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## LIST OF ACRONYMS

| | |
|---|---|
| CFR | Code of Federal Regulations |
| FERC or Commission | Federal Energy Regulatory Commission |
| Project | Kern River No. 1 Hydroelectric Project |
| SCE | Southern California Edison Company |

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# 3.0 EXISTING RESOURCE INFORMATION

## 3.1 INTRODUCTION

Sections 3.2 through 3.15, Existing Resource Information, were developed pursuant to Title 18 of the Code of Federal Regulations (CFR) Chapter I § 5.6(d)(3) and summarize the existing environment relevant to the relicensing of Southern California Edison Company's (SCE) Kern River No. 1 Hydroelectric Project (Project). This section is organized to address specific content requirements outlined in the Federal Energy Regulatory Commission's (FERC or Commission) regulations, including: (1) a description of the existing environment; and (2) a summary of existing data or studies, including references to sources of information or studies.

This section is organized by resource area, as follows:

- 3.2 General Description of the River Basin
- 3.3 Water Use and Hydrology
- 3.4 Water Quality
- 3.5 Fish and Aquatic Resources
- 3.6 Botanical and Wildlife Resources
- 3.7 Geology and Soils
- 3.8 Geomorphology
- 3.9 Floodplains, Littoral Zones, and Associated wetland and Riparian Habitats
- 3.10 Land Use
- 3.11 Recreation Resources
- 3.12 Aesthetics
- 3.13 Cultural Resources
- 3.14 Tribal Resources
- 3.15 Socioeconomics

In some cases, resource areas defined by FERC were split into separate sections to facilitate review by resource specialist. For example, required information on geology and soils was split into three resource sections: (1) 3.7, Geology and Soils, (2) 3.8, Geomorphology, and (3) 3.9, Floodplains, Littoral Zones, and Associated wetland and Riparian Habitats. In addition, when similar information was required in more than one section, it has only been provided in detail once (first reference) and then referred to in subsequent sections, as appropriate. Table 3.1-1 provides the content requirements of 18 CFR Chapter I § 5.6(d)(3) and identifies the section where resource information is provided.

All associated tables, figures, maps, and appendices are included at the end of each resource section. In addition, acronyms and references are provided within each section to facilitate review.

The information included in each resource section is based on data and information collected from publicly available sources supplemented with additional information received from resource agencies and other stakeholders in response to SCE's specific information requests and/or responses to the Project Information Questionnaire.

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## Table 3.1-1. FERC Regulations at 18 CFR § 5.6(d)(3) and Associated Kern River No. 1 Hydroelectric Project PAD Section

| 18 CFR § | FERC Regulation Text | PAD Section |
|---|---|---|
| 5.6 | Pre-application document. | – |
| (3) | Description of existing environment and resource impacts. | Sections 3.1 through 3.15; Section 4.0 Preliminary Issues, Draft Technical Study Plans, and Relevant Plans |
| **(i)** | ***General requirements.*** A potential applicant must, based on the existing, relevant, and reasonably available information, include a discussion with respect to each resource that includes: | – |
| (A) | A description of the existing environment as required by paragraphs (d)(3)(ii)-(xiii) of this section; | Section 3.0 Existing Resource Information |
| (B) | Summaries (with references to sources of information or studies) of existing data or studies regarding the resource; | Section 3.0 Existing Resource Information |
| (C) | A description of any known or potential adverse impacts and issues associated with the construction, operation or maintenance of the proposed project, including continuing and cumulative impacts; and | Section 4.0 Preliminary Issues, Draft Technical Study Plans, and Relevant Plans |
| (D) | A description of any existing or proposed project facilities or operations, and management activities undertaken for the purpose of protecting, mitigating impacts to, or enhancing resources affected by the project, including a statement of whether such measures are required by the project license, or were undertaken for other reasons. The type and amount of the information included in the discussion must be commensurate with the scope and level of resource impacts caused or potentially caused by the proposed project. Potential license applicants are encouraged to provide photographs or other visual aids, as appropriate, to supplement text, charts, and graphs included in the discussion. | Section 2.0 Existing Project Location, Facilities, and Operations |
| **(ii)** | ***Geology and soils.*** Descriptions and maps showing the existing geology, topography, and soils of the proposed project and surrounding area. Components of the description must include: | 3.7 Geology and Soils |
| (A) | A description of geological features, including bedrock lithology, stratigraphy, structural features, glacial features, unconsolidated deposits, and mineral resources at the project site; | 3.7 Geology and Soils |

| 18 CFR § | FERC Regulation Text | PAD Section |
|---|---|---|
| (B) | A description of the soils, including the types, occurrence, physical and chemical characteristics, erodibility and potential for mass soil movement; | 3.7 Geology and Soils |
| (C) | A description of reservoir shorelines and stream banks, including: | 3.7 Geology and Soils |
| (*1*) | Steepness, composition (bedrock and unconsolidated deposits), and vegetative cover; and | 3.8 Geomorphology; 3.9 Floodplains, Littoral Zones, and Associated Wetland and Riparian Habitats |
| (*2*) | Existing erosion, mass soil movement, slumping, or other forms of instability, including identification of project facilities or operations that are known to or may cause these conditions. | 3.8 Geomorphology |
| **(iii)** | ***Water resources*.** A description of the water resources of the proposed project and surrounding area. This must address the quantity and quality (chemical/physical parameters) of all waters affected by the project, including but not limited to the project reservoir(s) and tributaries thereto, bypassed reach, and tailrace. Components of the description must include: | 3.2 General Description of the River Basin; 3.3 Water Use and Hydrology; 3.4 Water Quality; 3.8 Geomorphology |
| (A) | Drainage area; | 3.2 General Description of the River Basin |
| (B) | The monthly minimum, mean, and maximum recorded flows in cubic feet per second of the stream or other body of water at the power plant intake or point of diversion, specifying any adjustments made for evaporation, leakage, minimum flow releases, or other reductions in available flow; | 3.3 Water Use and Hydrology |
| (C) | A monthly flow duration curve indicating the period of record and the location of gauging station(s), including identification number(s), used in deriving the curve; and a specification of the critical streamflow used to determine the project's dependable capacity; | 3.3 Water Use and Hydrology |
| (D) | Existing and proposed uses of project waters for irrigation, domestic water supply, industrial and other purposes, including any upstream or downstream requirements or constraints to accommodate those purposes; | 3.3 Water Use and Hydrology |
| (E) | Existing instream flow uses of streams in the project area that would be affected by project construction and operation; information on existing water rights and water rights applications potentially affecting or affected by the project; | 3.3 Water Use and Hydrology |
| (F) | Any federally-approved water quality standards applicable to project waters; | 3.4 Water Quality |

| 18 CFR § | FERC Regulation Text | PAD Section |
|---|---|---|
| (G) | Seasonal variation of existing water quality data for any stream, lake, or reservoir that would be affected by the proposed project, including information on: | 3.4 Water Quality |
| (*1*) | Water temperature and dissolved oxygen, including seasonal vertical profiles in the reservoir; | 3.4 Water Quality |
| (*2*) | Other physical and chemical parameters to include, as appropriate for the project; total dissolved gas, pH, total hardness, specific conductance, chlorophyll a, suspended sediment concentrations, total nitrogen (mg/L as N), total phosphorus (mg/L as P), and fecal coliform (E. Coli) concentrations; | 3.4 Water Quality |
| (H) | The following data with respect to any existing or proposed lake or reservoir associated with the proposed project; surface area, volume, maximum depth, mean depth, flushing rate, shoreline length, substrate composition; and | 3.2 General Description of the River Basin; 3.3 Water Use and Hydrology; 3.7 Geology and Soils; 3.8 Geomorphology |
| (I) | Gradient for downstream reaches directly affected by the proposed project. | 3.8 Geomorphology |
| **(iv)** | ***Fish and aquatic resources*.** A description of the fish and other aquatic resources, including invasive species, in the project vicinity. This section must discuss the existing fish and macroinvertebrate communities, including the presence or absence of anadromous, catadromous, or migratory fish, and any known or potential upstream or downstream impacts of the project on the aquatic community. Components of the description must include: | 3.5 Fish and Aquatic Resources |
| (A) | Identification of existing fish and aquatic communities; | 3.5 Fish and Aquatic Resources |
| (B) | Identification of any essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act and established by the National Marine Fisheries Service; and | 3.5 Fish and Aquatic Resources |
| (C) | Temporal and spatial distribution of fish and aquatic communities and any associated trends with respect to: | 3.5 Fish and Aquatic Resources |
| (*1*) | Species and life stage composition; | 3.5 Fish and Aquatic Resources |
| (*2*) | Standing crop; | 3.5 Fish and Aquatic Resources |
| (*3*) | Age and growth data; | 3.5 Fish and Aquatic Resources |
| (*4*) | Spawning run timing; and | 3.5 Fish and Aquatic Resources |
| (*5*) | The extent and location of spawning, rearing, feeding, and wintering habitat. | 3.5 Fish and Aquatic Resources |

