the development of requirements for the new license, which will be addressed outside the Study.
- This *ESA-listed Amphibians, CRLF Study* focuses on CRLF within the proposed Project boundary, but the study area for the *ESA-listed Amphibians, CRLF Study* is specific to the locations providing suitable habitat for this species.
- If required for the performance of the *ESA-listed Amphibians, CRLF Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *ESA-listed Amphibians, CRLF Study*.
- Field crews may make variances to the *ESA-listed Amphibians, CRLF Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances in the *ESA-listed Amphibians, CRLF Study* will be noted in the data resulting from the *ESA-listed Amphibians, CRLF Study*.



Figure 3.1-14. ESA-listed Amphibians, CRLF Study Area

Methods

The *ESA-listed Amphibians, CRLF Study* will consist of three steps: (1) identify and map locality records and potential aquatic habitat for CRLF; (2) desktop site assessment and field reconnaissance; and (3) prepare data. These steps are described below.

Step 1 – Identify and Map Locality Records and Potential Aquatic Habitat for CRLF.

Prior to conducting the field assessments, the Licensees will identify and map known locality records of CRLF and locations of upland and aquatic habitats in the study area for the *ESA-listed Amphibians, CRLF Study* potentially suitable for CRLF breeding. In addition to the CNDDDB, sources of locality records may include inquiries to “biological consultants, local residents, amateur herpetologists, resource managers and biologists from municipal, State, and Federal agencies, environmental groups, and herpetologists at museums and universities” (USFWS 2005). Potential CRLF breeding habitat will be identified from existing aerial imagery, NWI maps, and any existing on-the-ground photographs. Other aquatic habitats potentially affected by the Project that may be utilized by CRLF for dispersal, foraging, or predator avoidance will also be identified and mapped.

Step 2 – Desktop Site Assessment and Field Reconnaissance. The Licensees will complete a desktop site assessment to characterize upland and aquatic habitats mapped in Step 1, supplemented by field reconnaissance in accordance with USFWS (2005) guidelines, where additional information is needed and where accessible at locations within the proposed Project boundary. Field reconnaissance surveys will be completed by biologists or scientists that are qualified to identify amphibians and their habitats. A Habitat Site Assessment Data Sheet (USFWS 2005) will be completed at each site that is examined, and photographs will be taken depicting habitat and other notable findings. Data to be collected during field reconnaissance will include water flow and depth at the time of the site assessment, bank-full depth, stream gradient (i.e., percent slope), substrate, and description of bank. Consistent with the USFWS (2005) guidelines, field reconnaissance will not include formal surveys for CRLF or repeated visits to sites, and will not include activities that will require federal or State permits (e.g., dip-netting or use of traps, or handling CRLF) unless directed or authorized by USFWS to collect additional information. However, observation of CRLF of any life stage will be noted and documented by photographs if possible. USFWS decontamination guidelines will be implemented. This will include use of materials (e.g., Quat disinfectant) for decontaminating boots, waders, and other equipment between aquatic sites. Also, the requirements of the *Zebra and Quagga Mussel Rapid Response Plan* for the SWP must be followed for any equipment to be used in those water bodies, including heat treatment and the use of chemical solutions. Detections of any life stage of CRLF will be reported within three days to CDFW and USFWS. The presence of fish, non-native crayfish, and American bullfrog will also be noted during the site assessments. Aquatic habitats will be mapped and characterized by habitat type (e.g., pond, creek, or pool) and apparent seasonality. Upland habitats within the study area for the *ESA-listed Amphibians, CRLF Study* will be characterized based on description of upland vegetation communities, land uses, and any potential barriers to CRLF

movement. Once the site assessment has been completed, the Licensees will note Project O&M and Project-related recreation that typically occurs in the area.

Step 3 – Prepare Data. Following the field reconnaissance, the Licensees will develop summary text from field notes describing survey results and GIS maps depicting survey locations, locations of CRLF observations, Project facilities, features, and specific Project-related activities that may have an effect on CRLF.

Quality Assurance and Quality Control

Field data gathered during this *ESA-listed Amphibians, CRLF Study* will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures including checking field data sheets for accuracy and completeness.

Analysis

Once the locations of potentially suitable upland and aquatic habitats in the study area for the *ESA-listed Amphibians, CRLF Study* are determined, the Licensees will identify continuing Project O&M and Project-related recreation activities that occur in these areas.

Reporting

ESA-listed Amphibians, CRLF Study methods and results will be prepared and included, to the extent that they are completed, in the Licensees' ISR, and all results reported in the USR, DLA, and FLA. If any CRLF are found during this *ESA-listed Amphibians, CRLF Study* or observed incidentally during other relicensing studies being performed by the Licensees, a report considered "Privileged" will be developed and provided only to FERC, USFWS, and CDFW. If any CRLF are found on NFS lands, this Privileged report will also be provided to USFS. The report will also include a summary of historical records of CRLF from agency records, museum records, and other existing information.

3.1.9.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *ESA-listed Amphibians, CRLF Study* is consistent with the goals, objectives, and methods outlined for most recent FERC hydroelectric relicensing efforts in California, including the Yuba River Development Project (FERC No. 2246) and the Merced River Hydroelectric Project (FERC No. 2174), and will use methodology recommended by USFWS.

3.1.9.6 Schedule

The *ESA-listed Amphibians, CRLF Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the Study.

Fieldwork Preparation	January 2018 – April 2018
Fieldwork	April 2018 – June 2018
Data QA/QC	June 2018 – July 2018
Data Analysis and Reporting	August 2018 – June 2019

3.1.9.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *ESA-listed Amphibians, CRLF Study* will range between \$60,000 and \$80,000.

3.1.9.8 References

Hubbartt, V.K. and T.G. Murphey. 2005. Surveys for California red-legged frog and arroyo toad on the Los Padres National Forest. USFS General technical report PSW-GTR-195.

Jennings, M.R. and M.P. Hayes. 1994. Amphibian and reptile species of special concern in California. Report to the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, California. 255 pp.

Sandburg, N.H. 2006. Middle Piru Creek arroyo toad (*Bufo californicus*) clutch surveys 2005. Report to DWR. February 2006.

USFWS. 2005. Revised guidance on site assessments and field surveys for California red-legged frog. August 2005.

3.1.10 ESA-Listed Riparian Bird Species, Southwestern Willow Flycatcher, Least Bell's Vireo, and Yellow-billed Cuckoo Riparian Habitat Evaluations Study

3.1.10.1 Project Nexus

Continued Project O&M and Project-related recreation activities may have an effect on southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), and yellow-billed cuckoo (*Coccyzus americanus*), western DPS. These are riparian-breeding birds listed as threatened under the federal ESA.

3.1.10.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding southwestern willow flycatcher, least Bell's vireo, and yellow-billed cuckoo within the proposed Project boundary is provided in Section 4.8 of the Licensees' PAD. In summary, all three species are closely associated with dense riparian habitats (especially during nesting), but with differences in structure and composition as detailed below.

Least Bell's vireo breeding habitat is typically dominated by willows (*Salix* spp.), with dense cover within 3-6 feet of the ground, and a structurally diverse, dense canopy (USFWS 1998). Nests are often in openings or near habitat edges in understory shrubs,

including wild rose (*Rosa californica*) and mulefat (*Baccharis salicifolia*) beneath willows and cottonwoods (*Populus* spp.) (USFWS 1998). Home ranges of least Bell's vireo during the nesting season may also include adjacent non-riparian habitats such as chaparral and coastal scrub (Kus and Minor 1989).

Southwestern willow flycatcher's breeding habitat requires the presence of dense vegetation cover, usually willows or tamarisk, that is dense from the ground to 9.8 feet or more in height, and may occur as shrub stands or broadleaf trees with a dense shrub layer 6.5 to 16.4 feet in height. Habitats may be associated with either low gradient streams or lentic habitat. Other characteristic species include boxelder (*Acer negundo*), Russian olive (*Elaeagnus angustifolia*), cottonwood, ash (*Fraxinus* spp.), alder (*Alnus* spp.), and buttonbush (*Cephalanathus occidentalis*). Breeding territories may be as small as 0.25 acre, but most are at least 0.5 acre.

Yellow-billed cuckoo's western DPS breeding habitat includes riparian woodlands with native broadleaf trees and shrubs that are 50 acres or more in extent within arid to semiarid landscapes. However, patches greater than 200 acres in size are favored by the species. These areas are generally at low to moderate elevations. Cottonwood and willow-dominated vegetation is the preferred species composition. Connectivity to other similar habitats is also important for sustaining the species (Halterman et al. 2016). CDFW (2015) summarizes the general habitat for this species as "broad, lower flood-bottoms of larger river systems" and micro-habitats as "riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape." Yellow-billed cuckoo, western DPS was not included in the PAD as a species potentially affected by the Project because of the apparent limited extent and small patch size of riparian habitats in the proposed Project boundary. However, more information is needed on the structure and composition of riparian habitat in the proposed Project boundary to validate this conclusion.

The Licensees found no existing information regarding the presence of these species within the proposed Project boundary, where the most recent known surveys were performed in 2002 and 2003 for southwestern willow flycatcher and least Bell's vireo. No surveys are known to have been conducted for yellow-billed cuckoo. The nearest known occurrences of each species are a record of least Bell's vireos in the Castaic Lagoon Recreation Area approximately 4 miles south of Elderberry Forebay (multiple years, most recently in 2005); non-breeding, migrating willow flycatchers (sub-species not determined) on Liebre Gulch north of Pyramid Lake; and a sighting of a single yellow-billed cuckoo approximately 19 miles south of Pyramid Lake along the Santa Clara River, 3 to 4 miles east of the town of Piru in 1979. No yellow-billed cuckoos were detected at the latter location in subsequent surveys between 1999 and 2006 (CDFW 2015). All of these locations are outside the proposed Project boundary. Additional information, which will be provided by this *ESA-listed Riparian Bird Species Study*, is needed to determine locations of suitable habitat for each of the three species and whether southwestern willow flycatcher or least Bell's vireo occur there during the breeding season.

3.1.10.3 Study Goals and Objectives

The goals of this *ESA-listed Riparian Bird Species Study* are to: (1) identify the location of any suitable habitat for southwestern willow flycatcher, least Bell's vireo, or yellow-billed cuckoo western DPS in the study area for the *ESA-listed Riparian Bird Species Study*; (2) document the presence/absence of southwestern willow flycatcher and least Bell's vireo by surveys in the study area for the *ESA-listed Riparian Bird Species Study* during their breeding seasons; and (3) document incidental observations of breeding activities of any of the three species in the study area for the *ESA-listed Riparian Bird Species Study*. The *ESA-listed Riparian Bird Species Study* does not include presence/absence surveys for yellow-billed cuckoo.

The objective of this *ESA-listed Riparian Bird Species Study* is to gather sufficient data necessary to fill recognized gaps in the information available about habitat suitability and the species' likely presence or absence.

3.1.10.4 Study Methods

Study Area

The study area for the *ESA-listed Riparian Bird Species Study* consists of the area within the proposed Project boundary that includes suitable habitat for the three species of ESA-listed birds, excluding lands overlying the Angeles Tunnel on which the Licensees do not perform any Project O&M activities. The study area for the *ESA-listed Riparian Bird Species Study* is shown in Figure 3.1-15.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *ESA-listed Riparian Bird Species Study* will begin after FERC issues its Study Plan determination.
- The *ESA-listed Riparian Bird Species Study* does not include the development of requirements for the new license, which will be addressed outside the Study.
- This *ESA-listed Riparian Bird Species Study* focuses on ESA-listed bird species, specifically the southwestern willow flycatcher, least Bell's vireo, and yellow-billed cuckoo western DPS within the proposed Project boundary, but the study area for the *ESA-listed Riparian Bird Species Study* is specific to the locations providing suitable habitat for each of those species.
- If required for the performance of the *ESA-listed Riparian Bird Species Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the study. The Licensees will only enter private property if permission has been provided by the landowner.

- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *ESA-listed Riparian Bird Species Study*.
- Field crews may make variances to the *ESA-listed Riparian Bird Species Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *ESA-listed Riparian Bird Species Study* will be noted in the data and final report resulting from this study.

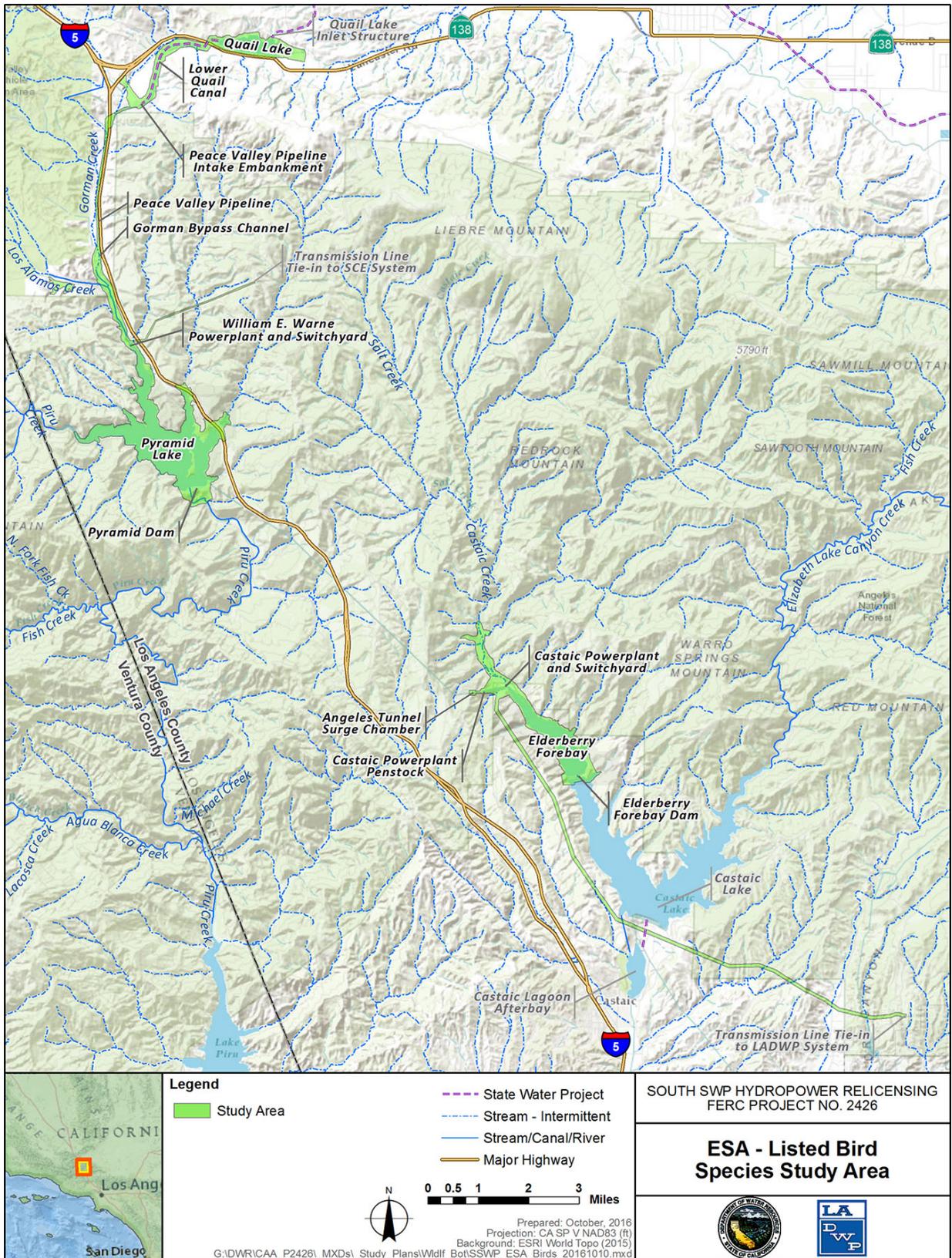


Figure 3.1-15. ESA-listed Riparian Bird Species, Southwestern Willow Flycatcher, Least Bell's Vireo, and Yellow-billed Cuckoo Study Area

Methods

The *ESA-listed Riparian Bird Species Study* will focus on areas containing appropriate habitat, as identified in vegetation mapping for the Project in the PAD, the CWHR studies and the riparian component of the Licensees' relicensing *Botanical Resources Study*. As described below, the lead biologists performing the southwestern willow flycatcher surveys for this Study will possess the necessary USFWS Section 10(a)(1)(A) species recovery permit allowing the use of pre-recorded willow flycatcher vocalizations. Call-playbacks will not be used for the least Bell's vireo surveys and will not require a USFWS permit. Although the Study does not include presence/absence surveys for yellow-billed cuckoo, the lead biologists will be qualified to identify yellow-billed cuckoo by sight and sound. The *ESA-listed Riparian Bird Species Study* will consist of three steps: (1) identify survey areas; (2) conduct field surveys; and (3) prepare data. These steps are described below.

Step 1 – Identify Survey Areas. The Licensees will use maps and descriptive habitat information from the *Botanical Resources Study* associated with riparian habitat areas to identify specific areas where southwestern willow flycatcher, least Bell's vireo, and yellow-billed cuckoo western DPS could occur in the study area for the *ESA-listed Riparian Bird Species Study*. Using this information, new maps will be created to guide the field teams during the assessments.

Step 2 – Conduct Field Surveys. The Licensees will visit identified potential riparian habitat within the study area for the *ESA-listed Riparian Bird Species Study* and evaluate its suitability for each of the target species based on vegetation species composition, habitat structure, and patch size. Based on this evaluation, locations for focused surveys for southwestern willow flycatcher and least Bell's vireo will be determined. Where possible, the results from the Licensees' relicensing *ESA-listed Terrestrial Wildlife – California Wildlife Habitat Relationships Study* will be incorporated into the evaluation.

The Licensees will perform presence/absence surveys for southwestern willow flycatcher and least Bell's vireo within suitable riparian habitat. These surveys are not intended to locate territories or nests, or to obtain precise information on the number of birds present. Surveys will follow protocols accepted by USFWS for southwestern willow flycatcher (Sogge 2010) and least Bell's vireo (USFWS 2001).

Southwestern Willow Flycatcher

Prior to the start of surveys, lead survey staff will familiarize themselves with each site. Southwestern willow flycatcher surveys rely on a call-playback technique in which certain pre-recorded vocalizations (i.e., the "fitz-bew" song and the "whitt" alarm call) are broadcast to elicit a song response from the target species. Determining "presence" of territorial southwestern willow flycatchers requires hearing the "fitz-bew" song during the non-migrant period (generally between June 15 to July 20), which may be supported by signs of breeding activity (e.g., observations of willow flycatchers carrying nesting material). Recordings of these and other vocalizations are available online from the

USGS Colorado Plateau Research Station (<http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/wiflvocl.asp>). Surveyor teams will include biologists or scientists that are qualified to identify the various target species and the methodologies to monitor for them. Qualifications to lead the southwestern willow flycatcher surveys include a USFWS Section 10(a) species recovery permit allowing for use of call-playback. In addition, the lead surveyor will be familiar with identification of other bird species likely to occur in the study area for the *ESA-listed Riparian Bird Species Study* with similar calls and songs, and capable of visually identifying species that could be confused with the southwestern willow flycatcher. Surveys will be distributed across three survey periods related to nesting phenology, with one survey in period 1 (May 15-31), two surveys in period 2 (June 1-24), and two surveys in period 3 (June 25 to July 17). During the third survey period, any southwestern willow flycatchers detected are likely to be territorial.

Least Bell's Vireo

The presence/absence surveys for least Bell's vireo will follow the USFWS (2001) survey protocols for least Bell's vireo, which are based on visual and auditory detection. The surveys will not include call-playbacks and will not require a USFWS species recovery permit. Minimum qualifications of the lead surveyors include familiarity with the characteristic vocalizations and visual identification features of the species, and related demonstrated experience and skills performing bird surveys, particularly surveys of least Bell's vireo. Surveys will be distributed across the April 10 to July 31 survey season with a total of eight surveys, conducted at least 10 days apart. Surveyors will note the location and status of each detection (e.g., age, sex and pairing of birds encountered; and foraging or calling).