| 18 CFR § | FERC Regulation Text | PAD Section |
|---|---|---|
| **(v)** | ***Wildlife and botanical resources*****.** A description of the wildlife and botanical resources, including invasive species, in the project vicinity. Components of this description must include: | 3.6 Botanical and Wildlife Resources |
| (A) | Upland habitat(s) in the project vicinity, including the project's transmission line corridor or right-of-way and a listing of plant and animal species that use the habitat(s); and | 3.6 Botanical and Wildlife Resources |
| (B) | Temporal or spatial distribution of species considered important because of their commercial, recreational, or cultural value. | 3.6 Botanical and Wildlife Resources |
| **(vi)** | ***Wetlands, riparian, and littoral habitat.*** A description of the floodplain, wetlands, riparian habitats, and littoral in the project vicinity. Components of this description must include: | 3.6 Botanical and Wildlife Resources; 3.9 Floodplains, Littoral Zones, and Associated Wetland and Riparian Habitats |
| (A) | A list of plant and animal species, including invasive species, that use the wetland, littoral, and riparian habitat; | 3.6 Botanical and Wildlife Resources; 3.9 Floodplains, Littoral Zones, and Associated Wetland and Riparian Habitats |
| (B) | A map delineating the wetlands, riparian, and littoral habitat; and | 3.9 Floodplains, Littoral Zones, and Associated Wetland and Riparian Habitats |
| (C) | Estimates of acreage for each type of wetland, riparian, or littoral habitat, including variability in such availability as a function of storage at a project that is not operated in run-of-river mode. | 3.9 Floodplains, Littoral Zones, and Associated Wetland and Riparian Habitats |
| **(vii)** | ***Rare, threatened and endangered species.*** A description of any listed rare, threatened and endangered, candidate, or special status species that may be present in the project vicinity. Components of this description must include: | 3.5 Fish and Aquatic Resources; 3.6 Botanical and Wildlife Resources |
| (A) | A list of Federal- and state-listed, or proposed to be listed, threatened and endangered species known to be present in the project vicinity; | 3.5 Fish and Aquatic Resources; 3.6 Botanical and Wildlife Resources |
| (B) | Identification of habitat requirements; | 3.5 Fish and Aquatic Resources; 3.6 Botanical and Wildlife Resources |
| (C) | References to any known biological opinion, status reports, or recovery plan pertaining to a listed species; | 3.5 Fish and Aquatic Resources; 3.6 Botanical and Wildlife Resources |

| 18 CFR § | FERC Regulation Text | PAD Section |
|---|---|---|
| (D) | Extent and location of any federally-designated critical habitat, or other habitat for listed species in the project area; and | 3.5 Fish and Aquatic Resources;<br>3.6 Botanical and Wildlife Resources |
| (E) | Temporal and spatial distribution of the listed species within the project vicinity. | 3.5 Fish and Aquatic Resources;<br>3.6 Botanical and Wildlife Resources |
| **(viii)** | ***Recreation and land use*****.** A description of the existing recreational and land uses and opportunities within the project boundary. The components of this description include: | 3.10 Land Use; 3.11 Recreation Resources |
| (A) | Text description illustrated by maps of existing recreational facilities, type of activity supported, location, capacity, ownership and management; | 3.10 Land Use; 3.11 Recreation Resources |
| (B) | Current recreational use of project lands and waters compared to facility or resource capacity; | 3.11 Recreation Resources |
| (C) | Existing shoreline buffer zones within the project boundary; | 3.11 Recreation Resources |
| (D) | Current and future recreation needs identified in current State Comprehensive Outdoor Recreation Plans, other applicable plans on file with the Commission, or other relevant local, state, or regional conservation and recreation plans; | 3.11 Recreation Resources |
| (E) | If the potential applicant is an existing licensee, its current shoreline management plan or policy, if any, with regard to permitting development of piers, boat docks and landings, bulkheads, and other shoreline facilities on project lands and waters; | 3.11 Recreation Resources |
| (F) | A discussion of whether the project is located within or adjacent to a: | 3.11 Recreation Resources |
| (*1*) | River segment that is designated as part of, or under study for inclusion in, the National Wild and Scenic River System; or | 3.11 Recreation Resources |
| (*2*) | State-protected river segment; | 3.11 Recreation Resources |
| (G) | Whether any project lands are under study for inclusion in the National Trails System or designated as, or under study for inclusion as, a Wilderness Area. | 3.11 Recreation Resources |
| (H) | Any regionally or nationally important recreation areas in the project vicinity; | 3.11 Recreation Resources |
| (I) | Non-recreational land use and management within the project boundary; and | 3.10 Land Use |
| (J) | Recreational and non-recreational land use and management adjacent to the project boundary. | 3.10 Land Use; 3.11 Recreation Resources |

| 18 CFR § | FERC Regulation Text | PAD Section |
|---|---|---|
| **(ix)** | ***Aesthetic resources*.** A description of the visual characteristics of the lands and waters affected by the project. Components of this description include a description of the dam, natural water features, and other scenic attractions of the project and surrounding vicinity. Potential applicants are encouraged to supplement the text description with visual aids. | 3.12 Aesthetics |
| **(x)** | ***Cultural resources*.** A description of the known cultural or historical resources of the proposed project and surrounding area. Components of this description include: | 3.13 Cultural Resources; 3.14 Tribal Resources |
| (A) | Identification of any historic or archaeological site in the proposed project vicinity, with particular emphasis on sites or properties either listed in, or recommended by the State Historic Preservation Officer or Tribal Historic Preservation Officer for inclusion in, the National Register of Historic Places; | 3.13 Cultural Resources |
| (B) | Existing discovery measures, such as surveys, inventories, and limited subsurface testing work, for the purpose of locating, identifying, and assessing the significance of historic and archaeological resources that have been undertaken within or adjacent to the project boundary; and | 3.13 Cultural Resources |
| (C) | Identification of Indian tribes that may attach religious and cultural significance to historic properties within the project boundary or in the project vicinity; as well as available information on Indian traditional cultural and religious properties, whether on or off of any federally-recognized Indian reservation (A potential applicant must delete from any information made available under this section specific site or property locations, the disclosure of which would create a risk of harm, theft, or destruction of archaeological or Native American cultural resources or to the site at which the resources are located, or would violate any Federal law, including the Archaeological Resources Protection Act of 1979, 16 U.S.C. 470w-3, and the National Historic Preservation Act of 1966, 16 U.S.C. 470hh). | 3.14 Tribal Resources |
| **(xi)** | ***Socio-economic resources*.** A general description of socio-economic conditions in the vicinity of the project. Components of this description include general land use patterns (*e.g.,* urban, agricultural, forested), population patterns, and sources of employment in the project vicinity. | 3.15 Socioeconomics |
| **(xii)** | ***Tribal resources*.** A description of Indian tribes, tribal lands, and interests that may be affected by the project Components of this description include: | 3.14 Tribal Resources |

| 18 CFR § | FERC Regulation Text | PAD Section |
|---|---|---|
| (A) | Identification of information on resources specified in paragraphs (d)(2)(ii)-(xi) of this section to the extent that existing project construction and operation affecting those resources may impact tribal cultural or economic interests, *e.g.,* impacts of project-induced soil erosion on tribal cultural sites; and | 3.14 Tribal Resources |
| (B) | Identification of impacts on Indian tribes of existing project construction and operation that may affect tribal interests not necessarily associated with resources specified in paragraphs (d)(3)(ii)-(xi) of this Section, *e.g.,* tribal fishing practices or agreements between the Indian tribe and other entities other than the potential applicant that have a connection to project construction and operation. | 3.14 Tribal Resources |
| **(xiii)** | ***River basin description.*** A general description of the river basin or sub-basin, as appropriate, in which the proposed project is located, including information on: | 3.2 General Description of the River Basin |
| (A) | The area of the river basin or sub-basin and length of stream reaches therein; | 3.2 General Description of the River Basin |
| (B) | Major land and water uses in the project area; | 3.2 General Description of the River Basin |
| (C) | All dams and diversion structures in the basin or sub-basin, regardless of function; and | 3.2 General Description of the River Basin |
| (D) | Tributary rivers and streams, the resources of which are or may be affected by project operations. | 3.2 General Description of the River Basin |

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| | |
|---|---|
| °F | degrees Fahrenheit |
| BLM | Bureau of Land Management |
| cfs | cubic feet pers second |
| FERC or Commission | Federal Energy Regulatory Commission |
| Forest Service | United States Forest Service |
| HUC | Hydraulic Unit Code |
| Project | Kern River No. 1 Hydroelectric Project |
| SCE | Southern California Edison Company |
| USACE | United States Army Corps of Engineer |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |

## 3.2 GENERAL DESCRIPTION OF THE RIVER BASIN

This section describes the Kern River Basin, where Southern California Edison Company's (SCE) Kern River No. 1 Hydroelectric Project (Project) is located. The Federal Energy Regulatory Commission's (FERC) content requirements for this section are specified in Title 18 of the Code of Federal Regulations Chapter I § 5.6(d)(3)(xiii).

This section provides an overview of the Kern River Basin, including information on the overall basin area and subbasin areas; length of stream reaches; waterbodies located within the basin including lakes and tributary streams; major land and water uses; and other dams and diversions in the basin.

### 3.2.1 Information Sources

This section was developed using existing information available in the following primary sources. Additional references are cited in the text, as appropriate.

- FERC's Final Environmental Assessment for Hydropower License, Kern River No. 1 Hydroelectric Project (FERC 1998)
- Informal Consultation on the Proposed Isabella Lake Dam Safety Modification Project (United States Fish and Wildlife Service [USFWS] 2016)
- United States Army Corps of Engineers (USACE) Isabella Lake Construction Update (USACE 2022)
- FERC's letter granting extension of time for filing surrender application (FERC 2022)

### 3.2.2 Kern River Basin

The Kern River Basin is the southernmost of four major river basins in the larger Tulare-Buena Vista Lakes Basin (Tulare Lake Basin) (Hydraulic Unit Code [HUC] 180300) draining to Tulare and Buena Vista lakes, and the southern-most major river system in the Sierra Nevada range (United States Geological Survey [USGS] 1981). The Kern River Basin is divided into three subbasins: Upper Kern Subbasin (HUC 18030001); South Fork Kern Subbasin (HUC 18030002); and the Middle Kern-Upper Tehachapi-Grapevine Subbasin (HUC 18030003) (Map 3.2-1). The Basin is characterized by steep slopes and deeply incised channels within rugged canyons. These channels have limited geomorphic landform development and are confined by narrow V-shaped valley bottoms and steep-side slopes with substrates dominated by bedrock and coarse sediment (i.e., boulders).

#### 3.2.2.1 Upper Kern Subbasin

The North Fork Kern River begins in the Upper Kern Subbasin in Sequoia National Park in northeastern Tulare County. The headwaters originate in small lakes northwest of Mount Whitney (14,505 feet above mean sea level [amsl]) on the west side of the Sierra Nevada, contained by the Great Western Divide to the west (a series of mountains in the

Sierra Nevada range dividing Kings Canyon and Sequoia National Parks), the Kings-Kern Divide to the north, and the main Sierra Crest to the east, all of which have mountain peaks above 13,000 feet amsl in elevation (USGS 2022). From its headwaters, the North Fork Kern River flows south through the Kern Canyon, a deep glacier-carved canyon, through both the Inyo and Sequoia National Forests and the Golden Trout Wilderness, receiving water from Rock Creek, Big Arroyo, Golden Trout Creek, and Rattlesnake Creek (USGS 2022). At Hockett Peak, the North Fork Kern River is joined by the Little Kern River at Forks of the Kern (USGS 2022) and then continues south to Lake Isabella. The elevation of the Upper Kern Subbasin ranges from 14,495 feet amsl at Mt. Whitney to 2,065 feet amsl at Lake Isabella (FERC and Forest Service 1996). The North Fork Kern River is approximately 92 miles long and has a drainage area of approximately 1,093 square miles.

#### 3.2.2.2 South Fork Kern Subbasin

The headwaters for the South Fork Kern River begin in the Sierra Nevada Mountains of the Inyo National Forest in northeastern Tulare County, about 10 miles east of the North Fork Kern River in the South Fork Kern Subbasin. The headwaters begin in the Gold Trout Wilderness, flowing south into the Sequoia National Forest. The South Fork Kern River is 100 miles long and has a drainage area of approximately 981 square miles.

Isabella Dam, owned and managed by USACE, is located downstream of the confluence of the north and south forks of the Kern River, creating Lake Isabella.

#### 3.2.2.3 Middle Kern-Upper Tehachapi-Grapevine Subbasin – Cottonwood Creek-Kern River Subbasin

Below Lake Isabella, the Kern River (referred to as the lower Kern River) enters the Middle Kern-Upper Tehachapi-Grapevine Subbasin. The Kern River flows an additional 75 miles and has a drainage area of 2,612 square miles. The Middle Kern-Upper Tehachapi-Grapevine Subbasin is divided into 16 subbasins. The Project is located within the Cottonwood Creek-Kern River subbasin, specifically in the Stark Creek-Kern River, Lucas Creek-Kern River, and Mill Creek-Kern River subbasins (Map 3.2-2).

Project facilities range from approximately 1,913 feet amsl at Democrat Dam to approximately 924 feet amsl at the Kern River No. 1 Powerhouse. Table 3.2-1 provides a summary of the subbasin areas, stream length, and elevations in the vicinity of the Project.

The longitudinal profile for lower Kern River, from Isabella Dam to the Mouth of the Kern Canyon is shown in Figure 3.2-1. The overall gradient from Isabella Dam to the Mouth of the Kern Canyon is 1.1%. Figure 3.2-2 provides the longitudinal profile for the lower Kern River from Democrat Dam Impoundment to the Kern River No. 1 Powerhouse (bypass reach). The overall gradient of this river section is 1.8%. The largest tributaries in the vicinity of the Project are Lucas and Stark creeks, containing upstream drainages of approximately 35 to 45 square miles each. Localized gradients in the vicinity of the bypass reach are up to 3.5%. The lower Kern River within the bypass reach, is a bedrock-controlled stream that is limited in its ability to adjust either vertically or laterally.

Streamflow upstream of Democrat Dam is regulated by the outflow from Lake Isabella. Lake Isabella is primarily used for flood control and irrigation (storage) and attenuates the snowmelt hydrograph. Spill flows may occur in the winter during extremely heavy rain events or in the spring during large snowmelt runoff.

### 3.2.3 Dams and Diversions

There are six FERC-licensed hydroelectric projects located on the Kern River (Map 3.2-3). In addition, the USACE operates a major flood control and storage reservoir upstream of the Kern River No. 1 Hydroelectric Project. SCE's Kern River No. 3 Project (FERC No. 2290), located on the North Fork Kern River, is the furthest upstream project and flows into Lake Isabella. The Kern River No. 3 Project is operated in run-of-river mode and consists of a main diversion dam and two feeder dams before discharging back to the North Fork Kern River at the Kern River No. 3 Powerhouse near Kernville, CA. Isabella Dam, located downstream of the Kern River No. 3 Project, is also fed by the adjoining South Fork Kern River to the east. The remaining five FERC-licensed hydroelectric projects are located on the mainstem Kern River and are licensed to SCE, Kern and Tule Hydro, LLC, and the Olcese Water District (Table 3.2-1).

Lake Isabella is a 568,075 acre-foot reservoir constructed in 1953 by the USACE, and provides flood-risk management, irrigation, and recreational benefits. The Lake Isabella Dam consists of a main dam on the Kern River channel and an auxiliary dam located immediately to the east of the main dam with a main service spillway located between the two. At the time of construction, the Isabella Auxiliary Dam overlaid a portion of the canal system for SCE’s former Borel Hydroelectric Project (FERC No. 382). In response, the USACE incorporated a controlled conduit through the Isabella Auxiliary Dam to allow continued operation of the Borel Project. As part of project operations, water was diverted from Lake Isabella and into an open canal and flume system before discharging back to the Kern River via the Borel Powerhouse located 7 miles downstream. In addition, the Isabella Partners Project (FERC No. 8377) generates from reservoir releases at the Isabella Main Dam, as directed by the Kern River watermaster.

In 2017, the USACE implemented a safety modification to the Isabella Auxiliary Dam, in which the USACE condemned 10.7 acres of private and public land associated with the Borel Project and sealed off the existing section of conduit through the Auxiliary Dam by filling it with concrete and abandoning it in-place, thus rendering the Borel Project non-operational. Consequently, the FERC requested that SCE file a plan and schedule for surrendering the Borel Project license. SCE has committed to file an application for project surrender no later than May 1, 2023, which FERC accepted in its August 30, 2022, letter.

The highest inflow to the Kern River No. 1 Hydroelectric Project typically occurs during the summer months resulting from irrigation releases from Isabella Dam to meet water delivery commitments in the California Central Valley. Isabella Dam occasionally spills water over the main service spillway during periods of exceptional inflow. However, Isabella Dam has not spilled water in recent years due to a storage restriction, which limits storage in Lake Isabella to 361,250 acre-feet outside of flood season and 170,000 acre-feet during flood season (November–March). The storage restriction was put in place to address seismic, hydrologic (potential overtopping during an extreme flood event), and seepage issues at the dams until a permanent solution was implemented.

The USACE dam safety modification project at Isabella Dam consists of: constructing a full height filter and drain on the downstream slope of the main dam; raising the crest height of the main and auxiliary dams by 16 feet; fortifying the main service spillway; constructing a new 300-foot-wide emergency spillway between the main and auxiliary dams; adding a 80-foot wide buttress to the auxiliary dam; and sealing the Borel conduit through the Auxiliary Dam. The USACE anticipates completion of the dams and spillways construction in 2023 and completion of the permanent operations facilities in 2024.