Survey detections of southwestern willow flycatcher and least Bell's vireo will be reported to CDFW and USFWS. Any incidental observations of yellow-billed cuckoo western DPS will also be documented and reported to the CDFW and USFWS. Surveyors will also note any presence and general distribution of brown-headed cowbirds (*Molothrus ater*) in the study area for the *ESA-listed Riparian Bird Species Study*.

Step 3 – Prepare Data. Following the surveys, the Licensees will develop summary text from field notes describing habitat evaluation and survey results, GIS maps of survey locations, southwestern willow flycatcher, least Bell's vireo, and yellow-billed cuckoo occurrences, and any breeding activities. The summary will also include Project facilities, features, and specific Project-related activities (e.g., recreation trails) in the area where southwestern willow flycatcher, least Bell's vireo, and yellow-billed cuckoos are observed and will identify where suitable habitat for any of the three species is located.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures, including spot-checks of transcription and

comparison of GIS maps with field notes to verify locations of southwestern willow flycatcher, least Bell's vireo and yellow-billed cuckoo occurrences.

Analysis

If any suitable habitat for the three species and/or locations of southwestern willow flycatcher, least Bell's vireo, or yellow-billed cuckoo are determined, the Licensees will describe potential Project-related disturbances, including continued Project O&M and Project-related recreation activities.

Reporting

ESA-listed Riparian Bird Species Study methods and results will be prepared and included, to the extent completed in the Licensees' ISR, and all results will be reported in the USR, DLA and FLA. If any occurrences of southwestern willow flycatcher, least Bell's vireo, or yellow-billed cuckoo western DPS are found, the report will be considered "Privileged," and will be provided to FERC, USFWS, and CDFW. If any occurrences of southwestern willow flycatcher, least Bell's vireo or yellow-billed cuckoo western DPS are found on NFS lands, the privileged report will also be provided to the USFS.

3.1.10.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *ESA-listed Riparian Bird Species Study* follows survey protocols that are recommended by USFWS and CDFW. Therefore, this *ESA-listed Riparian Bird Species Study* is consistent with standard methods accepted by the scientific community and regulatory agencies for evaluating habitat and assessing the presence and breeding activities of southwestern willow flycatcher and least Bell's vireo, and for evaluating habitat of the yellow-billed cuckoo western DPS.

3.1.10.6 Schedule

The *ESA-listed Riparian Bird Species Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *ESA-listed Riparian Bird Species Study*.

Fieldwork Preparation	October 2017 – November 2017
Fieldwork	April 2018 – July 2018
Data QA/QC	July 2018 – August 2018
Data Analysis and Reporting	August 2018 – June 2019

3.1.10.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *ESA-listed Riparian Bird Species Study* will range between \$190,000 and \$246,000.

3.1.10.8 References

- CDFW. 2016. CNDDDB. RareFind Version 5. Available online: <<https://www.wildlife.ca.gov/Data/CNDDDB/Maps-and-Data> >. Accessed December 15, 2016. Last updated December 2016. CDFW, Biogeographic Data Branch. Sacramento, CA.
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3.1.11 Recreation Facilities Demand Analysis and Condition Assessment Study

3.1.11.1 Project Nexus

Continued recreation is an important benefit of most hydroelectric projects, and FPA regulations require consideration for protection and enhancement of recreational opportunities. FERC's policies include ensuring that the ultimate development of recreation resources at licensed projects is consistent with area recreation needs and with the primary Project purpose. To plan for future needs for recreation within the proposed Project boundary, data on existing recreation facilities and their respective conditions is necessary to make informed decisions about the development needs required through the term of the new Project FERC license.

3.1.11.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding recreational resources within the proposed Project boundary is provided in Section 4.9 of the Licensees' PAD. Existing data includes a basic inventory of Project-related recreation facilities, maps showing locations of existing recreational trails, statistics on visitor use, and management guidelines and regional needs assessments from relevant regional resource management plans, including the State Comprehensive Outdoor Recreation Plan and the Angeles and LPNF's Land and Resource Management Plan. The Licensees also have historical annual occupancy information for the Pyramid Lake recreation facilities. Project recreation use information is collected every six years for FERC Form 80 reporting and the most recent reporting year was 2014. Recreation user data is continuously collected every year. The Licensees also filed an updated *Recreation Plan* in May 2016.

In addition, the Licensees have been continuously working with the Pyramid Lake concessionaire, Parks Management Company, to improve and maintain existing Project recreation facilities in a safe and functional manner. However, there may be additional opportunities to provide accessibility or other upgrades to meet future user needs. Typically, accessibility evaluations follow guidelines associated with the Architectural Barriers Act Accessibility Standards (ABAAS), the Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG), and the Forest Service Trail Accessibility Guidelines (FSTAG) on NFS lands as well as the Americans with Disabilities Act on other lands. Information, which will be provided by this *Recreation Study*, will include a detailed condition assessment and inventory of Project recreation facilities. Additionally, an overnight camping demand analysis has recently been performed for the Pyramid Lake area as part of the removal of Hardluck Campground from the Project Recreation Plan. The recreation demand analysis proposed in this *Recreation Study* will augment the information gathered in that study and expand the geographic scope to identify user preferences and recreation needs within the Project boundary.

3.1.11.3 Study Goals and Objectives

The goal of this *Recreation Study* is to develop a detailed condition assessment and inventory of Project-related recreation facilities to evaluate the facility offerings, configurations and conditions to help establish whether recreation needs are being met within the proposed Project boundary and to identify the areas with barrier free access. A demand analysis will contribute to the *Recreation Study* and be compared to the condition assessment and inventory to further evaluate existing and projected recreation needs within the Project area. This *Recreation Study* will comprise the following elements: (1) Project Existing Recreational Facility Inventory, Condition, and Carrying Capacity Assessment; (2) Project Existing Recreational Facilities Accessibility Assessment; and (3) Project Recreation Demand Analysis. The information from the condition assessment, accessibility assessment, and demand analysis will be evaluated to determine potential future improvements to or expansion of recreation facilities within the proposed Project boundary. Additional information, which will be provided by this

Recreation Study, will include an inventory and comprehensive assessment of Project-related recreation facilities.

The objective of this *Recreation Study* is to gather sufficient data necessary to fill recognized gaps in available information about the existing recreational facilities. This information will be used to determine whether potential future improvements to recreational facilities within the proposed Project boundary, such as additional opportunities for providing accessibility, are warranted.

3.1.11.4 Study Methods

Study Area

The area of focus for the recreation facilities condition assessment and demand analysis consists of existing Project recreation areas within the proposed Project boundary surrounding Quail Lake and Pyramid Lake. The Project lands around Elderberry Forebay are not part of this *Recreation Study* since the forebay is closed to the public due to safety concerns posed by fluctuating water levels. Figures 3.1-16 to 3.1-18 show the areas and facilities that will be studied. For the recreation demand component, the analysis area will expand to include relevant recreation demand studies for California, and make some use of national data sets on user trends and preferences.

Study Sites

Pyramid Lake is popular with boaters and fishermen. In addition, the lake, its surrounding shorelines, and adjacent areas are popular with swimmers, hikers, and picnickers, particularly during the summer months. As shown in Figure 3.1-17 and described below, recreation facilities on and around Pyramid Lake include: boat-in sites, a visitor center, picnic areas, boat launches and public docks, and swim beaches. Los Alamos Campground provides overnight and group campgrounds for Pyramid Lake visitors.

Recreational facilities at Quail Lake are owned and operated solely by DWR. A large, graveled parking area with portable restrooms, signage, and trash receptacles are located at the west end of the lake, adjacent to State Route 138 and the outlet structure. Project lands surrounding Quail Lake are fenced and recreational access to the lake is walk-in only. Natural surface trails lead to the lake from the parking area. A graveled service road, which is closed to privately-owned vehicles but open to hikers and fishermen, surrounds the lake (Figure 3.1-18). Quail Lake provides only non-contact recreation opportunities; no boating or swimming is permitted there.

The following recreation-related facilities will be evaluated as part of this *Recreation Study*. Existing inventory, condition, capacity, and accessibility assessments will be conducted for each facility listed below. Observed use information will also be documented during visits to each of these facilities.

Pyramid Lake Recreation Facilities:

- Emigrant Landing Boat Launch
- Emigrant Landing Swim and Picnic Area
- Emigrant Landing Picnic and Fishing Area No. 1
- Emigrant Landing Picnic and Fishing Area No. 2
- Vista Del Lago Visitor Center
- Vaquero Day Use Area
- Spanish Point Boat-in Picnic Area
- Serrano Boat-in Picnic Area
- Bear Trap Boat-in Picnic Area
- Yellow Bar Boat-in Picnic Area

Other Recreation Facilities:

- Quail Lake access point (parking, temporary restrooms, shoreline fishing)
- Los Alamos Campground and Group Camp

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Recreation Study* will begin after FERC issues its Study Plan determination.
- The *Recreation Study* does not include the development of requirements for the new license, which will be addressed outside of this Study.
- The *Recreation Study* specifically focuses on the recreation resources within the proposed Project boundary surrounding Pyramid and Quail Lakes and the study area for the *Recreation Study* is specific to that resource.
- If required for the performance of the *Recreation Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.

- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Recreation Study*.
- Field crews may make variances to the *Recreation Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *Recreation Study* will be noted in the data resulting from the *Recreation Study*.

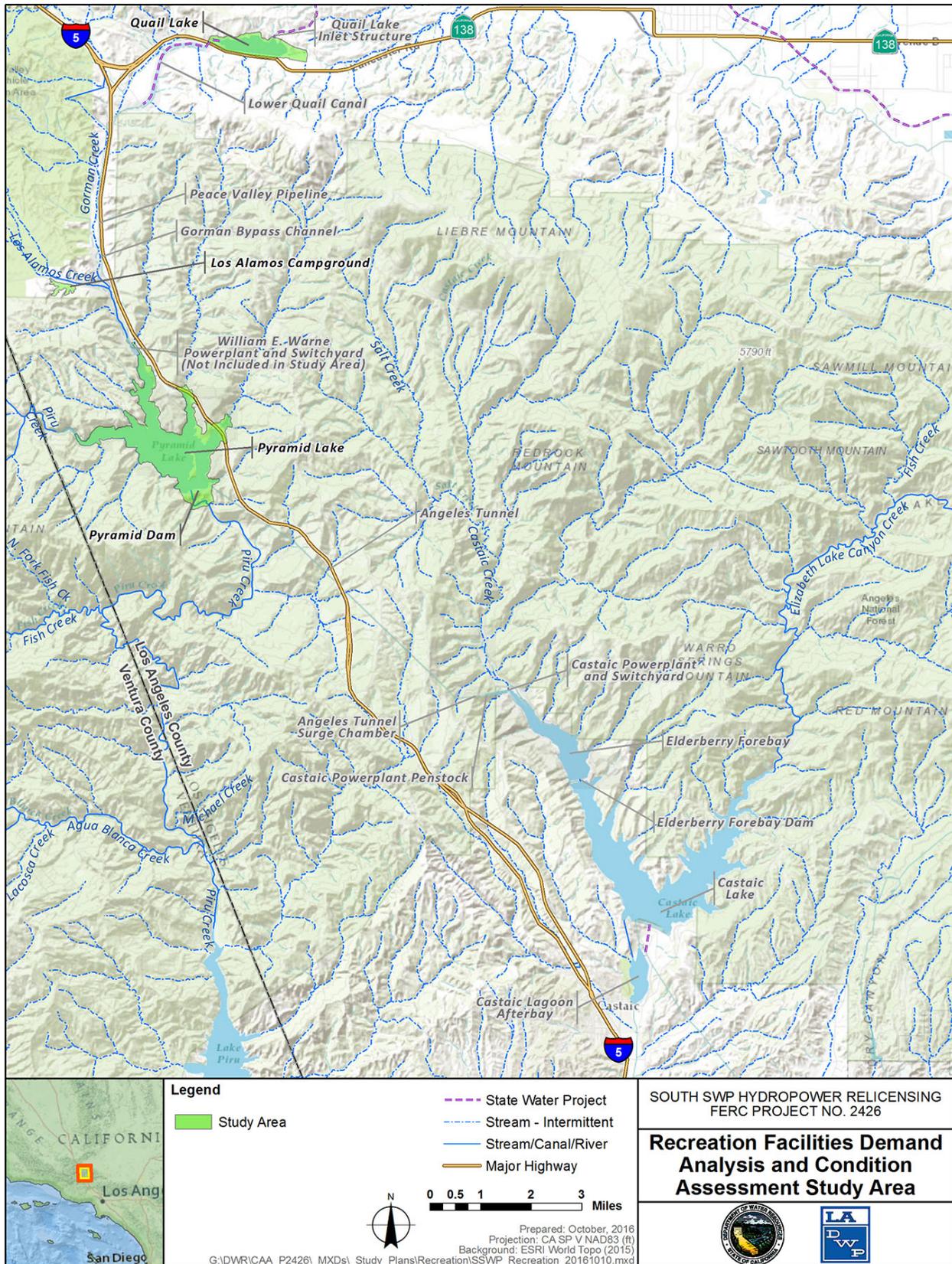


Figure 3.1-16. Proposed Project Boundary and Location Map

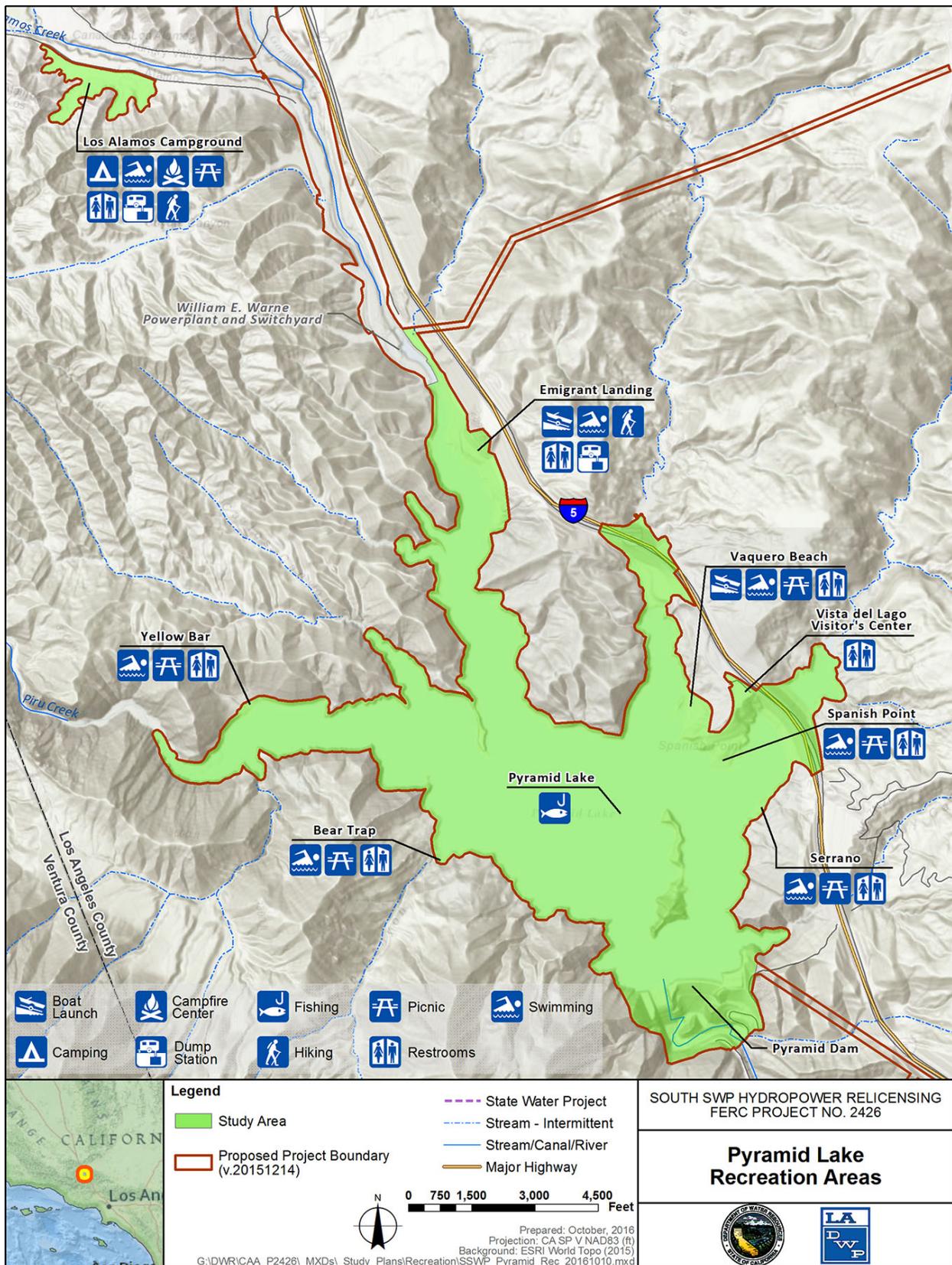


Figure 3.1-17. Pyramid Lake Recreation Areas

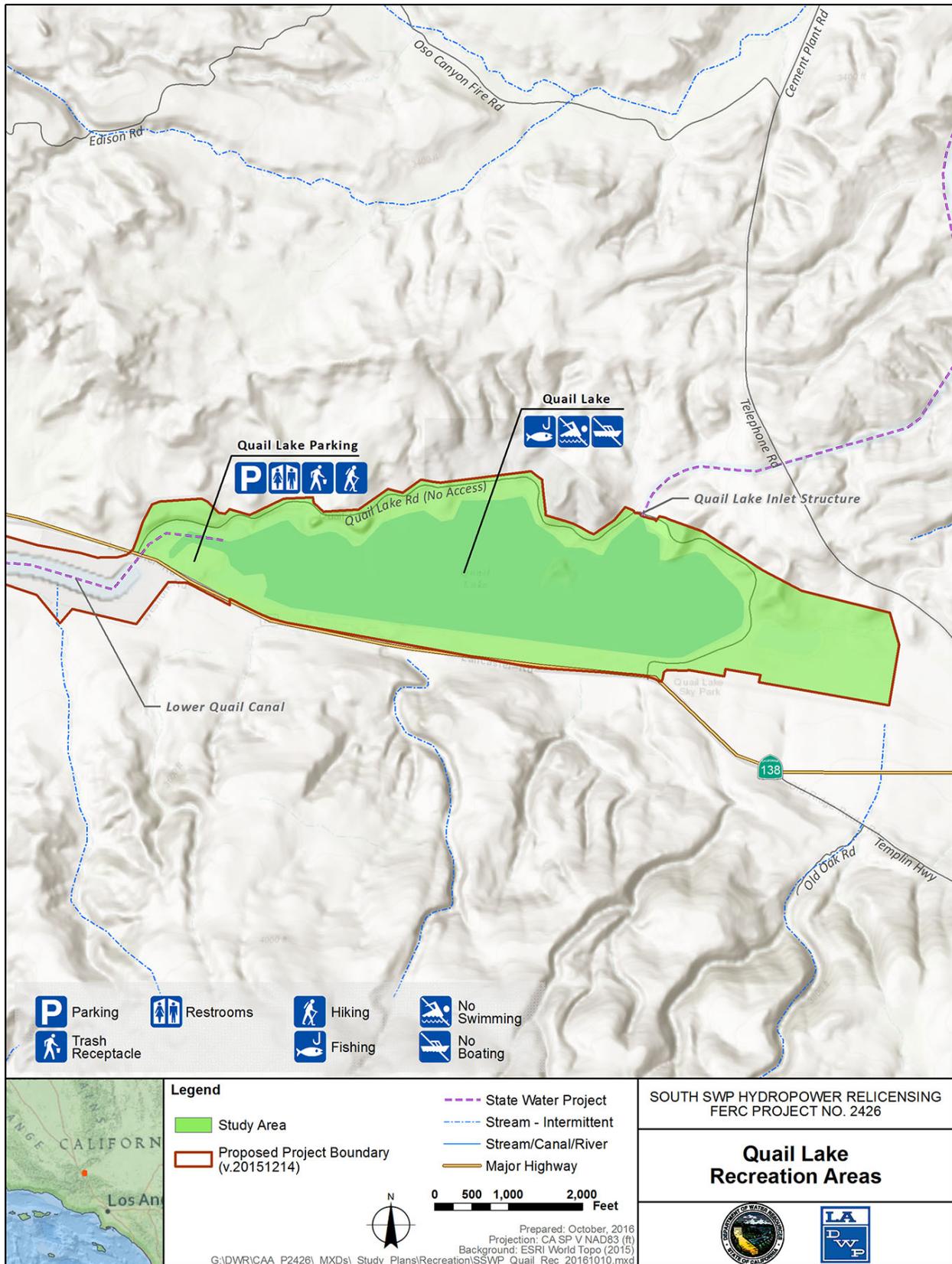


Figure 3.1-18. Quail Lake Recreation Areas

Methods

This *Recreation Study* has three components: (a) existing facility inventory, condition assessment, and carrying capacity analysis; (b) recreational facilities accessibility assessment; and (c) a recreation demand analysis.