Downstream of Lake Isabella, the Kern River is undiverted for 13 miles until reaching Democrat Dam, which diverts water into the Kern River No. 1 Hydroelectric Project. Thus, the Kern River No. 1 Hydroelectric Project inflow is almost entirely regulated by upstream operations at Isabella Dam, save for a few small tributaries between Isabella Dam and Democrat Dam. Water is diverted at Democrat Dam for the Kern River No. 1 Hydroelectric Project (intake capacity of 412 cfs) when flows exceed the minimum flow requirements of the license. The Project license (Article 401) requires 50 cfs to be released to the bypass reach from June 1 to September 30 and 15 cfs to be released between October 1 and May 31, or inflow if lower than the seasonal flow requirement. Water travels through the water conveyance system for 10.2 miles to the Kern River No. 1 Powerhouse. Water exits the powerhouse via a short tailrace and is then immediately diverted for Kern and Tule Hydro LLC's Kern Canyon Project (FERC No. 178). Diverted water from the Kern Canyon Project is released 1.6 miles downstream at the Kern Canyon Powerhouse and then diverted again 500 feet downstream by the Olcese Water District for its Rio Bravo Hydro Project (FERC No. 4129). The Rio Bravo Project returns diverted water back to the Kern River 2 miles downstream at the Rio Bravo Powerhouse where the Kern River continues downstream into the City of Bakersfield and the California Central Valley where it is almost entirely utilized by consumptive uses (see Section 3.2.4, Major Water Uses).

### 3.2.4 Major Water Uses

Upstream from the Project, water from the North Fork Kern River and South Fork Kern River flows into Lake Isabella. From the reservoir, these waters then flow into the Kern River, which, along with the Kings, Kaweah, and Tule rivers, supply the majority of the surface water supply to the Tulare Lake Basin (CRWQCB 2018). Water from the Kern River in this area is principally diverted for agriculture, with minor quantities being diverted for the urban area around Bakersfield and Oildale (Dale et al. 1966). At the southern end of the Kern River, the water is almost entirely diverted for irrigation and aquifer recharge, with any excess water directed into the California Aqueduct (part of the California State Water Project) or Buena Vista Lake. In addition to agriculture and domestic uses, large areas of land downstream from the Project have also been developed for the purposes of conserving the Kern River and other water supplies not needed for crop irrigation, which has allowed for underground storage of this water for future use (City of Bakersfield 2003).

Water rights diversions from the Kern River for these agricultural and domestic purposes date back to the 1860s (CAEPA 2008). The present distribution, use, and basis of water rights in the Kern River is complex and based on various other decrees and agreements developed over the last 100 years (CAEPA 2008).[1]

SCE operates the Project in a run-of-river mode for hydropower generation. Minimum instream flow releases are set at levels to benefit aquatic resources, to provide recreational opportunities, and to preserve aesthetic resources. No consumptive water use occurs until the Kern River reaches the mouth of the Kern River Canyon (downstream of the Project), where it is then diverted by several water users, primarily for agricultural purposes.

### 3.2.5 Major Land Uses

The Project is located in a rural area bounded within a narrow canyon. The Project is located entirely on National Forest System Lands in the Sequoia National Forest which is administered by the United States Forest Service (Forest Service). Consequently, there is no development within the immediate vicinity of the Project area except for recreation facilities and river access sites owned and operated by the Forest Service. The main recreation activities in the vicinity of the Project include whitewater rafting, fishing, hiking, and picnicking (see Section 3.11, Recreation Resources for additional information).

Small residential communities are located upstream of the Project and around Lake Isabella, which include the towns of Wofford Heights, Lake Isabella, Keyesville, and Bodfish. The closest major city is Bakersfield which is located about 15 miles southwest of the Project. The Kern River has historically been a focal point for the Bakersfield area, as it provides the city's municipal water supply, and also agricultural irrigation and recreational opportunities, allowing Bakersfield to become a major metropolitan area (County of Kern 2003).

Agriculture, including cultivated crops and hay, occurs in the Kern River Subbasins, particularly in the area around Bakersfield. Rangeland occurs in Kern County northeast of the Project around Lake Isabella on Bureau of Land Management (BLM) grazing allotments (BLM 2020). A more detailed discussion of land use in the vicinity of the Project can be found in Section 3.10, Land Use.

### 3.2.6 Climate

The Kern River Basin (Watershed) is characterized as a Mediterranean subtropical climate with cold, wet winters, and hot dry summers. Precipitation falls as snow in the

[1] Decision of the California Supreme Court in Lux v. Haggin (1886) 69 Cal. 255; Farmers Canal Company v. J.R. Simmon (Super. Ct., Kern County, 1900, No. 1901); Miller-Haggin Agreement, 1888; Amendment to the Miller-Haggin Agreement, 1930; Amendment to the Miller-Haggin Agreement, 1955; Kern River Water Rights and Storage Agreement, 1962; Lake Isabella Recreation Pool Agreement, 1963.

higher elevations of the Watershed, generally above Lake Isabella at elevations above 5,000 feet above sea level.

In the vicinity of the Project, precipitation generally occurs in the form of rain. Mean annual precipitation as measured at Isabella Dam from 1921 to 2022 is 10.97 inches. Temperature, as measured approximately 2.5 miles east of Democrat Dam between 2002 and 2022 is variable throughout the year with an average annual high temperature of 76.99° Fahrenheit (°F) and an average annual low of 49.46°F. The monthly average high and low temperatures are provided in Table 3.2-3.

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# TABLES

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## Table 3.2-1. Summary of Drainage Area and Stream Length of Waters in the Cottonwood Creek-Kern River Subbasins

| Cottonwood Creek-Kern River Subbasin | Total Area ($mi^2$) | Sub-divided Areas ($mi^2$) | Stream Length (mi) | Elevation (feet) |
|---|---|---|---|---|
| Mill Creek – Kern River | 112.5 | 45.3 | 7.6 | 2,018 to 7,535 feet |
| Lucas Creek – Kern River | | 34.0 | 8.7 | 1,554 to 7,458 feet |
| Stark Creek – Kern River | | 33.2 | 10.7 | 552 to 6,251 feet |

**Table 3.2-2. Summary of FERC-licensed Hydropower Projects in the Kern River Basin below Lake Isabella**

| Project | Licensee | Powerhouse Capacity (megawatts) | Location of Diversion Dam (river mile [RM]) | Intake Capacity (cubic feet per second [cfs]) | Bypass Reach Length (miles) | Minimum flow requirements |
|---|---|---|---|---|---|---|
| Isabella (FERC No. 8377) | Isabella Partners | 11.95 | RM 74.9 | > 605 | 0 | Run-of-river operation w/ USACE operations |
| Borel (FERC No. 382) | Southern California Edison Company | 12 | RM 74.9 | 605 | 7 | 25 cfs (Nov–Apr)<br>30 cfs (May, Oct)<br>60 cfs (Jun–Sep) |
| Kern River No. 1 (FERC No. 1930) | Southern California Edison Company | 26.3 | RM 54.4 | 412 | 10.2 | 50 cfs or inflow (June 1–Sept 30)<br>15 cfs or inflow (Oct 1–May 31) |
| Kern Canyon (FERC No. 178) | Kern & Tule Hydro, LLC | 11.475 | RM 43.9 | 720 | 1.6 | 25 cfs (year-round)<br>60 cfs (June–October) in wet years |
| Rio Bravo (FERC No. 4129) | Olcese Water District | 14 | RM 41.8 | 1,600 | 2 | 50 cfs (year-round) |

**Table 3.2-3. Average Monthly Temperature above Democrat Dam and Precipitation at Lake Isabella**

| Month | Average High Temperature (°F) | Average Low Temperature (°F) | Average Precipitation (inches) |
|---|---|---|---|
| January | 60.09 | 37.86 | 2.29 |
| February | 61.15 | 38.22 | 2.14 |
| March | 65.15 | 40.63 | 1.56 |
| April | 70.57 | 43.78 | 0.71 |
| May | 79.57 | 50.57 | 0.26 |
| June | 90.63 | 59.74 | 0.08 |
| July | 98.20 | 66.79 | 0.12 |
| August | 96.80 | 64.30 | 0.15 |
| September | 90.86 | 58.47 | 0.23 |
| October | 78.66 | 48.83 | 0.36 |
| November | 67.25 | 42.21 | 1.07 |
| December | 58.13 | 37.49 | 2.11 |

Source:
National Oceanic and Atmospheric Administration, Weather Station USR0000CDMC – Democrat California and California Data Exchange Center Precipitation Data – Isabella Dam (ISB): accessed November 2022

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# FIGURES

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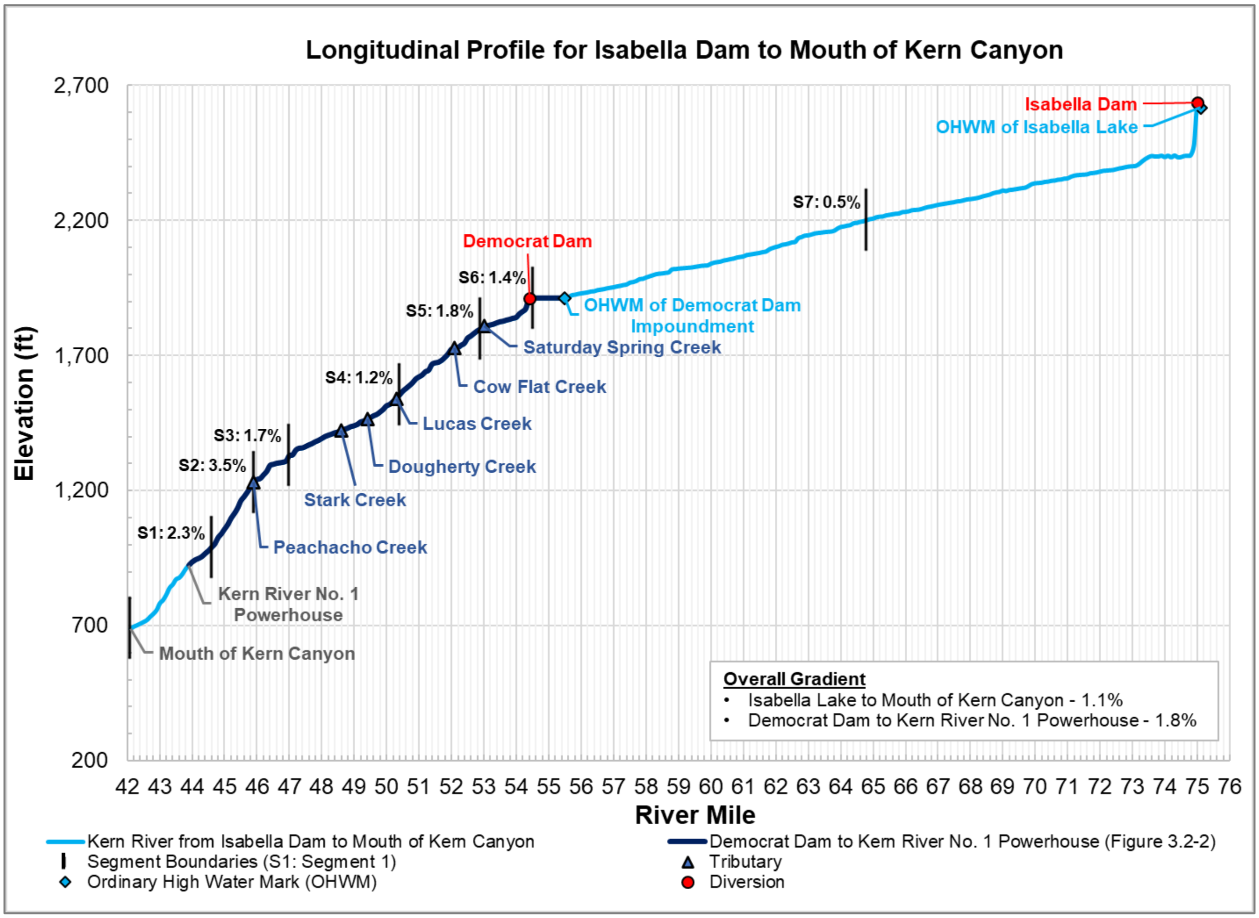


**Figure 3.2-1. Longitudinal Profile of Lower Kern River from Isabella Dam to the Mouth of Kern Canyon**

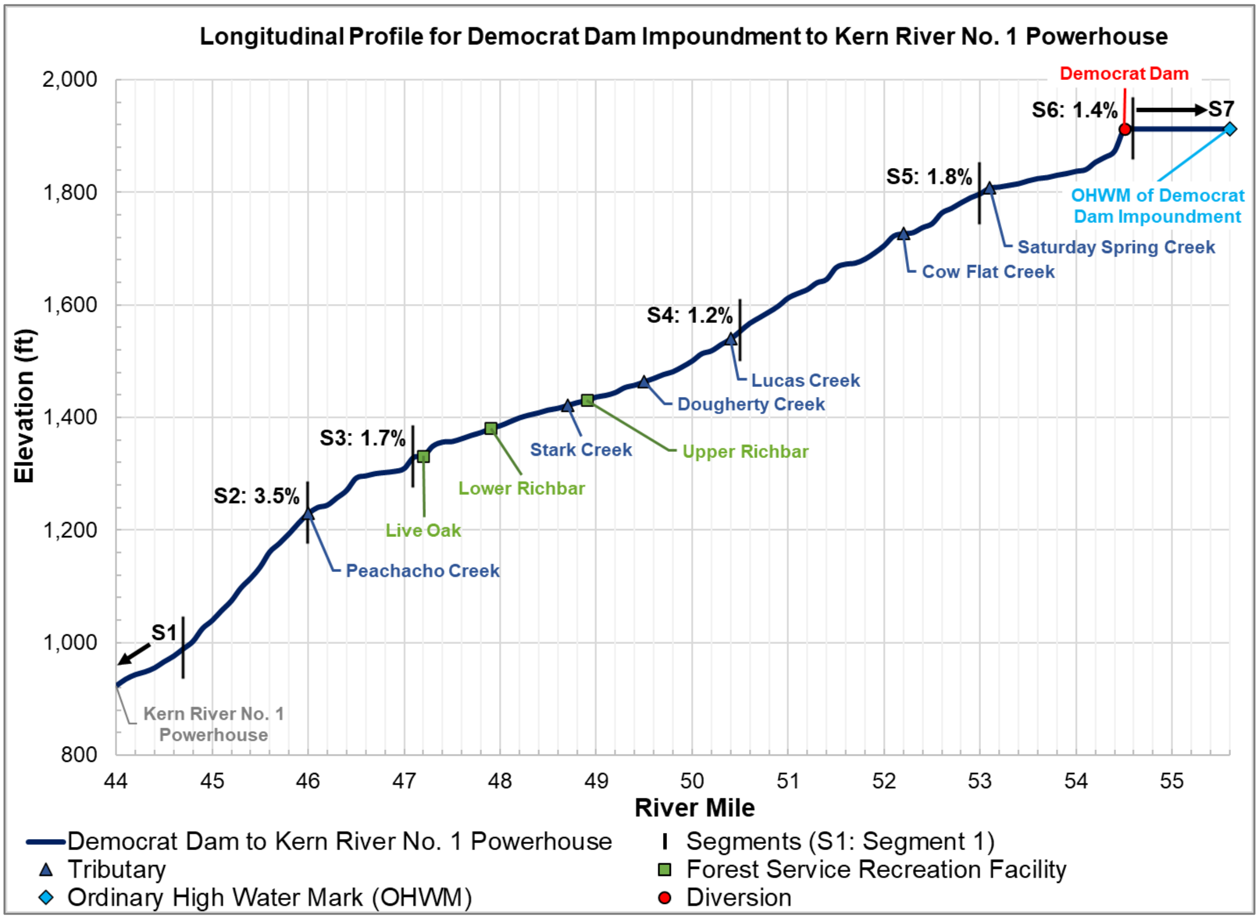


**Figure 3.2-2. Longitudinal Profile of Lower Kern River from Democrat Dam to the Kern River No. 1 Powerhouse**

# MAPS

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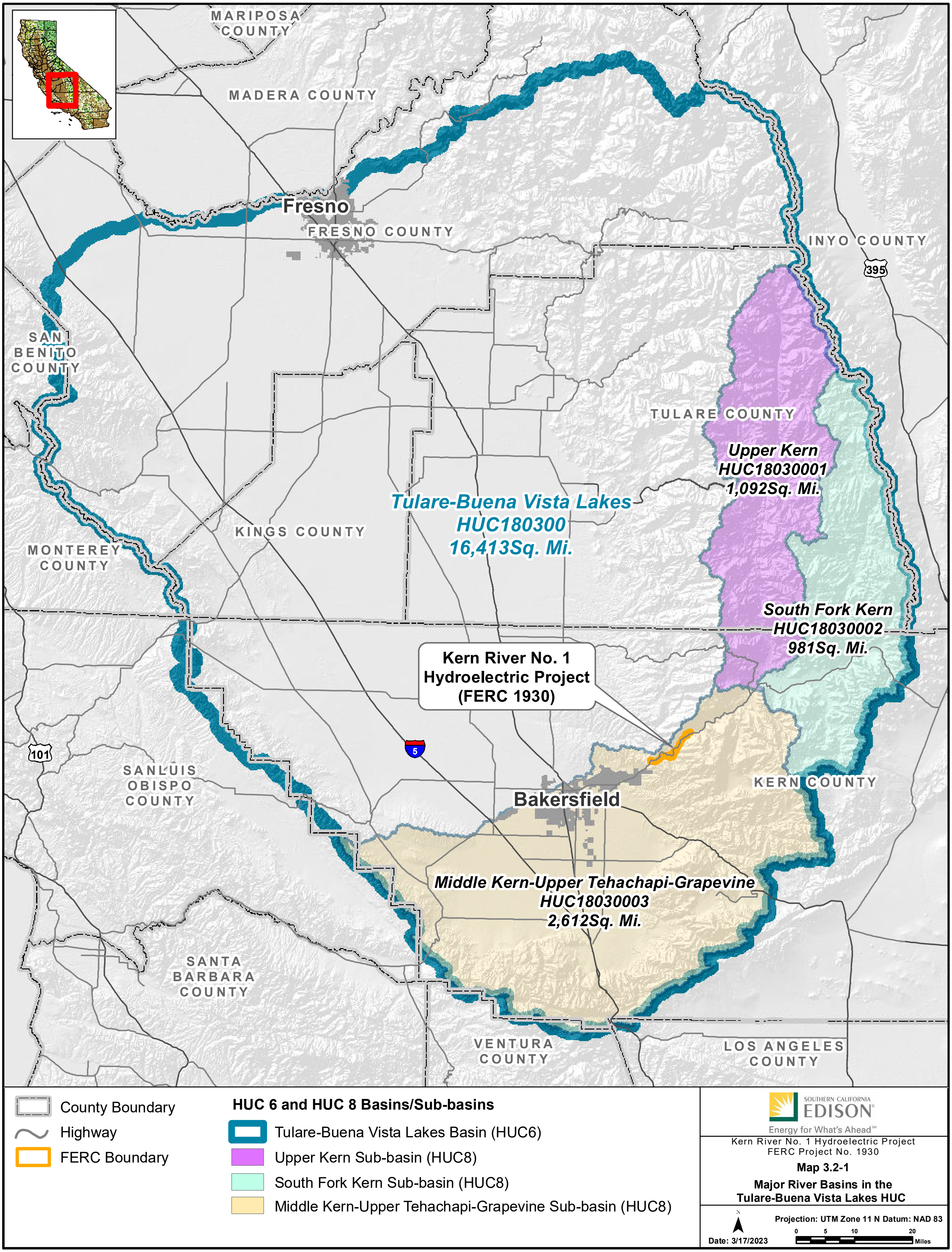