Existing Facility Inventory, Condition Assessment, and Carrying Capacity Analysis

The Existing Facility Inventory, Condition Assessment, and Carrying Capacity Analysis portion of this *Recreation Study* will consist of three steps: (1) conduct site condition assessments; (2) field reconnaissance; and (3) carrying capacity analysis. These steps are described in more detail below.

Step 1 – Conduct Site Condition Assessments. This *Recreation Study* will inventory the number and type of components that are provided at the recreation facilities listed in Section 3.1.4.2 above, and will provide updated information with respect to what is described in the Project's *Updated Recreation Plan* (May 2016). The facility inventory and carrying capacity analysis will inform the demand analysis and will also evaluate the condition of each of the listed facilities.

The existing facility inventory will include assessments of parking areas, and the location and number of parking spaces, picnic and camping units, boat and trailer parking spaces, accessible parking spaces, and facility components. Trailheads and trails will be inventoried for signage, types of improvements, general widths, and general trail conditions.

Step 2 – Field Reconnaissance. The field reconnaissance will include a physical condition inspection of existing Project recreation facilities, designated Project trails, user-created trails, and general trail conditions. The reconnaissance will also identify observable use patterns and field verify if recreation amenities are constructed and in a condition that serves user needs with common access points and travel routes. Observable resource impacts at developed and dispersed user created Project recreational sites will be noted.

Field reconnaissance surveys to gather facility information at each of the recreation sites in the Pyramid Lake and Quail Lake areas will take several days. User created sites (sites that are frequented by recreation users but not identified as an established facility) will be identified for observable use and wear patterns.

The following steps will be taken to complete the facilities inventory:

1. Gather background data: Compile and map current facilities and upload data to GPS unit or GPS enabled application. Develop a data dictionary template for data collection to streamline collection methods, and create organization and consistency of collected data. Prepare field maps.

2. Orient the field crew with the study area for the *Recreation Study*, review field research techniques to ensure consistent inventory methods and coordinate logistics and field crew mobilization.
3. Complete reconnaissance level field research: Conduct fieldwork to create a detailed inventory on the conditions of existing recreation facilities and other user created sites within the study area for the *Recreation Study* with observable wear patterns.
4. Assemble the results and create maps of data collected in the field.
5. Prepare data and perform quality assurance.

Step 3 – Carrying Capacity Analysis. A component of the *Recreation Study* provides an overall assessment of the types and levels of recreational use in the study area for the *Recreation Study* to determine if use levels are compatible with the capacity of existing Project recreation facilities. Maintaining use levels within a recreation site's capacity is important in terms of protecting natural, cultural, and recreation resources, as well as helping to assure public safety, providing predictability and helping to assess management alternatives.

Recreation carrying capacity can be evaluated by considering several factors together to estimate a level of use beyond which impacts exceed common recreation industry and Forest Service standards. Three types of capacity will be evaluated: (1) biophysical/ecological; (2) social; and (3) physical/spatial aspects including management components. These primarily qualitative analyses focus on the capacity of existing developed recreation facilities in the study area for the *Recreation Study*. To develop capacity conclusions, this assessment will evaluate each developed site with respect to:

- Biophysical/Ecological Capacity – Relative impacts on the ecosystem, such as impacts to wetlands or riparian communities, observed soil erosion, vegetation damage, and observed trash accumulation and sanitary problems, among others. By design, developed/hardened recreation sites typically have fewer ecological concerns compared to dispersed use areas. The relative level of this factor can be noted and elaborated on in the condition assessment component.
- Social Capacity – Reported social impacts of recent and past visitor's recreation experience, such as perceived crowding, actual and/or perceived conflict, and overall satisfaction.
- Physical/Spatial Capacity – Identification of the number of units from the inventory component combined with recreation management considerations (including law enforcement) that will inform physical capacity (the number of people who can typically use a site at one time), and include a spatial capacity component. The Licensees will evaluate the general ability to enhance a site

through new amenities or enlarge the site beyond its existing boundaries, including aspects related to law enforcement, visitor safety, and others.

The concept of recreation carrying capacity was originally developed out of biological models that attempted to determine the capability of a given environment (e.g., range, pasture) to sustain a specific number of animals over time. While density-related information is an important factor in capacity, in actuality, many management issues regarding recreation carrying capacity decision-making are not necessarily density dependent. Rather, recreation carrying capacity issues are also related to the ecological, social, and managerial aspects of recreational opportunities.

The full suite of recreation carrying capacity types will be assessed at each developed recreation site in the Study. For each developed site in the study area for the *Recreation Study*, qualitative and quantitative data will be used to identify ecological, social, and/or management capacity impacts and establish an existing capacity parameter (expressed in qualitative terms including “below,” “approaching,” “at,” or “exceeding” capacity). Additionally, where appropriate, any primary limiting factors for each site will be noted.

The Carrying Capacity Analysis methods will include:

- Utilize physical information from the site assessments and field reconnaissance.
- Gather Form 80 data
- Gather visitation data from Parks Management Company
- Use visitor questionnaire and interviews (from the demand analysis described in 3.1.4.7) to gather information about social capacity and perceived crowding
- Use information developed by other studies to understand other potential constraints around the immediate area (e.g. biological, cultural, etc.).
- Combine quantitative information on physical capacity, user data with management information and more qualitative information regarding user needs to establish an existing capacity parameter for each developed site.

Existing Facility Accessibility Assessment

Project-related recreation facilities (see Section 3.1.4.2 above) and signs at Project-related recreation facilities will be assessed for applicable accessibility requirements. Evaluating outdoor recreation facilities per the ABAAS, the FSORAG, and FSTAG will be a common technique to establish the level of accessibility at the recreation facilities, most of which are on Federal lands.

The facility inventory assessment and facility accessibility assessment field work will be completed concurrently. Information will be collected using digital technology. A GPS unit or tablet GPS application will be used to gather facility information that has been pre-loaded with all known existing features. A data dictionary designed to provide an

inventory on existing conditions of all recreation facilities within the Project area will be created and used to maintain consistency and organization of data collected. The condition assessment will be qualitative based on a range of repair/replacement/maintenance needs to acceptable appearance and function to evaluate the condition of recreation facilities. Photos will be taken of facilities, signs, trailheads, etc. and cataloged based on feature type or location. Other user created sites with observable wear patterns within the Project area will also be cataloged for further evaluation within the *Recreation Study*.

The USFS Accessibility Database will be checked prior to conducting field reconnaissance for any existing accessibility data that has been previously collected within the proposed Project boundary.

Recreation Demand Component

The Recreation Demand Component of this *Recreation Study* will consist of 6 steps: (1) observational survey; (2) visitor use questionnaire; (3) review of research publications and existing information; (4) assessment of regional uniqueness and significance of the Project area's primary recreation opportunities; (5) interviews with user groups and recreation providers; and (6) a regional demand assessment. The steps are described in more detail below.

Step 1 – Observational Survey. Observed recreation use occurring in the Project area based on observational surveys will be used to estimate existing use. Multiple observational surveys will be conducted and will be spread evenly across the summer recreation season. Timing and sampling frequencies will be based on estimated use levels and the survey will be conducted on different types of days (weekday, weekend, holiday, or opening of fishing season). The observation data that will be recorded includes but is not limited to vehicle counts, angler counts, boat counts, trail user counts, campground usage, and day use area usage.

Step 2 – Visitor Use Questionnaire. A concise visitor use and experience questionnaire will be fielded at Emigrant Landing, Vista Del Lago, Los Alamos Campground, and Quail Lake recreation sites where people are present. The survey will be conducted at least three times; once on a mid-summer weekday, once on a holiday weekend and once on a typical summer weekend. A review of past visitor data will be assessed to determine appropriateness of target survey dates with considerations for current season use patterns and any potential unexpected conditions taken into account. The questionnaire will be crafted to collect information from recreationists about recreation, activity participation, accessibility needs, areas visited, group size, user conflicts, perceived crowding, visitor profile (i.e., male/female, age, race) and preferences, visual impressions, and satisfaction with or desire for recreational opportunities and facilities in the Project area. The questionnaire will provide an opportunity for visitors to express any potential concerns over the current state of, and future possibilities for, recreation in the Project area.

Step 3 – Review of Research Publications and Existing Information. Recent relevant California-based user preference surveys and other outdoor recreation surveys about recreation demand will be gathered and reviewed. These reviews include but are not limited to the 2007 California Outdoor Recreation Survey and 2012 *Survey of Public Opinions and Attitudes on Outdoor Recreation in California*, as well as more current surveys that analyze the project outdoor recreation participation rates and growth needs in the greater Los Angeles area in order to help address how the Project recreation facilities are helping to meet demands of the greater area. Demand and user preference studies at various scales, covering California, but especially those addressing southern California, will be reviewed for their applicability to the Project area. Recreation activity and participation trends information will be examined from the existing demand studies and reports, as well as USFS reports, FERC Form 80 filings, and data collected by the Licensees.

Existing use data of recreation occurring in the Project area from Parks Management Company will be collected for use in the regional demand assessment.

Step 4 – Assessment of Regional Uniqueness and Significance of the Project Area’s Primary Recreation Opportunities. Regional uniqueness and significance of the Project area’s primary recreation opportunities will be evaluated. Site specific factors that contribute to the uniqueness of the Project area can inform the demand analysis and needs assessment. Within the region of the area generally covered by the ANF and LPNF, an inventory of water based recreation facilities will be compiled using Forest Planning and other recreation planning documents. Where available, information will be gathered for sites including types of designation, types of recreation opportunities available, visitation statistics (including information on visitors origin), and general popularity for regional outdoor recreation areas.

Step 5 – Interviews with User Groups and Recreation Providers. Interviews will be conducted with a variety of identified regional and local recreation providers and user groups associated with recreation in the Project area and in the Project vicinity. These entities, where willing, will then be interviewed to gather additional information on current use, user preferences and needs, perceived regional uniqueness and significance of recreation opportunities within the Project area, existing data, and observations in the Project area for both existing and potential future users.

Structured interviews with recreation providers and user groups will include Parks Management Company, local recreation user groups (including those representing anglers, people with accessibility needs, mountain bikers, and hikers), boating vendors, rental agencies, and local landowners. Some of these interviews will be done as focus group sessions where applicable. Interviews will also be conducted with key recreation management personnel, such as law enforcement officers, USFS personnel, police and fire prevention officials, and others that are closely associated with management or participation in recreation activities in the region. The interviews will provide an opportunity for representatives to provide any additional information on current or projected future recreational use within the Project area.

Step 6 – Regional Demand Assessment. The recreation demand analysis will compare demand with the existing supply of recreation opportunities and use patterns. A gap analysis will be performed by comparing relative demand to supply, with consideration for trends and cultural variations in user groups based on research and forecasts of population growth. By comparing this information to a detailed inventory of existing recreation opportunities and utilizing information gathered in the observational surveys, visitor use questionnaires, carrying capacity assessment, structured interviews, and focus groups, it will be possible to determine whether there is a need for modifications to existing facilities or for the development of additional facilities and recreation amenities.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results and shall be subject to appropriate QA/QC procedures. Utilizing a small field crew for the existing facilities inventory and condition assessment (approximately 4 people each day) that work together will eliminate potential errors in data collection. All GIS data used in the field will be verified prior to the start of the field survey and field checked for accuracy and completeness. Existing recreation facilities that will be included in the reconnaissance field survey are those included in Tables 2b and 2c of the *Updated Recreation Plan* (May 2016) for South SWP Hydropower FERC Project No. 2426. These tables are comprised of recreation amenities within the Project area as defined in the FERC issued document, *Project Recreation Facilities Tables, and As-Built Site Plan Drawing Guidance* (July 2014).

Analysis

The information gathered by the *Recreation Study* will be evaluated and compared to what is described in the *Updated Recreation Plan* (May 2016). The information will assess the suitability of facilities in terms of meeting the changing needs of recreation users in the Project area. The analysis will include developing existing and projected visitor-use estimates, along with existing and projected demand (including unmet demand) for recreational opportunities and the *Recreation Study* sites listed in section 3.1.4.2 above. The facility inventory assessment data collected will be analyzed to identify short- and long-term improvements needs over the term of the new license. For example, the Existing Facility Accessibility Assessment will be analyzed to determine if potential improvements to existing facilities are needed to improve barrier-free opportunities and if there are opportunities to better conform to current accessibility standards. The Recreation Demand Analysis will provide relevant information about user preferences and needs as related to recreation facilities provided by the Project.

Reporting

Recreation Study results, as well as other existing and relevant information will be included, to the extent completed in the Licensees' ISR, USR, DLA, and FLA.

3.1.11.5 Consistency of Methodology with Generally Accepted Scientific Practices

An inventory of recreation opportunities and facilities, and using existing and collected information during a site visit, is consistent with generally accepted practices employed during hydroelectric relicensing proceedings in California including Bucks Creek (FERC Project No. 619) and Southern California Edison's Big Creek Hydroelectric Project (FERC Project No. 2175). Evaluating outdoor recreation facilities per the Architectural Barriers Act Accessibility Guidelines is a common technique to establish the level of accessibility at outdoor recreation areas and recreation facilities on NFS lands.

3.1.11.6 Schedule

The *Recreation Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *Recreation Study*.

Fieldwork Preparation	June 2017
Fieldwork	June 2017 – September 2017
Data QA/QC Review	October 2017 – February 2018
Data Analysis and Reporting	February 2018 – June 2018

3.1.11.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Recreation Study* will range between \$399,000 and \$532,000.

3.1.11.8 References

- DWR and LADWP. August 2016. PAD. South SWP Hydropower. FERC Project No. 2426
- DWR. May 2016. Updated Recreation Plan. South SWP Hydropower. FERC Project No. 2426
- FERC 2014, Project Recreation Facilities Tables, and As-Built Site Plan Drawing Guidance.
- Shelby, B. and T.A. Heberlein. 1986. Carrying Capacity in Recreation Settings. Oregon State University Press. Corvallis, OR.
- United States Access Board. Architectural Barriers Act Standards Chapter 10: Recreation Facilities. <<https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/aba-standards/chapter-10-recreation-facilities>>

USFS. Accessibility documents: Forest Service Outdoor Recreation Accessibility Guidelines and Forest Service Trail Accessibility Guidelines.
<<http://www.fs.fed.us/recreation/programs/accessibility/>>

3.1.12 Cultural Resources Study

3.1.12.1 Project Nexus

Continued Project O&M and Project-related recreation activities have potential to affect cultural resources. For the purpose of this *Cultural Resources Study*, “cultural resource” refers to any prehistoric or historic district, site, building, structure, or object, regardless of its National Register of Historic Places (NRHP) eligibility.

This *Cultural Resources Study* does not address ethnographic or traditional cultural properties (TCP) resources, which are addressed in the *Tribal Resources Study*, a separate study being undertaken as part of this relicensing effort.

3.1.12.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding cultural resources within the proposed Project boundary is provided in Section 4.11 of the Licensees’ PAD. As a summary, the Licensees reviewed approximately 100 previous cultural resources investigations and other documents.

The majority of cultural resources investigations within the proposed Project boundary were performed more than ten years ago. Professional standards may change over time, as may site and field conditions. This *Cultural Resources Study* includes a field survey, because the existing and relevant information indicates that the lands within the proposed Project boundary may contain both prehistoric and historic built cultural resources, as well as potentially undocumented cultural resources.

3.1.12.3 Study Goals and Objectives

The goal of the *Cultural Resources Study* is to determine if continued Project O&M and Project-related recreation could affect cultural resources that have not been previously evaluated for the NRHP, or that are already listed on or eligible for listing on the NRHP. Under 36 Code of Federal Regulations (C.F.R.) Section (§) 800.16(l)(1), “historic properties” are defined as prehistoric or historic sites, buildings, structures, objects, districts, or properties of traditional religious and cultural importance that are included in, or eligible for inclusion in, the NRHP. Historic properties are identified through a process of evaluation against specific criteria found at 36 C.F.R. § 60.4.

The objective of this *Cultural Resources Study* is to gather sufficient information necessary to fill recognized information gaps to help determine if continued Project O&M and Project-related recreation could affect cultural resources.

This *Cultural Resources Study* does not include NHPA Section 106 informal consultation with the State Historic Preservation Officer (SHPO), Native American

tribes, BLM, or the USFS. Nevertheless, the Licensees will make every effort to assure the study area for the *Cultural Resources Study* described below and the NHPA Section 106 Area of Potential Effect (APE) are the same. Nor does this *Cultural Resources Study* include tribal consultation under California Assembly Bill (AB) 52. Consultations required under Section 106 and AB 52 will be conducted outside of this *Cultural Resources Study*.

3.1.12.4 Study Methods

Study Area

The study area for the *Cultural Resources Study* generally consists of the area within the proposed Project boundary, as defined by the known or potential locations of Project O&M (including direct and indirect disturbances) and Project facilities and features, including dams, spillways, powerhouses, recreation areas, transmission lines, access roads, staging areas, and other appurtenant facilities. However, in specific areas the study area for the *Cultural Resources Study* will be expanded outside of the proposed Project boundary where continued Project O&M and Project-related recreation might affect cultural resources. The *Cultural Resources Study* excludes lands overlying the Angeles Tunnel on which the Licensees do not perform any Project-related activities. The study area for the *Cultural Resources Study* is shown in Figure 3.1-19.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Cultural Resources Study* will begin after FERC issues its Study Plan determination.
- The *Cultural Resources Study* does not include the development of requirements for the new license, which will be addressed outside the Study.
- The *Cultural Resources Study* focuses specifically on the resources addressed by the study within the proposed Project boundary, but where necessary to evaluate a resource, the study area for the *Cultural Resources Study* may be modified to extend beyond the proposed Project boundary.
- If required for the performance of the *Cultural Resources Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the *Cultural Resources Study*. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Cultural Resources Study* (i.e., Archaeological

Resources Protection Act permits to survey NFS lands and necessary permits from BLM to survey on BLM lands).

- Field crews may make variances to the *Cultural Resources Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *Cultural Resources Study* will be noted in the data resulting from the *Cultural Resources Study*.

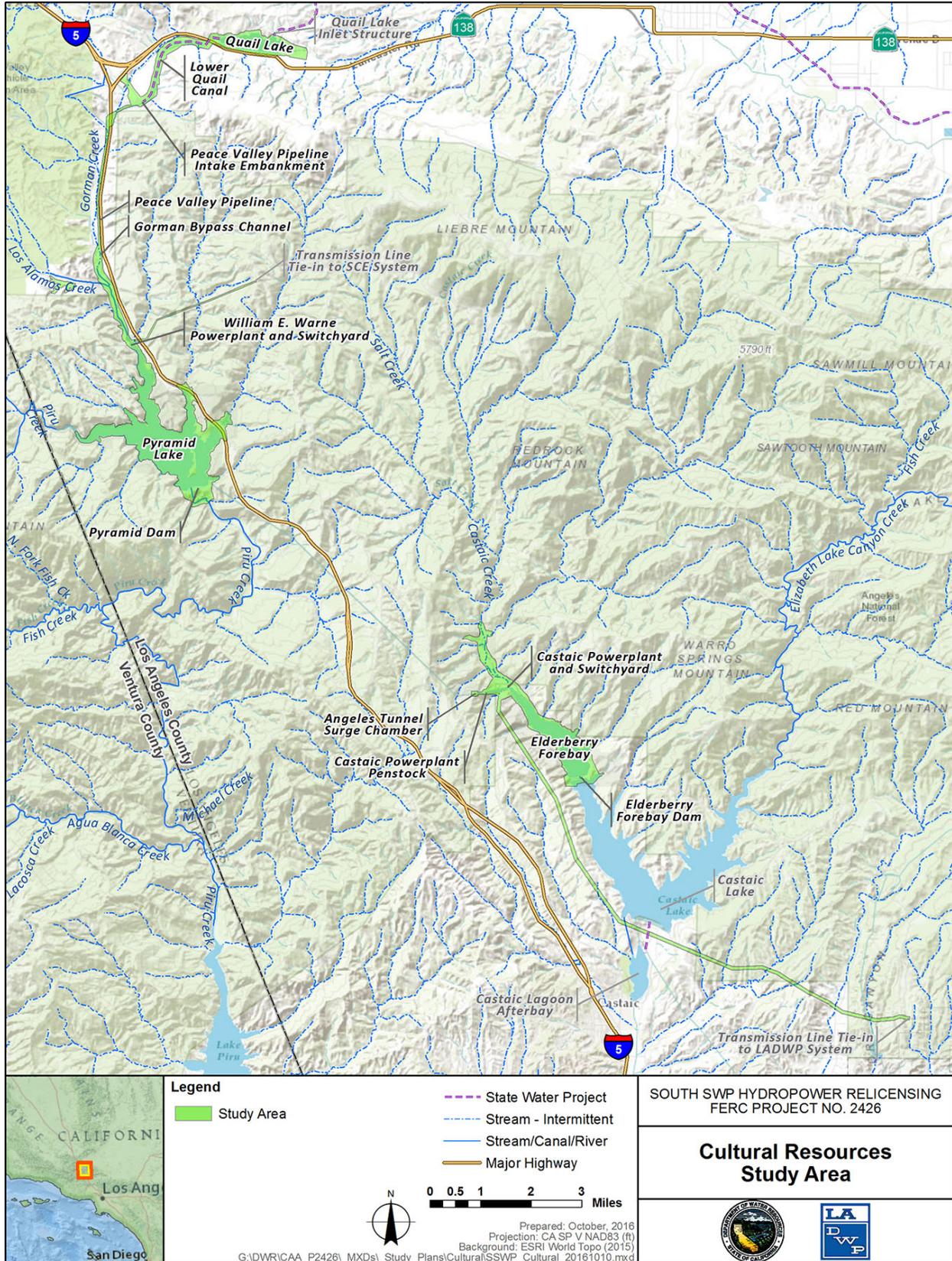


Figure 3.1-19. Cultural Resources Study Area

Methods

The *Cultural Resources Study* will consist of three steps: (1) perform archival research; (2) conduct field survey and identify resources; and (3) identify and assess potential Project effects on identified cultural resources. These steps are described below.

Step 1 – Perform Archival Research. Additional archival research will be conducted under this *Cultural Resources Study*. Appropriate repositories to be visited during this effort may include those listed below as well as other sources as they are identified during the *Cultural Resources Study* to obtain additional information specific to cultural resources in the study area for the *Cultural Resources Study*. The results of the archival research will serve as the basis for preparing the prehistoric and historic contexts against which cultural resources identified during the *Cultural Resources Study* may be understood and will provide detailed background information for the field survey portion of this Study.

Potential places, repositories, or other sources that may provide relevant background information include:

- Oral histories, as applicable
- California State Library, California Room
- Local historical societies
- Local museums
- Local universities and college libraries including the South Central Coastal Information Center at California State University, Fullerton
- Federal, state, or local agency documents not accessed during the PAD data gathering

Step 2 – Conduct Field Survey and Identify Resources

Archaeological Field Survey

Following completion of Step 1, the Licensees will conduct a field survey to verify locations of previously recorded cultural resources and to identify previously unknown cultural resources, if present, in the study area for the *Cultural Resources Study*. This will be completed by examining all accessible lands within the study area for the *Cultural Resources Study*. Locations within the study area for the *Cultural Resources Study* that cannot be accessed in a safe manner (e.g., locations containing dense vegetation or unsafe slopes) and areas inundated when the surveys are performed, will not be surveyed; these areas will be identified in the *Cultural Resources Study* report and an explanation for survey exclusion will be provided. The field survey and recording of cultural resources will follow the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (NPS 1983) and the State of California Office

of Historic Preservation (OHP) publication *Instructions for Recording Historical Resources* (OHP 1995).

Field methods will include crew members walking parallel transects spaced 15-20 meters apart. In areas containing moderately dense vegetation or moderately steep terrain, the survey strategy may employ 20- to 40-meter transects. All topographical features encountered in moderate areas and considered to be sensitive for cultural resources (e.g., springs and drainages) will be thoroughly inspected. Lands typically inundated by the Project reservoirs that become accessible during the survey season as a result of normal reservoir drawdown or other O&M activities will be surveyed when feasible. Although the reservoirs are normally kept at or close to full pool, drawdowns happen occasionally for maintenance and other purposes. To the extent possible and to take advantage of low water levels during drawdowns, the field surveys of the reservoirs will be scheduled to occur as close to the periods of low reservoir levels as possible. Additionally, each site identified during the *Cultural Resources Study* will be assessed for potential Project-related effects including, but not limited to, water fluctuation, wave action, and vegetation management activities. The areas examined during the field survey will be plotted onto the appropriate USGS 1:24,000 scale topographic maps. The Licensees will not collect artifacts during the survey. All encountered artifacts will be left in place, diagnostic artifact locations will be documented using a GPS receiver with sub-meter accuracy, or if diagnostic artifacts are concentrated within certain locations of the study area for the *Cultural Resources Study*, the artifact concentrations and overall site areas will be documented as described below. The GPS data will be based on the North American Datum of 1983 and utilize the Universal Transverse Mercator system. No subsurface testing will be conducted as part of this study at this time. Additional fieldwork and evaluation procedures may be required based on coordination with Native American tribes, FERC and SHPO.

Locations of previously recorded cultural resources will be verified and the sites updated or re-recorded if their existing site records or other documentation do not meet current OHP standards for recording resources (OHP 1995), or if the condition and/or integrity of the cultural resource has changed since its previous recording.

Newly discovered cultural resources, including isolated finds, will be fully documented on State of California Department of Parks and Recreation 523 Forms A-L following the procedures outlined in the *Instructions for Recording Historical Resources* (OHP 1995). A sketch map will be drawn to-scale for re-documented archaeological sites, if needed, and for newly discovered sites. Sites, historic built resources, and isolates will be photographed using digital color photography. The locations of archaeological sites, historic built resources, and isolates documented during the field survey will be plotted onto the appropriate USGS 1:24,000 scale topographic map by hand at the time of discovery, and the locations recorded using a GPS receiver.

All resource locations are considered to be confidential and will only be included in Privileged documents provided on a need-to-know basis (e.g., FERC, tribes, USFS, BLM, and SHPO).

Built Environment Inventory

A field inspection and documentation of historic built-environment resources (i.e., buildings and structures 45 years in age and older) located within the study area for the *Cultural Resources Study* will be conducted. Historic built-environment resources will be recorded or re-recorded to meet current OHP standards for documentation (OHP 1995). This will include digital color photography and sketch maps of individual features that show the relationship between buildings and structures. The historic built environment resources within the proposed Project boundary identified during the *Cultural Resources Study* will be assessed together when evaluating multiple built resources is necessary to assess their importance.

Step 3 – Identify and Assess Potential Project Effects on Identified Cultural Resources.

During Step 2, the Licensees will document any potential Project-related effects to cultural resources identified in the study area for the *Cultural Resources Study*. This information will be analyzed in Step 3 to determine whether any unevaluated or NRHP listed or eligible resources are being affected, thereby informing the need to conduct NRHP evaluations that may occur under the NHPA Section 106 consultation that will be completed subsequent to this study.

Quality Assurance and Quality Control

Field data gathered during this *Cultural Resources Study* will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures including checking field data for accuracy and completeness. Data gathering during the field survey will be overseen by qualified archaeologists and architectural historians who meet the Secretary of the Interior's Qualification Standards to ensure that data gathering techniques, documentation, and other efforts meet current professional standards. Cultural resources specialists will provide oversight and reviews of cultural resources document preparation.

Analysis of Potential Project Effects

The data gathered during this *Cultural Resources Study* will be compiled and summarized for incorporation into the DLA and FLA. The results of the *Cultural Resources Study* will be used to determine whether Project O&M or Project-related recreational activities are affecting any identified cultural resources in the study area for the *Cultural Resources Study*; to identify the need for NRHP evaluations of affected, unevaluated resources; and to determine if there is a need to implement treatment to mitigate potential Project effects on NRHP-eligible or listed properties.

Reporting

Cultural Resources Study results, as well as other existing and relevant information will be included, to the extent completed and Public, in the Licensees' ISR, USR, DLA and FLA. In addition, the Licensees will prepare a Privileged report that includes the following sections: (1) Study Goals and Objectives; (2) Methods; and (3) Results. The privileged report will include documentation that clearly depicts the following on USGS

1:24,000 topographic maps: the area examined; current inventory coverage in the areas surveyed; and intensity of the survey coverage. The report will contain sensitive, confidential, and privileged information. As such, the report will only be distributed to interested tribes (tribes will be notified of Native-American-related artifacts only), FERC, USFS, BLM, and SHPO for review and comment as part of the NHPA Section 106 consultation process that will be conducted by the Licensees outside of this Cultural Resources Study. Following that review, the report will be filed with FERC as Privileged.

3.1.12.5 Consistency of Methodology with Generally Accepted Scientific Practices

This Cultural Resources Study is consistent with the goals, objectives, and methods outlined for the most recent FERC hydroelectric relicensing efforts in California, including the Don Pedro Project (FERC No. 2299), the Yuba River Development Project (FERC No. 2246), and the Merced River Hydroelectric Project (FERC No. 2174). The methods are consistent with the Advisory Council for Historic Preservation's (ACHP) guidelines (ACHP 2007).

3.1.12.6 Schedule

The Licensees anticipate scheduling field surveys at a time when the weather permits. Surveys in the area below the NMWSE of the Project reservoirs will be scheduled to make use of, to the extent possible, normal drawdowns and low water levels. The Licensees anticipate the schedule below will be followed to complete the study.

Fieldwork Preparation	June 2017
Fieldwork	June 2017 – July 2017
Data QA/QC	August 2017 – June 2018
Data Analysis and Reporting	July 2018 – December 2018

3.1.12.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this Cultural Resources Study will range between \$387,000 and \$516,000.

3.1.12.8 References

- Advisory Council on Historic Preservation. 2007. Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Object. Washington, D.C.
- NPS. 1983. Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines in the Federal Register, September 29, 1983 (48 FR 44716). Department of the Interior, Washington, D.C.
- OHP. 1995. Instructions for Recording Historical Resources. Sacramento, CA.

3.1.13 Tribal Resources Study

3.1.13.1 Project Nexus

Continued Project O&M and Project-related recreation activities have potential to affect tribal resources. For the purpose of this Tribal Resources Study, tribal resources include Indian Trust Assets (ITA), TCPs, and other potential resources and interests important to Indian tribes (e.g., ethnographic sites, economic interests and other tribal cultural interests). Agreements that may exist between tribes and other entities may be useful in identifying potentially undocumented tribal resources. Each of these tribal resources has the potential to be a historic property. Historic properties are defined under 36 C.F.R. § 800.16(l) as any prehistoric or historic sites, buildings, structures, objects, districts, or properties of traditional religious and cultural importance that are included in, or eligible for inclusion in, the NRHP. This *Tribal Resources Study* does not address other cultural resources, which are addressed in the *Cultural Resources Study*, a separate relicensing study.

3.1.13.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding tribal resources within the proposed Project boundary is provided in Section 4.13 of the Licensees' PAD. As a summary, the Licensees identified approximately 100 previous cultural resources investigations and other documentation, of which 41 previous studies occurred directly within the proposed Project boundary. None of the previous studies identified any TCPs, ITAs, sacred lands, Indian reservations, or tribal agreements that pertain to Indian tribal land use within the proposed Project boundary. Previous studies did not include ethnographic or TCP investigations. A list of potentially interested tribes is provided below in Table 3.1-6.

This *Tribal Resources Study* will augment existing, relevant, and reasonably available information by providing current information regarding Indian tribal interests and resources that could be affected by the Project.

Table 3.1-6. Tribal Contacts Provided by the Native American Heritage Commission and FERC

Barbareno/Ventureno Band of Mission Indians Raudel Joe Banuelos, Jr. 331 Mira Flores Court Chumash Camarillo, CA 93012	Barbareno/Ventureno Band of Mission Indians Kathleen Pappo 2762 Vista Mesa Drive Rancho Pales Verdes, CA 90275
Barbareno/Ventureno Band of Mission Indians Julie Lynn Tumamait-Stenslie, Chair 365 North Poli Avenue Ojai, CA 93023	Coastal Band of the Chumash Nation Michael Cordero, Chairperson P.O. Box 4464 Santa Barbara, CA 93140
Fernandeno Tataviam Band of Mission Indians Rudy Ortega Jr., President 1019 2nd Street San Fernando CA 91403	Gabrielino Band of Mission Indians - Kizh Nation Andrew Salas, Chairperson P.O. Box 393 Covina, CA 91723
Gabrielino Tongva Indians of California Tribal Council Robert F. Dorame, Tribal Chair/Cultural Resources P.O. Box 490 Bellflower, CA 90707	Gabrielino/Tongva Nation Sam Dunlap, Cultural Resources Director P.O. Box 86908 Los Angeles, CA 90086
Gabrielino/Tongva Nation Sandonne Goad, Chairperson 106 1/2 Judge John Aiso Street Los Angeles, CA 90012	Gabrielino/Tongva San Gabriel Band of Mission Indian Anthony Morales, Chairperson P.O. Box 693 San Gabriel, CA 91778
Gabrielino-Tongva Tribe Bernie Acuna, Co-Chairperson 1999 Avenue of the Stars, Suite 1100 Los Angeles, CA 90067	Gabrielino-Tongva Tribe Conrad Acuna 1999 Avenue of the Stars, Suite 1100 Los Angeles, CA 90067
Gabrielino-Tongva Tribe Linda Candelana, Co-Chairperson 1999 Avenue of the Stars, Suite 1100 Los Angeles, CA 90067	Randy Guzman-Folkes 4676 Walnut Avenue Simi Valley, CA 93063
LA City/County Native American Indian Commission Ron Andrade, Director 3175 West 6th Street, Rm. 403 Los Angeles, CA 90020	Melissa M. Parra-Hernandez 119 North Balsam Street Oxnard, CA 93030
PeuYoKo Perez 5501 Stanford Street Ventura, CA 93003	Carol A. Pulido 165 Mountain View Street Oak View, CA 93022
San Fernando Band of Mission Indians John Valenzuela, Chairperson P.O. Box 221838 Newhall, CA 91322	Patrick Tumamait 992 El Camino Corte Ojai, CA 93023

Table 3.1-6. Tribal Contacts Provided by the Native American Heritage Commission and FERC (continued)

Tongva Ancestral Territorial Tribal Nation John Tommy Rosas, Tribal Admin. 712 Admiralty Way, Suite 172 Marina Del Rey, CA 90292	Tejon Indian Tribe Octavio Escobedo, Tribal Chair 1731 Hasti Drive, #108 Bakersfield, CA 93309
Kern Valley Indian Council Robert Robinson, Co-Chairperson P.O. Box 401 Weldon , CA 93283	Kitanemuk & Yowlumne Tejon Indians Delia Dominguez, Chairperson 115 Radio Street Bakersfield , CA 93305

¹*Santa Ynez Band of Chumash Indians was included in the Native American Heritage Commission's list of contacts but declined FERC's invitation to participate in the relicensing and is, therefore, not included in Table 3.1-6 (FERC 2016).*

3.1.13.3 Study Goals and Objectives

The goal of the *Tribal Resources Study* is to identify resources and interests important to Indian tribes within the proposed Project boundary and identify continued Project O&M and Project-related recreation activities that may potentially affect these tribal resources and interests.

The objective of this *Tribal Resources Study* is to gather sufficient data necessary to fill recognized information gaps using current field and research methods to identify tribal resources.

This *Tribal Resources Study* focuses only on obtaining the information necessary to meet the *Tribal Resources Study* goal. NHPA Section 106 consultation will be conducted outside of this *Tribal Resources Study*, and it will involve consultation with Native American tribes, SHPO, and the USFS including the ANF and the LPNF, and other potentially interested parties outside of this *Tribal Resources Study*.

3.1.13.4 Study Methods

Study Area

The study area for the *Tribal Resources Study* consists of the area within the proposed Project boundary, as defined by the known or potential locations of Project O&M (including direct and indirect disturbances) and Project facilities and features. This study does not include lands overlying the Angeles Tunnel on which the Licensees do not perform any Project O&M activities. The study area for the *Tribal Resources Study* is shown below in Figure 3.1-20.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Tribal Resources Study* will begin after FERC issues its Study Plan determination.

- The *Tribal Resources Study* does not include the development of requirements for the new license, which will be addressed outside of the *Tribal Resources Study*.
- This *Tribal Resources Study* focuses specifically on tribal resources within the proposed Project boundary, but where necessary to evaluate a resource, the study area for the *Tribal Resources Study* may be modified to extend beyond the proposed Project boundary.
- If required for the performance of the *Tribal Resources Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the *Tribal Resources Study*. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Tribal Resources Study*.
- Field crews may make variances to the *Tribal Resources Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the *Tribal Resources Study* will be noted in the data resulting from the *Tribal Resources Study*.