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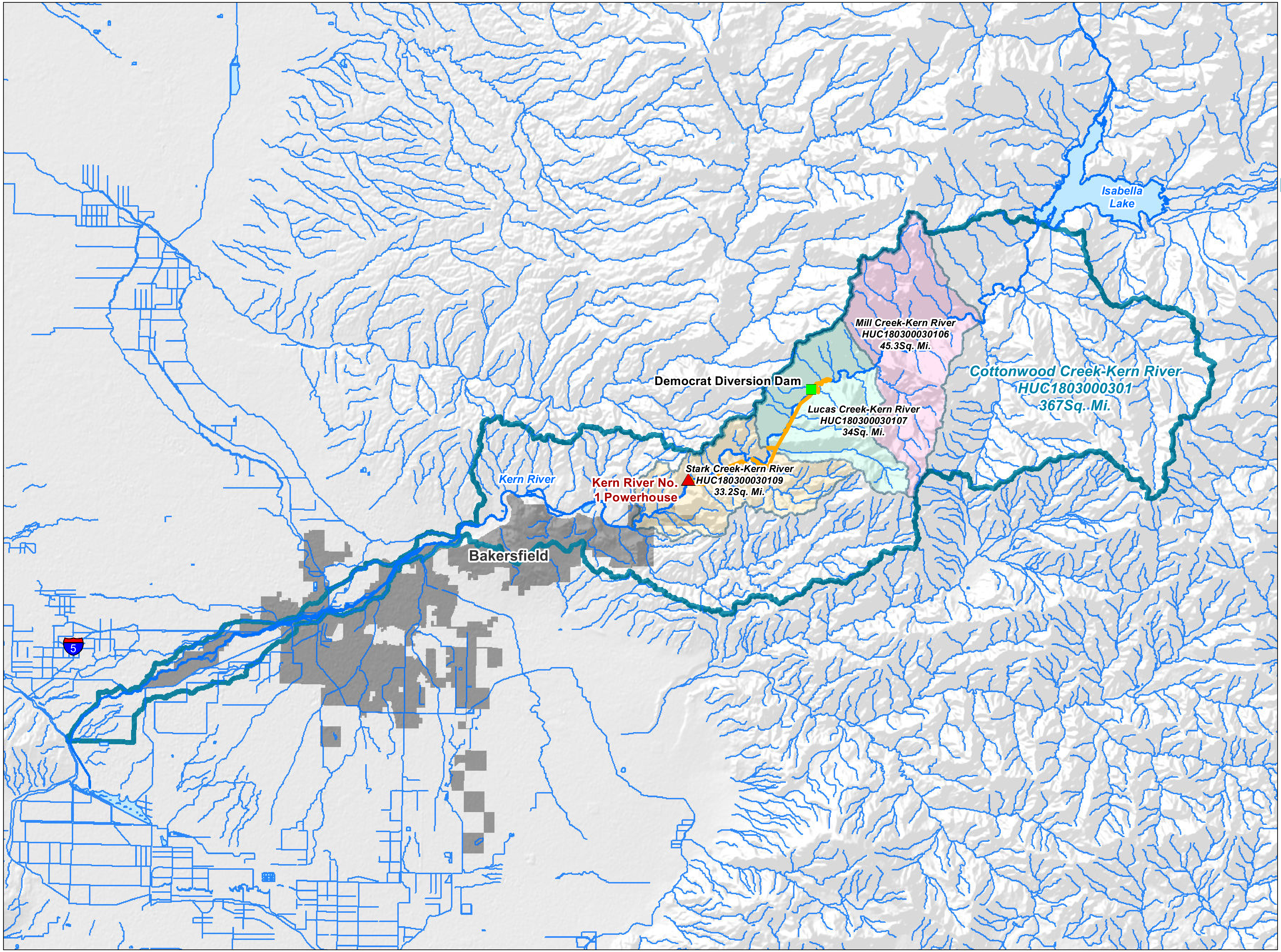



**Facilities**

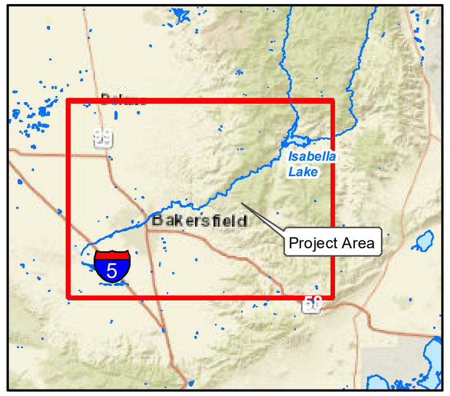
- Dam
- Powerhouse
- FERC Boundary

**Other Features**

- Highway
- Watercourse
- Water Body

**HUC 10 and HUC 12 Basins/Sub-basins**

- Cottonwood Creek-Kern River (HUC10)
- Mill Creek-Kern River (HUC 12)
- Lucas Creek-Kern River (HUC12)
- Stark Creek-Kern River (HUC12)

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Kern River No. 1 Hydroelectric Project
FERC Project No. 1930

**Map 3.2-2**

**Cottonwood Creek-Kern River HUC and HUC12 Sub-basins**

0 2.5 5 Miles

Date: 3/17/2023

**Projection: UTM Zone 11**
**Datum: NAD 83**



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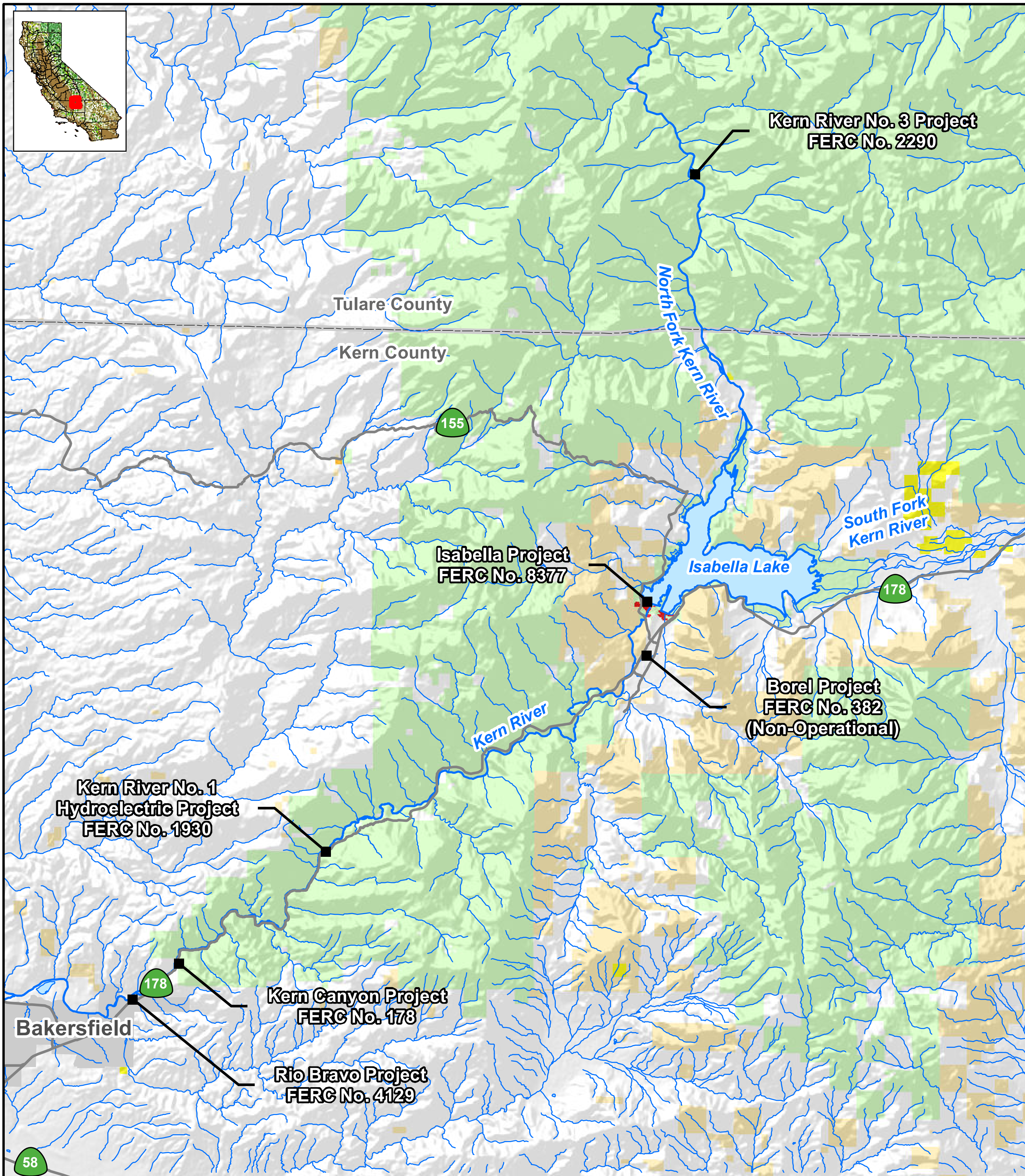