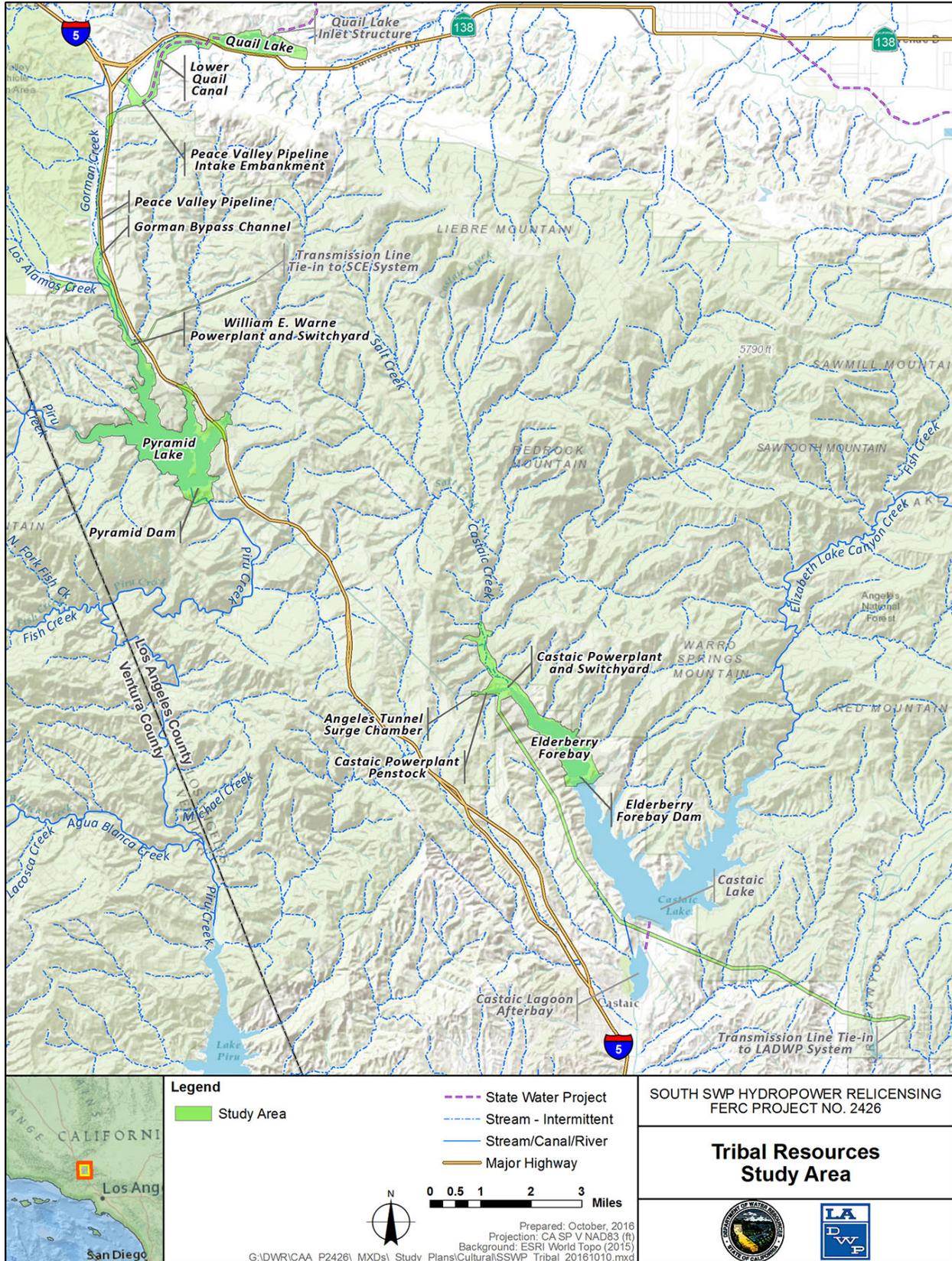


Figure 3.1-20. Tribal Resources Study Area

Methods

The *Tribal Resources Study* will consist of three steps: (1) perform archival research; (2) consult with Indian tribes and identify resources; and (3) conduct site visits. Each of these steps is described below.

Step 1 – Perform Archival Research. The Licensees will augment existing, relevant, and reasonably available information described in the PAD by additional archival research at:

- University of California, Berkeley, the Bancroft Library
- California State Library, California Room
- South Central Coastal Information Center, California State University, Fullerton
- National Archives and Records Administration, Pacific Region, San Francisco
- National Park Service Preservation Brief 36
- Phoebe Hearst Museum of Anthropology
- Other appropriate repositories identified during the research

Step 2 – Consult with Indian Tribes and Identify Resources. Following the ethnographic literature review discussed in Step 1, the Licensees will identify potential tribal resources by consulting and interviewing tribal representatives. Consultation, fieldwork, and potential tribal resources documentation will be consistent with National Register Bulletin No. 38, *Guidelines for Evaluating and Documenting Identification of Traditional Cultural Properties* (Parker and King 1998).

In order to facilitate tribal consultation, the Licensees will retain a qualified, professional ethnographer. The Licensees will coordinate selection of the ethnographer with interested tribes.

This *Tribal Resources Study* will include contacting the tribal representatives identified above in Table 3.1-6.

The Licensees and the ethnographer will coordinate with tribal representatives (i.e., tribal chairs, or his or her delegate, as directed by the tribal chairs) to define the scope and breadth of interviews. The ethnographer will arrange for interviews with identified tribal representatives to establish times and locations acceptable to the tribal representatives. If necessary, the Licensees will arrange for an initial introductory meeting between the Licensees, tribal representatives, and the ethnographer.

Interviews with tribal representatives may be conducted on a one-on-one basis with the ethnographer and the Licensees. The oral traditions and information collected during

the interviews will be used to help define potential tribal resources in the study area for the *Tribal Resources Study*.

If a participating tribe does not wish to disclose the locations of potential tribal resources, the Licensees and the ethnographer will work with the tribe to identify the general issues and concerns that the tribe may have regarding potential impacts of the Project upon resources identified by the tribe.

Step 3 – Conduct Site Visits. Tribal representatives, or a physically capable designated tribal representative, the Licensees' ethnographer, and the Licensees' cultural resources specialist may visit cultural resource sites (i.e., locations containing artifacts, features, or other physical remains from past human activities) identified during this *Tribal Resources Study* or during the *Licensees Cultural Resources Study*. The purpose of the visit will be to provide tribal representatives the opportunity to examine any sites of tribal interest that were encountered during the *Cultural Resources Study* fieldwork, and to enable the ethnographer to obtain additional information on potential tribal resources that may be associated with the sites. The Licensees and the Licensees' ethnographer will cooperatively make a reasonable effort to reach out to interested tribes to invite participation in *Tribal Resources Study* site visits by calling, sending letters by way of the United States Postal Service, or through electronic mail to the tribal chair or his or her designee. If any ethnographic sites (e.g., locations of tribal resources or activities that may or may not contain the physical remains from past or present activities) are identified during background research, tribal representatives may also wish to visit those locations. Depending on the tribes' wishes, the ethnographer may also visit the ethnographic sites.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures including checking field data for accuracy and completeness. The Licensees' ethnographer will meet the Secretary of the Interior's Qualification Standards (Parker and King 1998) to ensure that data gathering techniques, documentation, and other efforts meet current professional standards.

Analysis

The Licensees will identify any continued Project O&M and Project-related recreation activities that have a potential to affect tribal resources documented during the *Tribal Resources Study* survey.

Reporting

Tribal Resources Study results, as well as other existing and relevant information will be included, to the extent completed, in the Licensees' ISR, USR, DLA and FLA. The Licensees will also prepare a Privileged report at the conclusion of the *Tribal Resources Study* that includes the following sections: (1) *Tribal Resources Study* Goals and Objectives; (2) Methods; (3) Results, and, if potential tribal resources are identified; and (4) Evaluation of Identified Resources following National Register Bulletin No. 38,

Guidelines for Evaluating and Documenting Identification of Traditional Cultural Properties (Parker and King 1998). The Privileged report will contain sensitive, confidential information. As such, the report will have restricted distribution and will only be distributed on a need to know basis. As part of the NHPA Section 106 consultation process that will be conducted by the Licensees outside of this *Tribal Resources Study*, the draft Privileged report will be provided to the tribes for a 30-day review and comment period, and then to SHPO for concurrence. If the potential information affects National Forest System lands, the report will also be distributed to ANF and LPNF for review and comment. The final report will be filed with FERC as Privileged. With the tribe's approval, a copy of the final report will be filed with the South Central Coastal Information Center.

3.1.13.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *Tribal Resources Study* is consistent with the goals, objectives, and methods outlined for the most recent FERC hydroelectric relicensing efforts in California, including the Don Pedro Project (FERC No. 2299), the Yuba River Development Project (FERC No. 2246), and the Merced River Hydroelectric Project (FERC No. 2174) relicensing. The methods are consistent with the ACHP's guidelines.

3.1.13.6 Schedule

The *Tribal Resources Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *Tribal Resources Study*.

Fieldwork Preparation	June 2017
Fieldwork	June 2017 – April 2018
Data QA/QC	April 2018 – May 2018
Data Analysis and Reporting	May 2018 – October 2018

3.1.13.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Tribal Resources Study* will range between \$141,000 and \$188,000.

3.1.13.8 References

- FERC. 2016. Tribal Consultation Contact with the Santa Ynez Band of Chumash Indians Regarding the Relicensing of the South SWP Hydropower Project. Telephone memo filed in FERC's electronic Public Files on August 22, 2016
- Parker, Patricia L., and Thomas F. King. 1998. *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. Revised. National Register Bulletin 38. United States Department of the Interior, National Park Service, National Register, History, and Education Division, Washington, D.C.

3.1.14 Indicators of Hydrologic Alteration Study

3.1.14.1 Project Nexus

Continued Project O&M activities have the potential to affect flow in the Pyramid reach downstream of Pyramid Dam.

3.1.14.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding flow control devices in Pyramid Dam are described in Section 3.2.2.2 of the Licensees' PAD. As a summary, water can flow out of Pyramid Lake into the Pyramid reach through one or more Project structures. These include: (1) a Pyramid Dam gate-controlled spillway; (2) a Pyramid Dam uncontrolled emergency spillway; (3) a Pyramid Dam low-level outlet; and (4) seepage through, under, or around Pyramid Dam. All of the structures deliver water to the Pyramid reach within the first few hundred feet of Piru Creek below Pyramid Dam.

Existing, relevant, and reasonably available information regarding flow in the Pyramid reach immediately downstream of Pyramid Dam is described in Section 3.2.3.5 of the Licensees' PAD. In general, daily average flows are highest in the winter and spring months, with median flows between approximately 10 and 100 cubic feet per second (cfs). Daily average flows are lowest in summer, with median average daily flows of approximately 5 cfs. Median average daily flows have been recorded as high as 8,000 cfs in spring and as high as approximately 80 cfs in summer (see Figure 3.2-17 in PAD).

This *IHA Study* will develop statistics comparing daily average flows in the Pyramid reach under With-Project conditions and Without-Project conditions.

3.1.14.3 Study Goals and Objectives

The goal of this *IHA Study* is to compare various metrics of hydrologic alteration to assess how the Project alters Without-Project flows. The objective of the *IHA Study* is to gather sufficient data necessary to fill recognized gaps in existing information including the development of flow metrics and statistics for analyzing With-Project and Without-Project flows.

3.1.14.4 Study Methods

Study Area

The study area for the *IHA Study* will consist of Pyramid reach shown in Figure 3.1-21. Specifically, flow statistics will be developed for a single location in the Pyramid reach immediately downstream of where the Pyramid Dam spillway enters Pyramid reach. In this way, flows from the Pyramid Dam spillway, low-level outlet, and dam seepage will be accounted for in the Study.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *IHA Study* will begin after FERC issues its Study Plan determination.
- The *IHA Study* does not include the development of requirements for the new license, which will be addressed outside the *IHA Study*.
- The *IHA Study* focuses specifically on flow in the Pyramid reach below Pyramid Dam, and the study area *IHA Study* is specific to that resource.
- If required for the performance of the *IHA Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the *IHA Study*. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *IHA Study*.
- Field crews may make variances to the *IHA Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances in the *IHA Study* will be noted in the data resulting from the *IHA Study*.

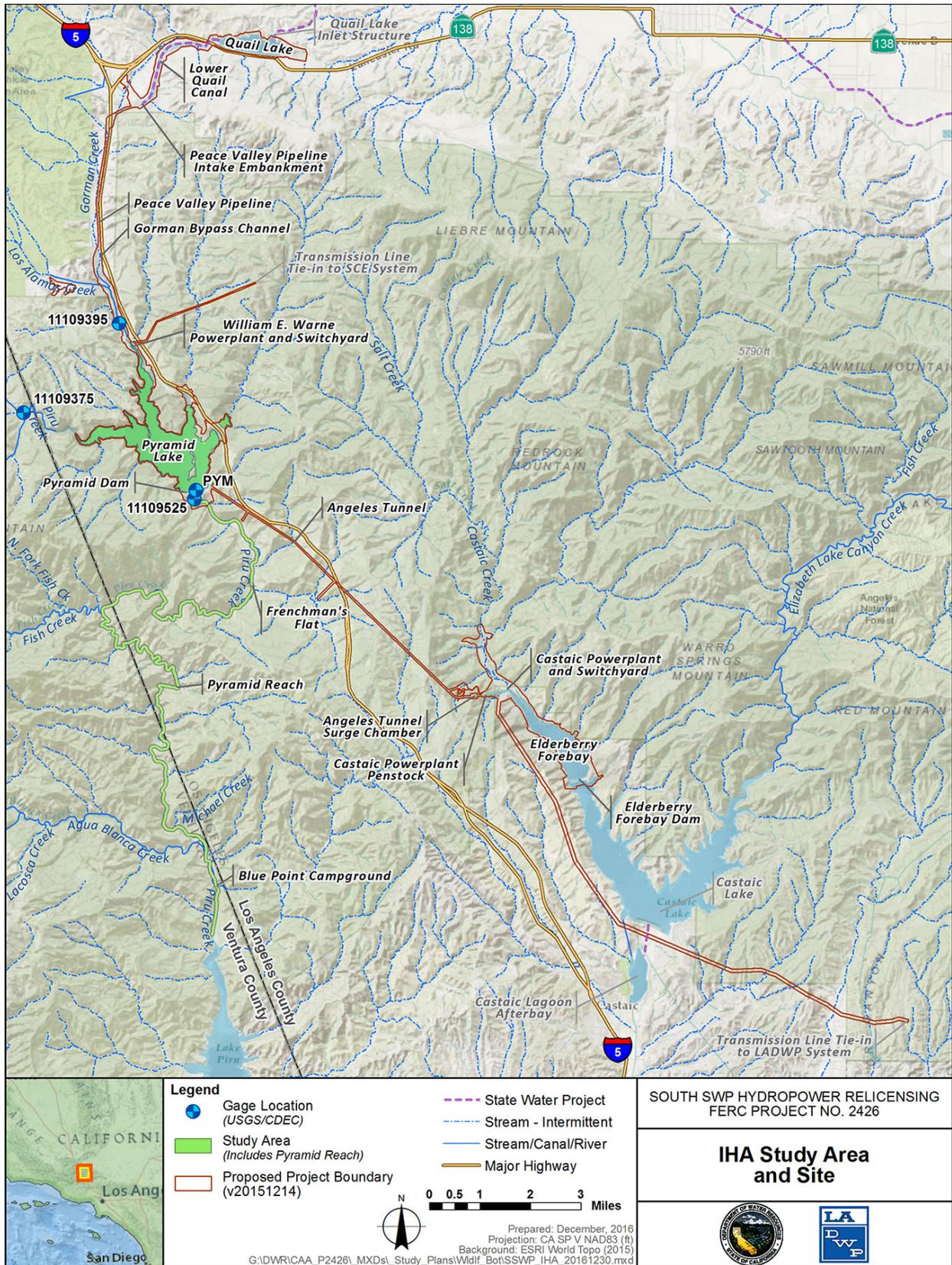


Figure 3.1-21. IHA Study Area and Site

Methods

This *IHA Study* will consist of three steps: (1) develop With-Project and Without-Project hydrology records; (2) conduct the ramping rate analysis; and (3) conduct the IHA analysis. These steps are described below.

Step 1 – Develop With-Project and Without-Project Hydrology Records. The Licensees will develop With-Project and Without-Project daily average flow hydrology from the years 2006 through 2016. The Licensees selected this period based on the availability of gaged data during this time, as described below, and because the Licensees began operating to the Article 52 “natural hydrology” beginning in 2006.

The With-Project hydrology record will be developed from USGS gage 11109525 (Piru Creek below Pyramid Lake, near Gorman, CA), which is located in the Pyramid reach immediately downstream of Pyramid Dam (Figure 3.1-21). The gage record of daily average flows extends from March 1972 through the present, and 15-minute and hourly flow data are available for the last seven years of the record. If any average daily flows are missing from the gaged record from the years 2006 through 2016, the Licensees will complete the record for those data using standard hydrology techniques, for example:

- Use historical flows for the same gage from another period that had similar conditions as the one with the missing data;
- Scale historical flows from a nearby gage for the same period of record by the ratio of contributing watershed sizes;
- Interpolate between available data for the gage with missing data.

The Without-Project hydrology record will be developed using the following gages:

- USGS gage 11109375 (Piru Creek below Buck Creek, near Pyramid Lake, CA), which is located in Piru Creek upstream of the NMWSE of Pyramid Lake (Figure 3.1-21). The gage record of daily average flows extends from October 1976 through the present, and 15-minute or hourly flow data are available for the last seven years of the record.
- USGS gage 11109395 (Cañada de Los Alamos above Pyramid Lake, CA), which is located on Gorman Creek upstream of the NMWSE of Pyramid Lake and the Warne Powerplant (Figure 3.1-21). The gage record of daily average flows extends from October 1976 through the present, and 15-minute or hourly flow data are available for the last seven years of the record.
- DWR gage PYM (Pyramid), which measures reservoir elevation and storage in Pyramid Lake (Figure 3.1-21). The gage record of daily average reservoir stage and storage extends from the year 2000 through the present, and 15-minute or hourly flow data are available for the last seven years of the record.

If any data are missing from the above records from the years 2006 through 2016, the Licensees will complete the records for those data using standard hydrology techniques.

Step 2 – Conduct Ramping Rate Analysis. The Licensees will select up to seven events from the year 2006 through year 2016, when the Licensees were making releases into Pyramid reach in an effort to reflect representative changes in flows into Pyramid Lake. The selection of these seven events will be contingent upon the Licensees having 15-minute or hourly flow data at both USGS gage 11109525 and USGS gage 11109375 for the events selected. For each event, the Licensees will plot the 15-minute or hourly flow changes at both gages on one figure.

Step 3 – Conduct the IHA Analysis. In order to compare the With-Project and Without-Project hydrologic records, using daily average flow data, flow characteristics will be computed and comparison tables will be prepared. The IHA methodology will be applied (Richter et al. 1996). Richter suggests that the hydrologic attributes of a stream can be described by five fundamental groups of statistics. The five groups are:

- Group #1: Magnitude of monthly water conditions
- Group #2: Magnitude and duration of annual extreme water conditions
- Group #3: Timing of annual extreme water conditions
- Group #4: Frequency and duration of high and low flow pulses
- Group #5: Rate and frequency of change in water conditions

Statistics will be computed for the five IHA groups using IHA Version 7.1, a software package developed by Totten Software Design and Smythe Scientific Software (The Nature Conservancy, 2007). The statistics will be computed for the entire year 2006 through year 2016 period.

Quality Assurance and Quality Control

All data, including both input data and output data, will be developed and analyzed in a manner that promotes high quality results and will be subject to appropriate QA/QC procedures. Data will be entered into and organized in both Microsoft Excel and Hydrologic Engineering Center Data Storage System formats, where applicable. IHA data will be presented in its standard IHA output format.

Analysis

The Licensees will compare the changes in ramping rates and compare IHA statistics between the With-Project and Without-Project conditions. If any significant differences occur, the Licensees will review operations logs to determine the reason for the differences. If the reason is related to one of the qualifying conditions in Article 52 of the

existing license, the Licensees will so indicate. For clarity, the qualifying conditions, as stated in Article 52, are as follows:

- Natural inflow to Pyramid Lake will be released into Piru Creek at a rate of up to about 18,000 cfs, which is the maximum safe, designed release from Pyramid Dam. The exact maximum safe release depends on the lake surface water elevation at the time of the release.
- Storm releases from Pyramid Dam into Piru Creek may be held back at less than 18,000 cfs if higher releases are deemed a threat to life, safety, or property at Pyramid Dam or downstream of the dam.
- The Licensees may elect to appropriate inflow to Pyramid Lake above the safe release flows under the provisions of its existing water rights.
- Up to 3,150 acre-feet of SWP water would be delivered to United Water Conservation District via the Pyramid reach (from Pyramid Dam) between November 1 and the end of February of each water year. During this period, water deliveries may be made over a period of a few days, ramping flows up and down to simulate the hydrograph of a typical storm event, or they may be released more gradually over a longer period.
- Releases from Pyramid Dam could be increased by up to 50 cfs for short periods to exercise the Pyramid Dam radial gate and stream release valves; test emergency power sources; conduct tests mandated by the Commission; or meet other short-term operational or maintenance requirements. No such testing would take place between March 15 and June 15. Testing would also be avoided to the extent possible between June 16 and July 31. Tests may be conducted at any time between August 1 and March 14, provided that flows do not increase by more than 50 cfs above current base flows during the event and that the event does not last longer than 15 minutes. Scheduled tests requiring larger releases or lasting longer than 15 minutes would require prior notification to the USFWS. Unscheduled releases due to equipment failure or emergency situations must be reported to the USFWS no later than three business days after the event.
- The gaging station on upper Piru Creek (located north of Pyramid Lake) provides 24-hour averages; therefore, instantaneous peak stream releases may be attenuated. Unlike the natural inflow hydrograph, which typically peaks sharply, the stream release hydrograph of Pyramid reach may be attenuated.
- A multiplier is used to account for those portions of Pyramid Lake watershed that are not tributaries of upper Piru Creek and Cañada de Los Alamos upstream of their respective gaging stations. This may result in some deviations for individual storm events due to localized variations in storm water intensity.
- Because of operational constraints, the stream release hydrograph of Pyramid reach would typically gage measured inflow. The valves at Pyramid Dam can be

adjusted for release flows of less than 3 cfs; however, the precise measurement of released flows less than 3 cfs may not be possible due to operational constraints of the dam's gaging instrumentation.