County Boundary
Highway
Watercourse
Water Body

**Land Ownership (BLM, 2021)**

U. S. Forest Service
U. S. Bureau of Land Management
U. S. Army Corps of Engineers
State of California
Private (Blank)

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Kern River No. 1 Hydroelectric Project
FERC Project No. 1930

**Map 3.2-3**

**FERC-Licensed Projects in the Kern River Basin**

Projection: UTM Zone 11 N Datum: NAD 83

0 2.5 5 Miles

Date: 5/1/2023

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## LIST OF ACRONYMS

| | |
|---|---|
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CRWQCB | California Regional Water Quality Control Board |
| FERC | Federal Energy Regulatory Commission |
| Project | Kern River No. 1 Hydroelectric Project |
| SCE | Southern California Edison Company |
| USACE | United States Army Corps of Engineers |
| USGS | United States Geological Survey |

## 3.3 WATER USE AND HYDROLOGY

This section describes water use and hydrology associated with Southern California Edison Company's (SCE) Kern River No. 1 Hydroelectric Project (Project). The Federal Energy Regulatory Commission's (FERC) content requirements for this section are specified in Title 18 of the Code of Federal Regulations (CFR) Chapter I § 5.6(d)(3)(iii). The FERC regulations require information on water resources, including water use and water quality, affected by the Project. This section specifically addresses the water use (hydrology) component of the FERC regulations. Information on water quality is addressed in Section 3.4, Water Quality.

Section 3.3.2, Kern River Basin Overview provides an overview of the Kern River Basin/Watershed. Section 3.3.3, Existing Water Uses provides information on: (1) Project water uses; (2) Project water rights and agreements; and (3) upstream and downstream requirements or constraints that may affect Project operations. Section 3.3.4, Hydrology provides information on: (1) existing FERC license flow requirements; (2) flow gages used for Project operations and/or compliance; (3) hydrology associated with Project operations; and (4) water storage.

Additional information on Project facilities and operations and adjacent water projects can be found in Section 2.0, Project Location, Facilities, and Operations and Section 3.2, General Description of the River Basin, respectively.

### 3.3.1 Information Sources

This section was developed using existing information available in the following primary sources. Additional references are cited in the text, as appropriate.

- California Regional Water Quality Control Board (CRWQCB), Central Valley Region, Water Quality Control Plan for the Tulare Lake Basin (CRWQCB 2018)
- FERC's Order Issuing New License, Kern River No. 1 Hydroelectric Project (FERC 1998)
- United States Army Corps of Engineers (USACE) Isabella Situation Report (USACE 2022)
- United States Geological Survey (USGS) Surface-Water Data for the Nation (USGS 2022)

### 3.3.2 Kern River Basin Overview

The Kern River Basin/Watershed (Basin or Watershed) consists of two principal forks, the North Fork and South Fork, and a lower river reach referred to as the lower Kern River. Both forks flow generally southward and converge at Lake Isabella. The lower Kern River exits Lake Isabella and flows west toward the San Joaquin Valley and terminates in Buena Vista Lake about 20 miles southwest of the City of Bakersfield.

As described in Section 3.2, General Description of the River Basin and shown on Map 3.2-1, there are a total of six FERC-licensed hydroelectric projects located on the Kern River. In addition, USACE operates Lake Isabella, a major flood control and storage reservoir upstream of the Project.

### 3.3.3 Existing Water Uses

This section describes existing water uses including: (1) Project water uses; (2) Project water rights and agreements; and (3) upstream and downstream requirements or constraints that may affect Project operations.

#### 3.3.3.1 Project Water Uses

Existing beneficial uses that apply to the surface waters within the Kern River Watershed are identified in the Water Quality Control Plan for the Tulare Lake Basin (Basin Plan) (CRWQCB 2018). Beneficial uses identified in the Basin Plan that pertain to the Kern River from Lake Isabella to the Kern River No. 1 Powerhouse (inclusive of the Project) include: (1) hydropower generation; (2) water contact recreation (3) non-contact water recreation; (4) warm freshwater habitat; (5) cold freshwater habitat; (6) wildlife habitat; and (7) rare, threatened, or endangered species.

SCE operates the Project in a run-of-river mode for hydroelectric generation. The Project has a single powerhouse containing four generating units. Water is diverted from the Kern River at Democrat Dam and directed through the Project's water conveyance system, comprised of approximately 8.5 miles of tunnels, flumes, and conduits. Water within the conveyance system is directed to a small concrete forebay, through a buried penstock, and into the Project powerhouse. The total installed capacity of the powerhouse is 26.3 megawatts. Water exiting the powerhouse is returned to the Kern River via a short tailrace located on the upstream side of the powerhouse (10.2 miles downstream of the dam). See Map 2-3 a-g, Project Facilities.

A summary of Project generation and outflow records for operations (annually and quarterly) for the 5 years preceding filing of the Pre-Application Document (2018–2022) is provided in Table 2-5. Based on the last 5 years, the estimated dependable generating capacity of the Project is 24.8-megawatt hours.

#### 3.3.3.2 Project Water Rights / Agreements

The Project operates under Water Right Claim S007761, a Pre-1914 water right with a direct diversion limit of 412 cubic feet per second (cfs) and incidental consumptive use at the powerhouse. This water right is senior to the water rights allowing operation at Lake Isabella, as such inflow up to 412 cfs into Isabella Reservoir must be bypassed through Isabella Dam to avoid injury to SCE.

SCE and the City of Bakersfield have an agreement that allows the City to request SCE reduce its water entitlement deliveries from Lake Isabella, provided the City compensates SCE for the associated loss of generation. The water in Lake Isabella would remain in storage for future water supply deliveries to the City.

#### 3.3.3.3 Upstream Requirements or Constraints

Flows upstream of the Project are influenced by the retirement of SCE’s Borel Project (FERC Project No. 382) and USACE's operation of Lake Isabella. SCE's Borel Project was originally licensed in 1925. The original Borel diversion structure is located approximately 4.2 miles upstream of Isabella Dam and the Powerhouse is located approximately 7 miles downstream of Isabella Dam. Prior to the construction of Isabella Dam (1953), the Borel Project was a run-of-river project that diverted water from the North Fork Kern River into an 11.2-mile-long canal and penstock conveyance system to the Borel Powerhouse. The Borel Project had a 605 cfs direct diversion water right to support generation at the powerhouse.

In 1953, the USACE built Lake Isabella Dam and Reservoir to provide flood protection and water supply for irrigation. During the spring runoff season, the reservoir stores up to 568,075 acre-feet of water. Lake Isabella Dam consists of a main dam on the Kern River channel and an auxiliary dam located immediately to the east of the main dam with a main service spillway located between the two. At the time of construction, the Isabella Auxiliary Dam overlaid a portion of the canal system for SCE’s existing Borel Project. In response, the USACE incorporated a controlled conduit through the Isabella Auxiliary Dam to allow continued operation of the Borel Project.

In wet years, Isabella Dam regularly impounded enough water to inundate the open canal and flume system of the Borel Project upstream of the dam. In drier years, when Lake Isabella storage was low, SCE reverted to the original diversion structure (4.2 miles upstream of the dam) to divert water from the North Fork Kern River and into the canal/Powerhouse.