Reporting

IHA Study methods and results will be prepared and included, to the extent completed, in the Licensees' ISR, USR, DLA, and FLA.

3.1.14.5 Consistency of Methodology with Generally Accepted Scientific Practices

The *IHA Study* methods are generally consistent with the methods used for recent FERC hydroelectric relicensing efforts in California, including the Yuba River Development Project (FERC Project No. 2246). Further, IHA is a widely used hydrologic assessment tool and is endorsed by several State and federal agencies.

3.1.14.6 Schedule

The *IHA Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *IHA Study*:

Develop Hydrology	July 2017 – October 2017
Data QA/QC	September 2017
Conduct IHA Analysis	October 2017 – January 2018
Data Analysis and Reporting	February 2018 – May 2018

3.1.14.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *IHA Study* will range between \$20,000 and \$35,000.

3.1.14.8 References

Richter, B.D., J.V. Baumgartner, J. Powell, and D.P. Braun. 1996. A method for assessing hydrologic alteration within ecosystems. *Conservation Biology* 10:1163-1174.

The Nature Conservancy (in collaboration with Totten Software Design and Smythe Scientific Software). 2007. Indicators of Hydrologic Alteration – Version 7 User's Manual. Online document.

3.1.15 Visual Quality Study

3.1.15.1 Project Nexus

Continued Project O&M and Project-related recreation activities have the potential to affect visual quality.

3.1.15.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding the visual quality of the area within the proposed Project boundary is described in Section 4.10 of the Licensees' PAD. Approximately 49 percent of the land within the boundary is NFS lands managed by the USFS as part of the ANF. As a summary, the ANF's Scenic Integrity Objectives (SIO) for NFS lands within the proposed Project boundary are "Moderate" and "High" (SFS 2005a, 2005b). This *Visual Quality Study* will provide information to determine whether the existing visual conditions related to the Project meet ANF's visual direction.

3.1.15.3 Study Goals and Objectives

The goal of this *Visual Quality Study* is to identify any Project facilities or features on NFS lands that do not meet ANF's visual direction. The objective of this *Visual Quality Study* is to gather sufficient data necessary to fill recognized gaps in existing information in order to identify, map, and describe Project facilities and features on NFS lands that could be reasonably viewed by the public, document the existing visual condition of these facilities and features, and determine whether their existing visual conditions meet ANF's visual direction.

3.1.15.4 Study Methods

Study Area

The study area for the *Visual Quality Study* will consist of all Project facilities and features on NFS lands within the proposed Project boundary, and their associated viewsheds. The study area for the *Visual Quality Study* is shown in Figure 3.1-22.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Visual Quality Study* will begin after FERC issues its Study Plan determination.

- The *Visual Quality Study* does not include the development of requirements for the new license, which will be addressed outside the *Visual Quality Study*.
- The *Visual Quality Study* focuses specifically on visual quality on NFS lands within the proposed Project boundary, and the study area for the *Visual Quality Study* is specific to those visual resources.
- If required for the performance of the *Visual Quality Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the *Visual Quality Study*. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Visual Quality Study*.
- Field crews may make variances to the *Visual Quality Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances in the *Visual Quality Study* will be noted in the data resulting from the *Visual Quality Study*.

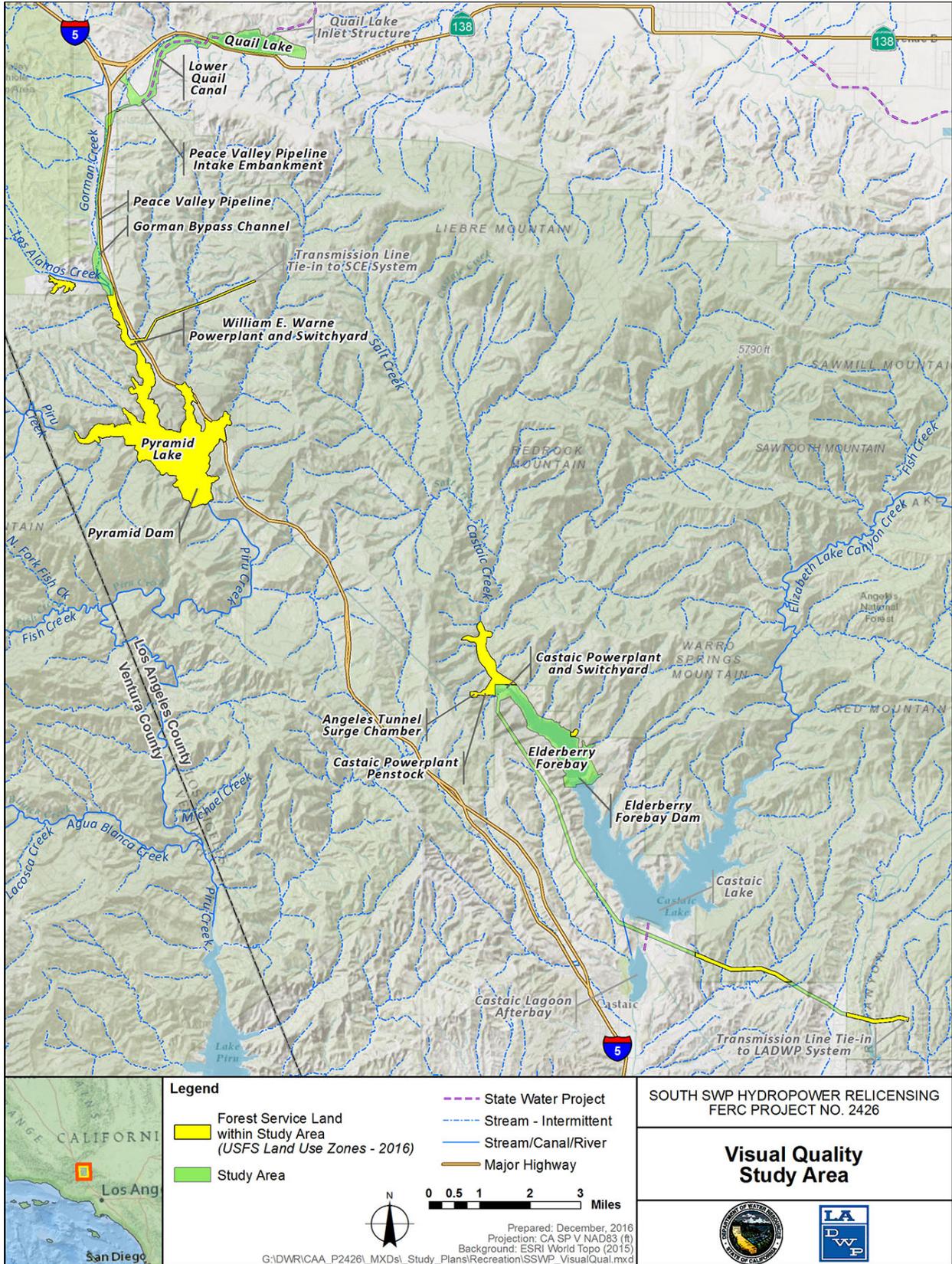


Figure 3.1-22. Visual Quality Study Area

Methods

The *Visual Quality Study* will consist of two steps: (1) identify Project facilities and features to evaluate; and (2) information gathering and mapping. These steps are described below.

Step 1 – Identify Project Facilities and Features to Evaluate. The Licensees will document all existing Project facilities and features within the proposed Project boundary on NFS lands. In consultation with the USFS, the Licensees will identify which facilities and features will be included in the Visual Quality Study.

Step 2 – Information Gathering and Mapping. For the facilities and features that the Licensees and the USFS agree will be included in the Visual Quality Study, the Licensees will perform the following:

- Identify and map all reasonable viewsheds associated with the Project facilities and features identified in Step 1.
- Map and summarize the ANF's SIOs (USFS 2005a, 2005b) potentially related to the Project facilities and features identified in Step 1.
- Identify and summarize the *ANF's Land Management Plan* (USFS 2005a, 2005b) direction associated with the scenic inventories relative to the Project facilities and features identified in Step 1.
- Map the location of the Project facilities and features identified in Step 1 with respect to their associated viewsheds and scenic inventories, including SIOs.
- Summarize variety classes, sensitivity levels, and distance zones in table format.
- Document the existing visual conditions of the Project facilities and features identified in Step 1.
- In consultation with the USFS, identify Key Observation Points (KOP) where photographs will be taken based on the list of Project facilities and features identified in Step 1 using agreed upon photographic protocols. The Licensees will map and describe the location of the KOPs, and take photographs from the KOPs of the Project facilities and features identified in Step 1.

Quality Assurance and Quality Control

All data collected during this *Visual Quality Study* will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures including checking field data for accuracy and completeness.

Analysis

The Licensees will assess the existing visual conditions of the Project facilities and features identified in Step 1, and document whether those conditions meet *ANF Land Management Plan* scenic direction and are consistent with the 1969 MOU between the USFS and DWR regarding construction and operation of the California Aqueduct on NFS lands within the ANF and LPNF (DWR and USFS, 1969). The relevant portions of the MOU include Section III, Protection of Lands, which states: “The Department shall make every reasonable effort to preserve the scenic and aesthetic values of all National Forest System lands occupied or used by the Project as far as possible and consistent with Project development.” Furthermore, MOU Section X, General Considerations, states: “All permanent structures will harmonize with the forest setting. Use of bright colors and reflective surfaces incompatible with the environment will not be authorized.”

Reporting

Visual Quality Study methods and results will be prepared and included, to the extent completed, in the Licensees’ ISR, USR, DLA, and FLA.

3.1.15.5 Consistency of Methodology with Generally Accepted Scientific Practices

The *Visual Quality Study* methods are generally consistent with the methods used for recent FERC hydroelectric relicensing efforts in California, including the Yuba River Development Project (FERC Project No. 2246).

3.1.15.6 Schedule

The *Visual Quality Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the Visual Quality Study:

Fieldwork Preparation	January 2017 – June 2017
Fieldwork	July 2017 – August 2017
Data QA/QC	September 2017
Data Analysis and Reporting	October 2017 – December 2017

3.1.15.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Visual Quality Study* will range between \$25,000 and \$35,000.

3.1.15.8 References

USFS and DWR. 1969. MOU Between the Forest Service, United States Department of Agriculture, and the Department of Water Resources, State of California, for Conduct of Work by the Department During Construction and Subsequent

Operation of the California Aqueduct on the Los Padres and Angeles National Forests.

USFS, Southwest Region. 2005a. Land Management Plan, Part 2, Angeles National Forest.

_____. 2005b. Land Management Plan, Part 3, Design Criteria for Southern California National Forests.

3.1.16 Water Quality and Temperature Study

3.1.16.1 Project Nexus

Continued Project O&M activities have the potential to affect water quality and water temperature in Project reservoirs and stream reaches downstream of Project facilities.

3.1.16.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding water quality and water temperature in Pyramid Lake and the Pyramid reach was presented in the Licensees' PAD in Section 4.4. As a summary, Project water quality monitoring has been conducted by the Licensees since 1968. The water quality program monitors eutrophication, salinity and other parameters of concern for drinking water, recreation, and fish and wildlife purposes. Additional data are collected by MWD. Extensive water quality sampling and analysis is ongoing by both DWR and MWD. Additionally, the USGS studies surface-water quality in cooperation with local and State governments, and with other federal agencies. The monitoring program consists of collection, analysis, data archiving, and dissemination of data and information describing the quality of surface water resources. These data are summarized in Section 4.4 of the PAD.

In addition, defined Beneficial Uses and Water Quality Objectives of Project waters are presented in Tables 4.4-6 and G-1, respectively, in the PAD.

Additional water quality and temperature data from this Study will be added to the existing data.

3.1.16.3 Study Goals and Objectives

The goal of this *Water Quality and Temperature Study* is to supplement existing information regarding water quality and temperature. The objective of the Study is to gather sufficient data necessary to fill recognized information gaps concerning water quality and temperature.

3.1.16.4 Study Methods

Study Area

The study area for the *Water Quality and Temperature Study* consists of Quail Lake, Pyramid Lake, and the Pyramid reach of Piru Creek downstream of Pyramid Lake (Figure 3.1-23).

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Water Quality and Temperature Study* will begin after FERC issues its Study Plan determination.
- The *Water Quality and Temperature Study* does not include the development of requirements for the new license, which will be addressed outside the *Water Quality and Temperature Study*.
- The *Water Quality and Temperature Study* focuses specifically on Quail Lake, Pyramid Lake, and Pyramid reach, and the study area for the *Water Quality and Temperature Study* is specific to those resources.
- If required for the performance of the *Water Quality and Temperature Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the *Water Quality and Temperature Study*. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Water Quality and Temperature Study*.
- Field crews may make variances to the *Water Quality and Temperature Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances in the *Water Quality and Temperature Study* will be noted in the data resulting from the *Water Quality and Temperature Study*.

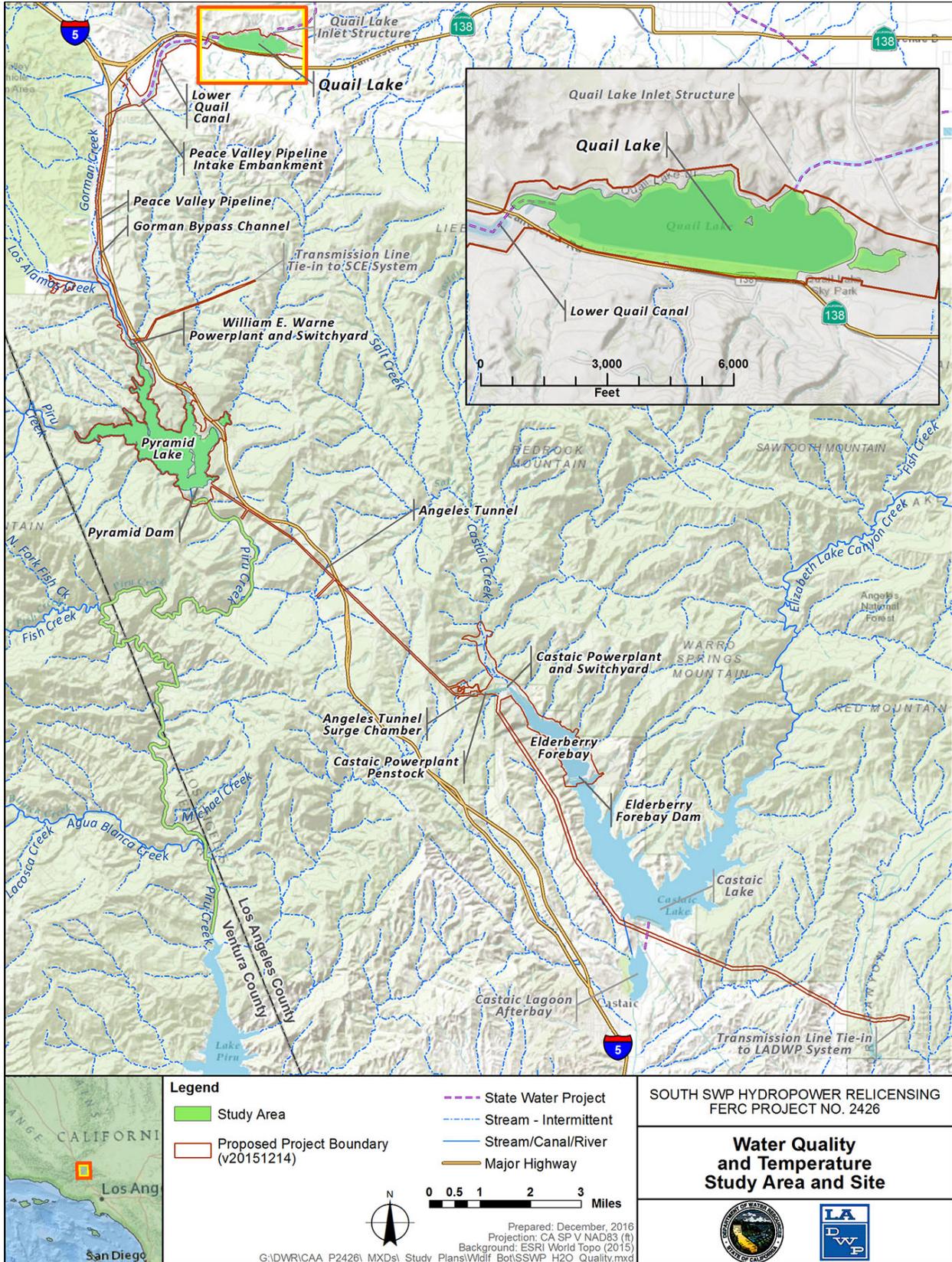


Figure 3.1-23. Water Quality and Temperature Study Area

Methods

This *Water Quality and Temperature Study* will consist of five steps: (1) select water quality parameters; (2) select sampling locations; (3) collect water quality samples; (4) collect reservoir profiles; and (5) install and maintain stream temperature loggers. These steps are described below.

Step 1 – Select Water Quality Parameters. For the purpose of this *Water Quality and Temperature Study*, the water quality parameters and constituents to be measured are divided into two categories: (1) basic water quality – in situ; and (2) basic water quality – laboratory, which includes inorganic ions, nutrients and metals. The parameters included in each category and associated information are listed in Table 3.1-7. Water temperature will also be monitored.

Table 3.1-7. Water Quality Parameters and Constituents to be Measured, and Methods, Reporting Limits and Laboratory Holding Times for Each

Parameter		Method	Target Reporting Limit ¹ µg/L (or other)	Hold Time
BASIC WATER QUALITY – IN SITU				
Dissolved oxygen	DO	SM 4500-O	0.1 mg/L	Field (<i>in situ</i>)
Specific conductance	--	SM 2510A	0.001 µmhos	Field (<i>in situ</i>)
pH	--	SM 4500-H	0.1 su	Field (<i>in situ</i>)
Turbidity	--	SM 2130 B	0.1 NTU	Field (<i>in situ</i>)
Secchi disc	--	--	--	Field (<i>in situ</i>)
BASIC WATER QUALITY – LABORATORY				
Total organic carbon	TOC	SM 5310	0.2 mg/L	28 d
Dissolved organic carbon	DOC	EPA 415.1 D	0.5/0.1	28 d
Total dissolved solids	TDS	EPA 2540 C SM 2340 C	1 mg/L	7d
Total suspended solids	TSS	EPA 2520 D SM 2340 D	1 mg/L	7d
INORGANIC IONS				
Total alkalinity	--	SM 2340 B	2000	14 d
Calcium	Ca	EPA 6010 B	30	180 d
Chloride	Cl	EPA 300.0	20	28 d
Hardness (measured value)	--	EPA 2340 B SM 2340 C	1 mg/L as CaCO ₃	14 d
Magnesium	Mg	EPA 6010 B	1	180 d
Potassium	K	EPA 6010 B	500	180 d
Sodium	Na	EPA 6010 B	29	180 d
Sulfate	SO ₄ ²⁻	EPA 300.0	1.0 mg/L	28 d
Sulfide	S ²⁻	SM 4500 S2 – D	0.05 mg/L	28 d

Table 3.1-7. Water Quality Parameters and Constituents to be Measured, and Methods, Reporting Limits and Laboratory Holding Times for Each (continued)

Parameter		Method	Target Reporting Limit ¹ µg/L (or other)	Hold Time
NUTRIENTS				
Nitrate-nitrite	--	EPA 300.0	2	28 d <pH 2
Total ammonia as N	--	EPA 4500-NH3 SM 4500-NH3	0.02	28 d <pH 2
Total Kjeldahl nitrogen as N	TKN	SM 4500 N	100	28 d <pH 2
Total phosphorus	TP	SM 4500 P	20	28 d <pH 2
Dissolved orthophosphate	PO ₄	EPA 365.1 EPA 300.0	0.01	48 h at 4 °C
METALS (total and dissolved)				
Aluminum (total and dissolved)	Al	EPA 200.8/EPA 1638	4.0/0.4	180 d
Arsenic (total and dissolved)	As	EPA 200.8/1638	0.15/0.04	180 d
Cadmium (total and dissolved)	Cd	EPA 200.8/1638	0.020/0.004	180 d
Chromium, total (total and dissolved)	Cr	EPA 200.8/1638	0.010/0.03	180 d
Copper (total and dissolved)	Cu	EPA 200.8/1638	0.10/0.01	180 d
Iron (total and dissolved)	Fe	EPA 200.8/1638	10.0/3.2	180 d
Lead (total and dissolved)	Pb	EPA 200.8/EPA 1638	0.040/0.003	180 d
Mercury (total)	Hg	EPA 1631	0.0005/0.00008	28 d
Methylmercury (total and dissolved)	CH ₃ Hg	EPA 1630	0.00005/0.000019	90 d
Nickel (total and dissolved)	Ni	EPA 200.8/1638	0.10/0.01	180 d
Selenium (total)	Se	EPA 200.8/1638	0.60/0.19	180 d
Silver (total and dissolved)	Ag	EPA 200.8/1638	0.20/0.006	180 d
Zinc (total and dissolved)	Zn	EPA 200.8/1638	0.2/0.1	180 d
Chlorpyrifos	--	EPA 8081A	0.005/0.0024 mg/L	7 d
Diazinon	--	EPA 8141A	0.005/0.0029 mg/L	7 d

¹The Target Reporting Limit is the minimum accuracy at which the parameter will be reported in the Licensees' ISR, USR, DLA and FLA.

Key:

EPA = United States Environmental Protection Agency

CaCO₃ = calcium carbonate

d = days

h = hours

µmhos = micro-mhos

µg/L = micrograms per liter (equals parts per billion)

mg/L = milligrams per liter (equals parts per million)

NTU = Nephelometric Turbidity Units

SM = Standard Method

su = standard unit

TDS = total dissolved solids

TOC = total organic carbon

TSS = total suspended solids

Step 2 – Select Sampling Locations. Water quality and temperature data will be collected in Quail Lake, Pyramid Lake, and in Pyramid reach. Samples collected in Quail Lake and Pyramid Lake will correspond to reservoir profile locations. To the extent possible, the sampling locations will correspond with the sampling locations of recent or ongoing water quality monitoring by the Licensees.

Sampling in Quail Lake will occur at two locations: (1) near the center of the reservoir; and (2) near the Quail Lake outlet. Sampling in Pyramid Lake will occur at three locations: (1) near the dam; (2) in the Piru Creek arm; and (3) in the William E. Warne Powerplant arm. Sampling in each reservoir will occur at two depths: within the hypolimnion and just below the surface of the epilimnion. To the extent possible, the sampling locations will correspond with the sampling locations of recent or ongoing water quality monitoring by the Licensees.

Sampling in Pyramid reach will occur at three locations corresponding to the fish sampling locations in Pyramid reach that are described in the *Pyramid Reach Fish Populations Study*. In addition, the Licensees will collect water temperature data at a single location in Piru Creek upstream of Pyramid Lake near the existing USGS flow gaging station.

Step 3 – Collect Water Quality Samples. Water chemistry samples will be collected once in the fall from all locations listed in Step 2. This description provides a broad overview of the sample collection procedures that will be followed. Specific quality assurance and quality control protocols will be followed to prevent sample contamination and ensure the sample accuracy. These protocols include instrument calibration, equipment decontamination, sample cross contamination prevention, labels and documentation, laboratory certification, chain of custody procedures, and sample collection, preservation, storage, transport, and analyses protocols.

In situ water quality measurements will be made with a Hydrolab DataSonde 5 (Hydrolab), or other instrument with similar precision and accuracy. Water temperature ($\pm 0.1^\circ\text{C}$), dissolved oxygen (± 0.2 milligrams per liter [mg/L]), pH (± 0.2 standard unit, or su), specific conductance (± 0.001 micro-mhos per centimeter [$\mu\text{mhos/cm}$]), and turbidity (± 1 Nephelometric Turbidity Unit [NTU]) will be measured at each location. Prior to and after each use, the instrument will be calibrated using the manufacturer's recommended calibration methods. Any calibration variances will be noted on the field data sheet and in the *Water Quality and Temperature Study* report, and recalibration or repair done as necessary. Field crews will note relevant conditions during each sampling event on the field data sheet (e.g., air temperature, flow [if available at a nearby gage], description of the sampling location, floating material, evidence of oil and grease, and activities in the vicinity of the sampling site that could cause short- or long-term alterations to water quality).

The Licensees will follow USGS sampling protocol for water quality (Wilde, 2011). In summary, each sample will be collected in laboratory-supplied clean containers. While in the field, samples requiring refrigeration will be stored on ice, in an ice chest, until transferred to an appropriate laboratory refrigerator. Water samples to be analyzed for metals will be collected using "clean hands" methods consistent with the EPA's Method 1669 sampling protocol, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria (EPA 1995). Samples requiring filtration before metals analysis will be filtered in accordance with standard protocols in the field. Certification of filter cleanliness will be obtained from the vendor and kept in the Project files.

All sample containers will be labeled with the date and time that the sample is collected, and a sampling site or unique sample identification number. A field sample log sheet will be maintained that includes a table of sample label information. The sampling site location will be recorded using a GPS unit. All containers will be handled in a manner consistent with appropriate chain-of-custody protocols. The sample containers will be preserved as appropriate, stored and delivered to a State of California-certified water quality laboratory for analyses of the parameters listed in Step 1, and in accordance with maximum holding periods for each parameter. A chain-of-custody record will be maintained with the samples at all times.

As part of the field QA program, one field blank and one equipment rinsate will be collected and submitted to the laboratory, with a target of one for every 10 samples. A field blank is a sample of analyte-free water poured into the container in the field, preserved and shipped to the laboratory with samples. A field blank for filtered samples will be similarly created, but filtered using field techniques before pouring into the sample container. A field blank assesses the contamination from field conditions during sampling. A rinsate is a sample of analyte-free water poured over or through decontaminated field sampling equipment prior to the collection of samples and assesses the adequacy of the decontamination processes. Two duplicate samples will also be collected to confirm the laboratory's QA process.

Step 4 – Collect Reservoir Profiles. Reservoir profiles will be taken once quarterly during 2018 at the locations in Quail Lake and Pyramid Lake described in Step 2.

A GPS receiver will be used during each successive sampling occasion to locate the geographical coordinates of each sample site. Care will be taken to identify the same site for successive profiles where water conditions and GPS accuracy allow.

Field crews will use a Hydrolab® DataSonde 5® multi-parameter water quality monitoring system (or equivalent) to measure water temperature ($\pm 0.2^\circ\text{C}$) at each of the reservoir sampling sites. Generally, measurements will be taken at 10-foot vertical increments where the change in temperature with respect to depth is low. Where the temperature gradient is higher or where measuring water temperatures near the intake elevations, 5-foot or smaller vertical increments will be used. At each sample depth, the parameter readings will be allowed to stabilize before water temperature will be recorded. Data will be collected throughout the entire water column.

Field crews will collect a Secchi disc depth reading as an indicator of water clarity and photic zone during each reservoir water temperature profile collection. Secchi depth readings will be taken by lowering a Secchi disc over the shaded side of the boat until the disc is no longer visible from the boat. The disk will then be raised until visible, at which location the depth of the disc will be recorded in tenths of a foot, and the average of the two readings will be used as the water clarity reading for that location.

Step 5 – Install and Maintain Stream Temperature Loggers. Stream temperature loggers will be installed at the stream locations described in Step 2 for at least one year (i.e., 365 days) from the date they are installed.

The stream water temperature recorders in the active flow channel will have 12-bit resolution, with a minimum accuracy of plus or minus 0.2°C (i.e., onset or equivalent). Each stream recorder will be contained in a durable protective housing that permits the active flow of water in and around the unit, and will be placed at an appropriate depth to allow continuous recording during the entire 365 days. Each stream recorder will be secured by a cable to a stable root mass, tree trunk or man-made structure, or secured using embedded rebar where necessary, such that the recorder will be secured in the channel during high flow periods without presenting a safety hazard to people or wildlife. The stream recorders will be installed in the channel thalweg, and the housing and cable will be disguised as much as possible while ensuring the ability to retrieve the unit for future downloads. A GPS coordinate will be taken and recorded at each installation point, along with any waypoints that may prove valuable for future retrieval, especially where there is not a defined trail leading to the access point. Photographs of the recorder site, including installation configuration, will be taken. Each recorder will be set to record water temperature at 15-minute intervals.

Prior to installation, each recorder will be numbered and calibrated to the manufacturer's recommended specifications. Field crews will install a redundant water temperature recorder at each site. Redundant recorders will be located as close as possible to the primary recorders. Where a redundant recorder occurs, the primary recorder will be labeled with the recorder number for the site (e.g., "PC1") with the suffix "a," and the redundant recorder with the number for the site with the suffix "b." Data from both recorders will be downloaded during each scheduled visit.

Loggers will be downloaded at least quarterly. During each visit, field crews will download data into an optic shuttle or directly to a personal computer. Immediately after the data are safely downloaded, back-ups will be recorded on portable memory devices (i.e., USB [Universal Serial Bus] "thumb drive"). Only after the raw water temperature data are safely backed-up will the optic shuttle be cleared or the data processed. In addition, during each site visit, crews will be prepared to replace or fix a recorder installation. Any recorder or optic shuttle that fails to download will be returned to the manufacturer for possible data recovery. Field crews will also check equipment operation/calibration and remaining battery life, and will calibrate the instrument to manufacturer's specifications. After the recorder is removed from the water, it will be cleaned and visually inspected.

To prevent introduction and transmittal of amphibian chytrid fungus and invasive invertebrates (e.g., quagga mussels, zebra mussels and Asian clams) field crews will be trained on, provided with, and use materials (e.g., Quat) for decontaminating their boots, waders, and other equipment between water-based study sites. All boats used during the study will follow clean protocols, including inspections before and after use. All decontamination requirements in place at Project reservoirs will be strictly followed, including DWR's *SWP Rapid Response Plan for Zebra and Quagga Mussels* which includes a decontamination protocol using heat treatment and chemical solutions.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures. QA/QC of laboratory data will follow that laboratory's QA/QC procedures. All water quality data will be verified and/or validated as appropriate. More specifically, following the field sampling and laboratory analyses, which includes the laboratories' own QA/QC analysis, the Licensees will subject all data to additional QA/QC procedures including, but not limited to: (1) spot-checks of transcription; (2) review of electronic data submissions for completeness; (3) graphical review of data to check for errors; (4) comparison of results to field blank and rinsate results; and (5) identification of any data that seem inconsistent.

If any datum seems inconsistent during the QA/QC procedure, the Licensees will consult with the laboratory to identify any potential sources of error before concluding that the data is correct. Values that are determined to be anomalous will be removed from the analysis if the reason for the reading cannot be identified. If data are unavailable for brief periods of the record, the missing data will be synthesized into the record using a straight line interpolation method, and the data will be indicated as "synthesized" in the record and all subsequent summaries. The raw data files will be retained in their unaltered state for future QA/QC reference and data modified in the final record will be so indicated in the record.

Should the laboratory need to re-extract samples and re-run the sample under different calibration conditions, the data identified by the laboratory as the most certain will be used. If field-sampling conditions, as measured by the field blank and the rinsate sample results, indicate that samples have been contaminated, the Licensees will identify the data accordingly.

Analysis

The Licensees will analyze the raw data relative to Los Angeles or Lahontan Basin Plan water quality objectives, as appropriate (California Regional Water Quality Control Board [RWQCB] Lahontan Region 1995 and California RWQCB Los Angeles Region 1994).

Reporting

Water Quality and Temperature Study methods and results will be prepared and included, to the extent completed, in the Licensees' ISR, USR, DLA, and FLA.

3.1.16.5 Consistency of Methodology with Generally Accepted Scientific Practices

The *Water Quality and Temperature Study* methods are generally consistent with the methods used for collecting water quality and temperature data in recent relicensing efforts in California, including for the Don Pedro Project (FERC No. 2299), Yuba River Hydroelectric Project (FERC No. 2246) and Merced River Hydroelectric Project (FERC No. 2179).

3.1.16.6 Schedule

The *Water Quality and Temperature Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *Water Quality and Temperature Study*:

Fieldwork Preparation	July 2017 – September 2017
Fieldwork	October 2017 – September 2018
Data QA/QC	October 2017 – September 2018
Data Analysis and Reporting	October 2017 – September 2018

3.1.16.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Water Quality and Temperature Study* will range between \$80,000 and \$120,000.

3.1.16.8 References

California RWQCB Lahontan Region. 1995. Water quality control plan for the Lahontan Region, North and South Basins. Plan effective March 31, 1995, amended through August 16, 2011. Available:
http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/references.shtml

California RWQCB Los Angeles Region. 1994. Water Quality Control Plan Los Angeles Region. Basin Plan for the coastal watersheds of Los Angeles and Ventura counties. Adopted 1994. Amended through July 2015. Available:
http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/basin_plan_documentation.shtml

EPA. 1995. Method 1669: Sampling ambient water for trace metals at United States Environmental Protection Agency water quality criteria levels. EPA 821-R-95-034, United States Environmental Protection Agency, Washington, D.C.

Wilde, F.D., 2011, Water-quality sampling by the U.S. Geological Survey—Standard protocols and procedures: U.S. Geological Survey Fact Sheet 2010-3121, 2 p. Available at <https://pubs.usgs.gov/fs/2010/3121>.

3.1.17 Fish Entrainment Risk Assessment Study**3.1.17.1 Project Nexus**

Continued Project O&M activities have the potential to affect fish in Pyramid Lake due to entrainment into the Angeles Tunnel intake and Pyramid Dam low level outlet to Pyramid reach.

3.1.17.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding Pyramid Lake and its operations, fishes in Pyramid Lake, the Pyramid Dam low level outlet, and the Angeles Tunnel intake are described in the Licensees' PAD. As a summary, at its NMWSE, Pyramid Lake has a normal maximum capacity of 169,902 acre-feet and a maximum depth of 280 feet near Pyramid Dam.

Pyramid Dam low level outlet is a 15-foot-diameter, concrete-lined tunnel approximately 1,350 feet long and is located at the right abutment of Pyramid Dam. The tunnel can release up to 18,000 cfs into Pyramid reach. The lake outlet at the tunnel entrance is a submerged, 119-foot-high, 15-foot-diameter, reinforced concrete tower with an 18-foot-high trashrack. The tower lip is at elevation 2,340 feet, 238 feet below the NMWSE of Pyramid Lake.

The Angeles Tunnel intake structure, located at the north portal of the Angeles Tunnel, is a multiple-compartmented structure (four, 22-foot by 22-foot horizontal openings) with trashracks, which transitions to a 30-foot-diameter tunnel. The Angeles Tunnel intake draws water from Pyramid Lake down to elevation 2,335 feet, 243 feet below the NMWSE of Pyramid Lake. The Angeles Tunnel has a maximum capacity of 18,400 cfs. (Section 3.2 of the PAD.)

CDFW annually stocks 20,000 pounds of catchable size rainbow trout (*O. mykiss*) in the lake (Section 4.5.4.5 of the PAD), and based on sampling in 2013, CDFW considers the Pyramid Lake fish populations to be in good condition. CDFW found 12 fish species, and the catch was numerically dominated by largemouth bass (*Micropterus salmoides*). CDFW advised the Licensees that it intends to repeat its 2013 fish population sampling in Pyramid Lake in 2017. In addition, Environmental Science Associates, Inc. under contract with DWR conducts creel surveys in Pyramid Lake, with the most recent creel surveys in 2015 and 2016. (Section 4.5 of the PAD.)

3.1.17.3 Study Goals and Objectives

The goal of the *Fish Entrainment Risk Assessment Study* is to assess the potential for fish in Pyramid Lake to be entrained into the Pyramid Dam low level outlet or entrained into the Angeles Tunnel intake. The objective of this *Fish Entrainment Risk Assessment Study* is to gather sufficient information necessary to fill recognized information gaps regarding the potential for fish entrainment.

3.1.17.4 Study Methods

Study Area

The study area for the *Fish Entrainment Risk Assessment Study* will consist of Pyramid Lake (Figure 3.1-24).

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *Fish Entrainment Risk Assessment Study* will begin after FERC issues its Study Plan determination.
- The *Fish Entrainment Risk Assessment Study* does not include the development of requirements for the new license, which will be addressed outside the Fish Entrainment Risk Assessment Study.
- The *Fish Entrainment Risk Assessment Study* focuses specifically on Pyramid Lake, and the study area for the *Fish Entrainment Risk Assessment Study* is specific to that resource.
- If required for the performance of the *Fish Entrainment Risk Assessment Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the Study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *Fish Entrainment Risk Assessment Study*.
- Field crews may make variances to the *Fish Entrainment Risk Assessment Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances in the Study will be noted in the data resulting from the *Fish Entrainment Risk Assessment Study*.

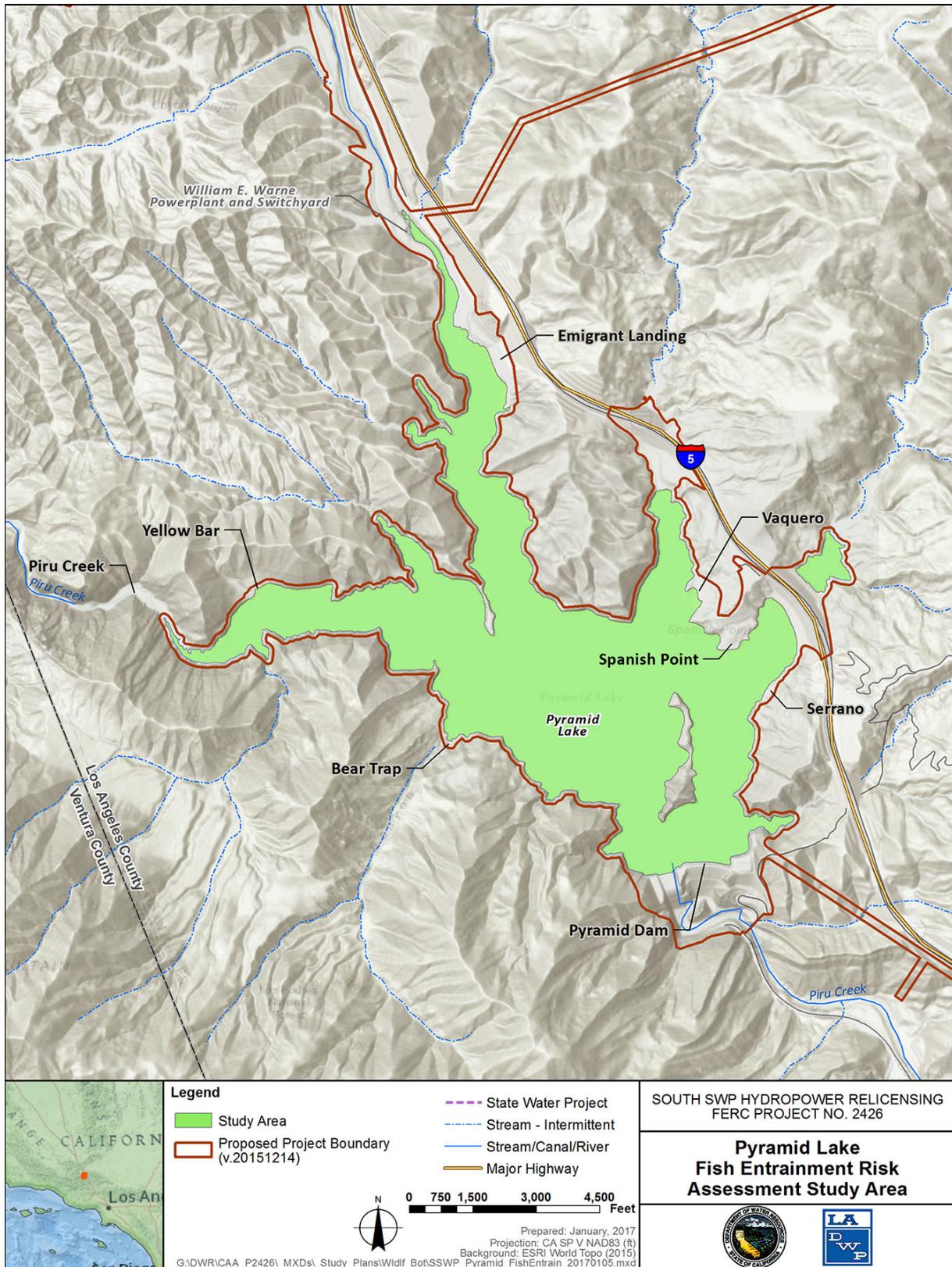


Figure 3.1-24. Pyramid Lake Fish Entrapment Risk Assessment Study Area and Site

Methods

This *Fish Entrainment Risk Assessment Study* will consist of four steps: (1) characterize each outlet through which Pyramid Lake water is released (i.e., the Angeles Tunnel intake and Pyramid Dam Low Level Outlet); (2) determine the likelihood that reservoir fish would be near the outlets; (3) determine swim speeds for fish life stages likely to be near the outlets; and (4) compare swim speeds and outlet water velocities. These steps are described below:

Step 1 – Characterize Each Outlet. The Licensees will examine existing Exhibit F and L Design Drawings and operations of Pyramid Lake and the two outlets to characterize for each outlet the typical outlet depth, dimensions and flows. Using this information, the Licensees will calculate typical approach velocities near and at each outlet, and at various distances from the outlet.

Step 2 – Determine Likelihood That Reservoir Fish Would be Near the Outlets. Using the information developed in Step 1, existing information regarding the fish species in Pyramid Lake and existing information in existing literature regarding the fish species' life history, the Licensees will determine which of the species' life stages has a reasonable potential to be near the outlets and when.

Step 3 – Determine Swim Speeds for Fish Life Stages Likely to be Near the Outlets. Using information from Alexander (1967) and Clay (1961) and other sources, the Licensees will determine the swim speeds of fish life stages that are determined in Step 2 to likely be near the outlets. A general rule of thumb is that a fish can sustain a speed equal to about four fish-lengths per second for long periods and a speed of about ten fish-lengths per second for short bursts.

Step 4 – Compare Swim Speeds and Outlet Velocities. The Licensees will compare the outlet velocities calculated in Step 1 with the swim speeds calculated in Step 3, and assess the potential for fish entrainment at the two outlets.

Quality Assurance and Quality Control

All data collected during this *Fish Entrainment Risk Assessment Study* will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures including checking all data for accuracy and completeness.

Analysis

The Licensees will compare the outlet velocities calculated in Step 1 with the swim speeds calculated in Step 3 to determine the risk for fish entrainment.

Reporting

The *Fish Entrainment Risk Assessment Study* methods and results will be prepared and included, to the extent completed, in the Licensees' ISR, USR, DLA, and FLA.

3.1.17.5 Consistency of Methodology with Generally Accepted Scientific Practices

The *Fish Entrainment Risk Assessment Study* methods are generally consistent with the methods used for assessing the potential for entrainment at deep water outlets in reservoirs in recent relicensing efforts in California, including the Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

3.1.17.6 Schedule

The *Fish Entrainment Risk Assessment Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the Fish Entrainment Risk Assessment Study:

Characterize Each Outlet	July 2017 – October 2017
Determine Fishes Near Outlets	July 2017 – October 2017
Determine Swim Speeds	November 2017 – December 2017
Data QA/QC	January 2018
Data Analysis and Reporting	February 2018 – May 2018

3.1.17.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *Fish Entrainment Risk Assessment Study* will range between \$20,000 and \$30,000.

3.1.17.8 References

- Alexander, R.M. 1967. *Functional Design of Fishes*. Hutchinson and Company, London.
- Clay, C.H. 1961. *Design of Fishways and Other Fish Facilities*. Department of Fisheries of Canada, Ottawa. Cat. No. FS 31-1961/1.

3.1.18 ESA-Listed Terrestrial Wildlife Species – California Wildlife Habitat Relationships Study

3.1.18.1 Project Nexus

Continued Project O&M and Project-related recreation activities have the potential to affect federal ESA-listed terrestrial wildlife species. For the purpose of this *ESA-listed Terrestrial Wildlife Species –CWHR Study*, an ESA-listed terrestrial wildlife species is defined as a terrestrial species that is listed under ESA as threatened or endangered, or is a candidate for listing. There are no species proposed for listing identified by USFWS.

Three ESA-listed terrestrial wildlife species are considered under a separate study for the Project and will not be included in this Study. These species are the least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo western DPS. However, information from this Study may be used to help inform that study.

3.1.18.2 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding ESA-listed terrestrial wildlife species and their habitat within the proposed Project boundary is provided in Section 4.8 of the Licensees' PAD. The PAD identified three species potentially affected by the Project that will be included as part of this Study: vernal pool fairy shrimp (*Branchinecta lynchi*), California condor (*Gymnogyps californianus*), and the coastal California gnatcatcher (*Polioptila californica californica*). Additionally, this Study addresses two other species not included in the PAD as potentially affected by the Project because the Project is outside of each species' known range: the Mojave desert tortoise (*Gopherus agassizii*) and blunt-nosed leopard lizard (*Gambelia sila*). However, because of the proximity of each species range, more information is needed to validate this conclusion.

As a summary, the Licensees found no records of vernal pool fairy shrimp, coastal California gnatcatcher, Mojave desert tortoise, or blunt-nosed leopard lizard from the proposed Project boundary. There are records of California condor in the CNDDDB from the Sespe-Piru Condor Area, which is less than one mile from Pyramid Lake (CDFW 2015). Aspen Environmental Group (2007) indicates California condors are "commonly observed" in flight around Pyramid Lake.

In order to meet the goals of the Study (described in 3.1.3 below), the Licensees have identified the following additional information needs: (1) collection of further CWHR habitat data for each potential special-species; and (2) a list of Project O&M activities that includes location and duration of the activity.

3.1.18.3 Study Goals and Objectives

The goal of this *ESA-listed Terrestrial Wildlife Species – CWHR Study* is to determine the quality and suitability of potential habitat for ESA-listed terrestrial wildlife species within the proposed Project boundary.

The objective of this *ESA-listed Terrestrial Wildlife Species – CWHR Study* is to gather sufficient data necessary to fill recognized gaps in existing information regarding the potential for ESA-listed terrestrial wildlife species to occur within the proposed Project boundary.

3.1.18.4 Study Methods

Study Area

The study area for the *ESA-listed Terrestrial Wildlife Species – CWHR Study* consists of the area within the proposed Project boundary, excluding lands overlying the Angeles Tunnel on which the Licensees do not perform any Project-related activities. The study area for the *ESA-listed Terrestrial Wildlife Species – CWHR Study* is shown below in Figure 3.1-25.

General Concepts and Procedures

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews.
- The *ESA-listed Terrestrial Wildlife Species – CWHR Study* will begin after FERC issues its Study Plan determination.
- The *ESA-listed Terrestrial Wildlife Species – CWHR Study* does not plan to include the development of requirements for the new license, which will be addressed outside the Study.
- The *ESA-listed Terrestrial Wildlife Species – CWHR Study* focuses specifically on special-status terrestrial wildlife within the proposed Project boundary, but the study area for the *ESA-listed Terrestrial Wildlife Species – CWHR Study* is specific to locations that can support those resources.
- If required for the performance of the *ESA-listed Terrestrial Wildlife Species – CWHR Study*, the Licensees will make a good faith effort to obtain permission to access private property well in advance of initiating the study. The Licensees will only enter private property if permission has been provided by the landowner.
- The Licensees will acquire all necessary agency permits and approvals prior to beginning fieldwork for the *ESA-listed Terrestrial Wildlife Species – CWHR Study*.
- Field crews may make variances to the *ESA-listed Terrestrial Wildlife Species – CWHR Study* in the field to accommodate actual field conditions and unforeseen problems. Any variances from the Study will be noted in the data resulting from the *ESA-listed Terrestrial Wildlife Species – CWHR Study*.

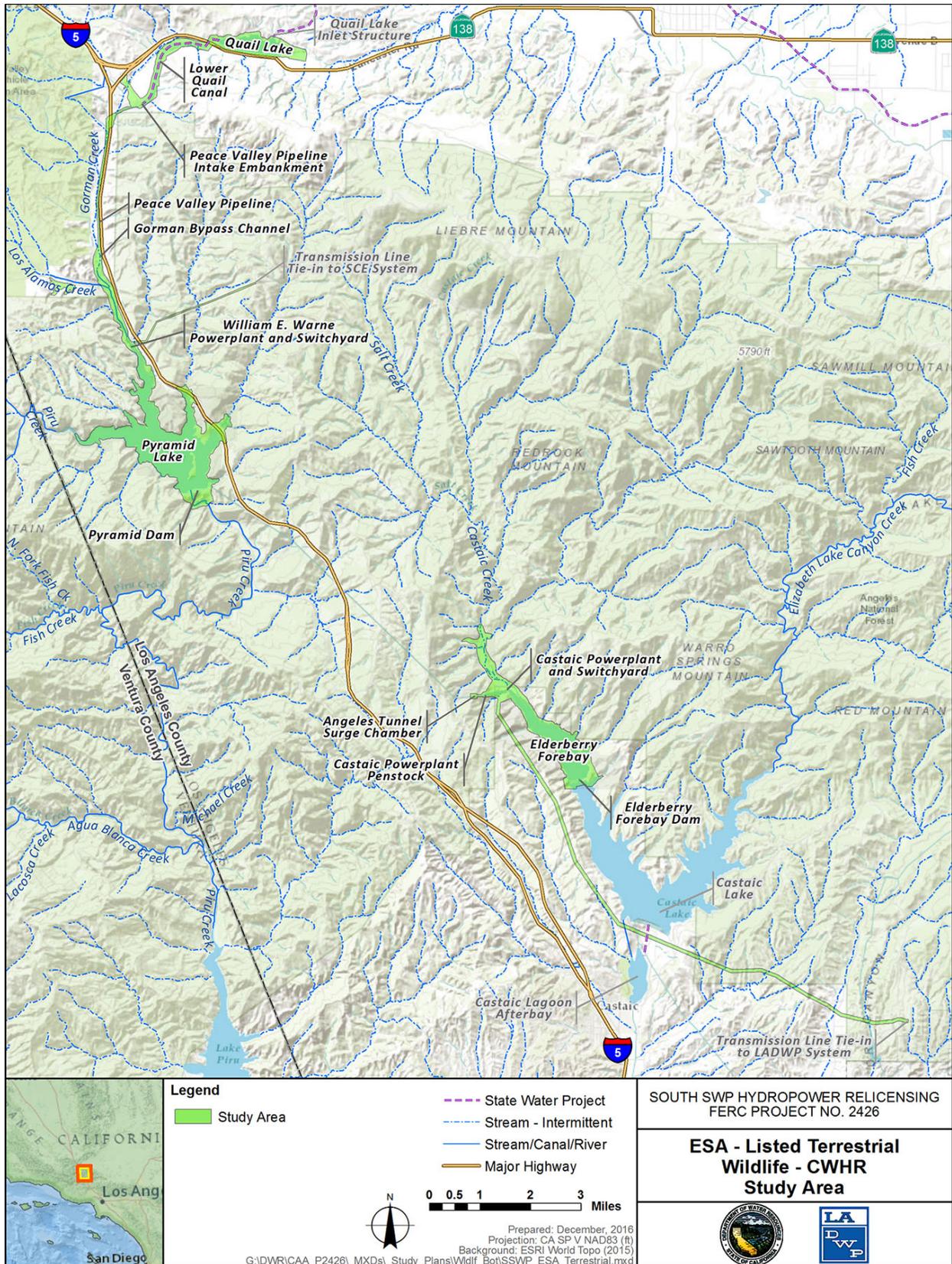


Figure 3.1-25. ESA-listed Terrestrial Wildlife Species – CWHR Study Area

Methods

This *ESA-listed Terrestrial Wildlife Species – CWHR Study* will consist of two steps: (1) create field study maps; and (2) conduct field habitat assessments at sampling points. These steps are described below. The Licensees' relicensing *Botanical Resources Study* will also be a source of information for habitat features, including vernal pools, which may be too small to be represented on existing habitat maps.

Step 1 – Create Field Study Maps. There were 15 terrestrial CWHR vegetation types identified within the proposed Project boundary, as shown in Table 3.1-8 below. Of these, the most common are Mixed Chaparral (563 acres), Coastal Scrub (545 acres), and Sagebrush (286 acres). There are also four riparian and wetland vegetation types identified within the proposed Project boundary: Montane Riparian (39 acres), Valley Foothill Riparian (54 acres), Wet Meadow (53 acres), and Freshwater Emergent Wetland (39 acres) (USFS 2014). Using GIS, the Licensees will select sampling points in representative habitats, with more points in areas with higher potential for special-status species (e.g., Wet Meadow and Montane Riparian) and larger acreage inside the proposed Project boundary. Table 3.1-8 shows the 15 terrestrial vegetation types and the number of sampling points for each.

Table 3.1-8. California Wildlife Habitat Relationship Acreages within the Proposed Project Boundary and Sampling Points

California Wildlife Habitat Relationship Type	Acreage ¹	Percentage of Study Area	Number of Sampling Points ²
Tree-Dominated Habitats			
Pinyon-Juniper (PJN)	5	<1	1
Montane Hardwood (MHW)	<1	<1	1
Coastal Oak Woodland (COW)	3	<1	1
Montane Riparian (MRI)	39	2	2
Valley Foothill Riparian (VRI)	54	2	2
Shrub-Dominated Habitats			
Sagebrush (SGB)	286	11	4
Mixed Chaparral (MCH)	563	22	5
Chamise-Redshank Chaparral (CRC)	130	5	3
Coastal Scrub (CSC)	545	22	5
Desert Wash (DSW)	63	2	2
Herbaceous-Dominated Habitats			
Annual Grassland (AGS)	208	8	3
Wet Meadow (WTM)	53	2	2
Freshwater Emergent Wetland (FEW)	39	2	2
Developed Habitats			
Urban (URB)	293	12	4
Non-vegetated Habitats			
Barren (BAR)	226	9	3
	2,507	100	40

Notes:

¹Acreages include underground features.

²Sampling points are the same as those in the *Special-Status Terrestrial Wildlife Species – CWHR Study* and information collected will be used for both studies.

The Licensees will produce for the study updated maps that will include CWHR habitat types, sampling points, CNDDDB occurrences, other known locations of ESA-listed species, and Project facilities.

Step 2 – Conduct Field Habitat Assessments at Sampling Points. Field habitat assessments and characterizations will be conducted at representative sampling points (Table 3.1-8), using CDFW's CWHR System data forms (CDFW 2016). Information collected on these forms will include species composition, stages, structure, percent cover, and habitat elements, as well as diameter at breast height for wooded habitats. Evidence of Project O&M activities and Project-related recreation activities in the vicinity of the sampling points will also be documented. Photographs of all sampling points will be taken in each cardinal direction from the center point of the plot.

If an ESA-listed terrestrial wildlife species is incidentally identified, the survey team will prepare a California Native Species Field Survey Form, which records data required to be submitted to CDFW for addition to the CNDDDB and reported to the CDFW and USFWS. The information will also be provided to the USFS if the occurrence is located on NFS lands.

Quality Assurance and Quality Control

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate QA/QC procedures, including spot-checks of transcription and comparison of GIS maps with field notes.

Analysis

Field data will be used in conjunction with CWHR to refine the list and habitats of ESA-listed terrestrial wildlife potentially occurring in the study area for the *ESA-listed Terrestrial Wildlife Species – CWHR Study*. The Licensees will then use the maps created in Step 1 to identify areas within the study area for the *ESA-listed Terrestrial Wildlife Species – CWHR Study* in which ESA-listed wildlife habitat, Project facilities, and O&M activities overlap.

Reporting

The Licensees will compile and summarize results of this *ESA-listed Terrestrial Wildlife Species – CWHR Study*, as well as other existing and relevant information, to the extent completed for incorporation into the Licensees' ISR, USR, DLA, and FLA.

3.1.18.5 Consistency of Methodology with Generally Accepted Scientific Practices

This *ESA-listed Terrestrial Wildlife Species – CWHR Study* is consistent with the goals, objectives, and methods outlined for the most recent FERC hydroelectric relicensing efforts in California, including the Yuba River Development Project (FERC Project No. 2246), French Meadows Transmission Line Project (FERC Project No. 2479), Camp Far West Transmission Line Project (FERC Project No. 10821), Drum-Spaulding Project

(FERC Project No. 2310), and Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

3.1.18.6 Schedule

The *ESA-listed Terrestrial Wildlife Species – CWHR Study* will begin after FERC issues its Study Plan determination. The Licensees anticipate the schedule below will be followed to complete the *ESA-listed Terrestrial Wildlife Species – CWHR Study*.

Fieldwork Preparation	January 2017 – March 2017
Fieldwork	March 2017 – Sept 2017
Data QA/QC	October 2017 – June 2018
Data Analysis & Reporting	July 2017 – June 2018

3.1.18.7 Level of Effort and Cost

Based on the work effort described above, the Licensees estimate the current cost to complete this *ESA-listed Terrestrial Wildlife Species – CWHR Study* will range between \$5,000 and \$10,000.

3.1.18.8 References

Aspen Environmental Group. 2007. Biological Assessment and Report of Sensitive Resource Surveys for Castaic Power Plant and Vicinity. Report prepared for LADWP. September 2007.

CDFW. 2016. California Wildlife Habitat Relationships. Available online: <<https://www.wildlife.ca.gov/Data/CWHR>> Accessed December 16, 2016. Last updated 2016. Sacramento, CA.

USFS. 2014. Classification and Assessment with Landsat of Visible Ecological Groupings (CalVeg) data. Updated in 2014. Available online: <<http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192>>.

4.0 NEXT STEPS

Section 5.11(e) of FERC's ILP regulations requires that an applicant for a new license hold at least one meeting for the purpose of clarifying the applicant's PSP and any initial information gathering or study requests, and in an attempt to resolve any outstanding issues with respect to the PSP. The initial meeting must be held no later than 30 days after the PSP is filed with FERC.

The Licensees have scheduled the required PSP meeting from 8 A.M. to 5 P.M. on Wednesday, February 8, 2017, at the Embassy Suites Valencia, 28508 Westinghouse Place, Santa Clarita. The Licensees have informed interested relicensing stakeholders of the meeting, and posted a notice of the meeting on the Relicensing Website. The meeting will be held in conformance with the Communication Guidelines included in the Licensees' PAD. The Licensees will schedule additional meetings with interested relicensing stakeholders if the Licensees believe the meetings will be useful.

Section 5.11(b)(3) of FERC's ILP regulations requires that the PSP include provisions for periodic progress reports, including the manner and extent to which information will be shared. The Licensees will post study results to the Relicensing Website when data are available and have undergone appropriate QA/QC and will notify interested relicensing stakeholders via email upon posting. The Licensees will periodically post to the website progress of ongoing studies.

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