In 2006, the USACE determined that the Isabella Dam did not meet earthquake safety standards and reduced the gross pool (restricted gross pool) to 361,250 acre-feet. In 2017, the USACE began seismic safety modifications to the Auxiliary Dam that resulted in condemnation of the Borel canal conduit through the dam. The conduit was filled with concrete, cutting off the water supply and preventing the Borel Project from generating power, rendering it non-operational. SCE is currently in the process of decommissioning the Borel Project. The seismic safety modifications at Isabella Dam are expected to be completed by summer of 2023. Once the seismic safety modifications are complete, the gross pool of the reservoir will return to 568,075 acre-feet (USACE 2022).

The absence of diversions to the Borel Project reduces releases, or at least changes the pattern of releases, from Lake Isabella. When in operation, the Borel Project would divert up to 605 cfs and return it to the Kern River below the Borel Powerhouse. Because the Borel Project is no longer operational, releases for SCE from Lake Isabella have been reduced from a maximum of 605 cfs to 412 cfs (maximum capacity of the Kern River No. 1 Diversion). Given the current non-operative status of the Borel Project, inflow to the Kern River No. 1 Hydroelectric Project is a primary function of spills, minimum flow releases from the Isabella Main Dam, and additional irrigation releases as directed by the Kern River Watermaster.

#### 3.3.3.4 Downstream Requirements or Constraints

Water exits the Kern River No. 1 Powerhouse via a short tailrace and is immediately diverted for Kern and Tule Hydro LLC's Kern Canyon Project (FERC No. 178). Diverted water from the Kern Canyon Project is released 1.6 miles downstream at the Kern Canyon Powerhouse and then diverted again 500 feet downstream by the Olcese Water District for its Rio Bravo Hydro Project (FERC No. 4129). The Rio Bravo Project returns diverted water back to the Kern River 2 miles downstream at the Rio Bravo Powerhouse where the Kern River continues downstream into the City of Bakersfield and the California Central Valley where it is almost entirely utilized by consumptive uses (refer to Section 3.2.5, Major Water Uses). There are no downstream requirements or constraints associated with operation of the Project.

### 3.3.4 Hydrology

This section describes: (1) existing FERC license flow requirements, (2) flow gages used for Project operations and/or compliance, and (3) hydrology associated with operation of the Project.

#### 3.3.4.1 Existing FERC License Flow Requirements

SCE's existing license for the Project includes minimum instream flow requirements in the bypassed reach. These minimum instream flow requirements, as specified in License Article 401 and United States Forest Service 4(e) Condition No. 4 of the license are shown in Table 3.3-1. The minimum instream flow requirement has no water year types and is equal to 50 cfs or inflow, whichever is less, from June 1 through September 30, and equal to 15 cfs or inflow, whichever is less, from October 1 through May 31 of each year.

#### 3.3.4.2 Flow Gages

SCE operates and maintains the following USGS gaging stations to monitor and record flows associated with operations of the Project (Table 3.3-2) as follows:

- Kern River near Democrat Springs (USGS Gage No. 11192500; SCE Gage No. 409) – This gage is located about 0.4 mile downstream of the diversion dam. The stream flow is measured using a float and an A-35 recorder. Data collected from this gage represents flow in the Kern River below the diversion dam (bypass reach).

- Kern River No. 1 Conduit near Democrat Springs (USGS Gage No. 11192000; SCE Gage No. 410) – This gage is located on the Kern River No. 1 Flowline near Cow Flat Creek. Stream flow is measured using a float and an A-35 recorder. Data collected from this gage represents flow diverted from the Kern River for Project generation.

- Kern River near Democrat Springs + Conduit (USGS Gage No. 11192501) – Data for this gage represents inflow into the Project (Democrat Dam Impoundment) and is computed by combining the data collected in the bypass reach below the dam

(USGS Gage No. 11192500) and the flowline (USGS Gage No. 11192000). For record keeping purposes, the USGS has numbered this gage 11192501 and compiles data as if it were an actual gage.

The location of the flow gages associated with the Project are shown on Map 2-3a and Map 2-3c.

#### 3.3.4.3 Hydrology Associated with Project Operations

**Project-related Stream Flows**

The period of record used to characterize recent historical flows associated with the Project extends from Water Year 1999 through Water Year 2021 (October 1, 1998, through September 30, 2021). This time period represents Project operations since issuance of the current FERC license in 1998. USGS Data is missing in Water Year 2004 for Kern River near Democrat Springs gage (USGS Gage No. 11192500; SCE Gage No. 409). Options for addressing this data gap will be discussed during study plan development.

Diversion amounts and timing are a function of several factors including Project inflow; existing water rights; FERC License requirements for minimum instream flow release; and flowline capacity. Total annual inflow into the Project in Water Years 1999–2021 ranged from approximately 135,000 acre-feet to over 1,735,000 acre-feet. The median total annual inflow was approximately 455,000 acre-feet during this period (Figure 3.3-1).

Monthly flow exceedances and monthly average flows in the bypass reach and diversions to the powerhouse are shown in Figures 3.3-2 and 3.3-3. Daily flow exceedances in the bypass reach and diversions to the powerhouse are shown in Figures 3.3-4 and 3.3-5.

**Water Management from Lake Isabella through the Lower Kern River**

The hydrology of the lower Kern River is dominated by Lake Isabella operations. As a result of reservoir operations, flows are high in summer when agricultural releases are made, and low in winter when the dam retains water to fill the reservoir. An example of these operations is shown in Figure 3.3-6.

A detailed summary of the hydrology (inflow, bypass reach, and conveyance) using Project gages is provided in the following appendices:

- Appendix 3.3-A – This appendix provides daily flow graphs (1999–2021) for inflow, the bypass reach, and the diversion conduit associated with the Project.
- Appendix 3.3-B – This appendix includes tables of monthly summary statistics (minimum, maximum, and average discharge) and exceedances (10%, 50%, and 90%) for gaging stations (1999–2021) for inflow, the bypass reach, and the diversion conduit associated with the Project.

- Appendix 3.3-C – This appendix includes tables summarizing monthly average flows (1999–2021) for inflow, the bypass reach, and the diversion conduit associated with the Project.

- Appendix 3.3-D – This appendix includes a table summarizing instantaneous peak annual flows (1999–2021) for inflow, the bypass reach, and the diversion conduit associated with the Project.

- Appendix 3.3-E – This appendix includes two figures showing example operations of the Project.

#### 3.3.4.4 Water Storage

The Project is operated in a run-of-the-river mode and has no usable water storage. The Democrat Dam Impoundment covers approximately 27 acres and has a gross storage capacity of 247 acre-feet when full. The entire dam crest serves as a spillway as such the dam regularly spills and the Impoundment water elevation is governed by inflow from the Kern River and downstream FERC minimum flow requirements. At the end of the water conveyance system, a small concrete forebay impounds water (less than 1 acre-foot) and is used to regulate flow to the powerhouse.

### 3.3.5 References

CRWQCB (California Regional Water Quality Control Board). 2018. Water Quality Control Plan for the Tulare Lake Basin. Central Valley Region. Third Edition. Revised May 2018.

FERC (Federal Energy Regulatory Commission). 1998. Order Issuing New License (Major Project), Project No. 1930-014. 83 FERC ¶ 62,241. June 16.

USACE (U.S. Army Corps of Engineers). 2022. Isabella Situation Report. November. Accessed: November 2022. Available online at: https://www.spk.usace.army.mil/Portals/12/documents/civil_works/Isabella/SitReps/2022/Isabella_SitRep_NOV2022.pdf?ver=iISuUIb07gIqZoZKE8OPYg%3d%3d.

USGS (U.S. Geological Survey). 2022. Surface-Water Data for the Nation. Accessed: November 2022. Available online at: https://waterdata.usgs.gov/nwis/sw.

# TABLES

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### Table 3.3-1. Minimum Instream Flow Requirements below Democrat Dam

| Month | Flow Requirement in Kern River below Democrat Dam[1] (cfs) |
|---|---|
| October | 15 |
| November | 15 |
| December | 15 |
| January | 15 |
| February | 15 |
| March | 15 |
| April | 15 |
| May | 15 |
| June | 50 |
| July | 50 |
| August | 50 |
| September | 50 |

Notes: cfs = cubic feet per second

[1] Minimum instream flow requirement is the lesser of inflow to Democrat Dam or the value listed in Table 3.3-1.

**Table 3.3-2. Project Flow Gages**

| Gage Name | SCE Gage Number | USGS Station Number | Data Obtained | Period of Record | Lat, Long |
|---|---|---|---|---|---|
| Kern River near Democrat Springs | 409 | 11192500 | Measures flow in the Kern River below Democrat Dam (flow in the bypass reach) | 7/26/1950 – present (missing water year 2004) | 35°31’15”, 118°40’34” |
| Kern River No. 1 Conduit near Democrat Springs | 410 | 11192000 | Measures flow present in the water conveyance system (near Cow Flat Creek) | 10/1/1975 – present | 35°29’50”, 118°41’30” |
| Kern River near Democrat Springs + Conduit | N/A | 11192501 | Represents inflow into the project (Democrat Dam Impoundment) and is computed by combining the data collected in the bypass reach below the dam (Gage 11192500) and the water conveyance system (Gage 11192000) | 7/26/1950 – present | N/A |

# FIGURES

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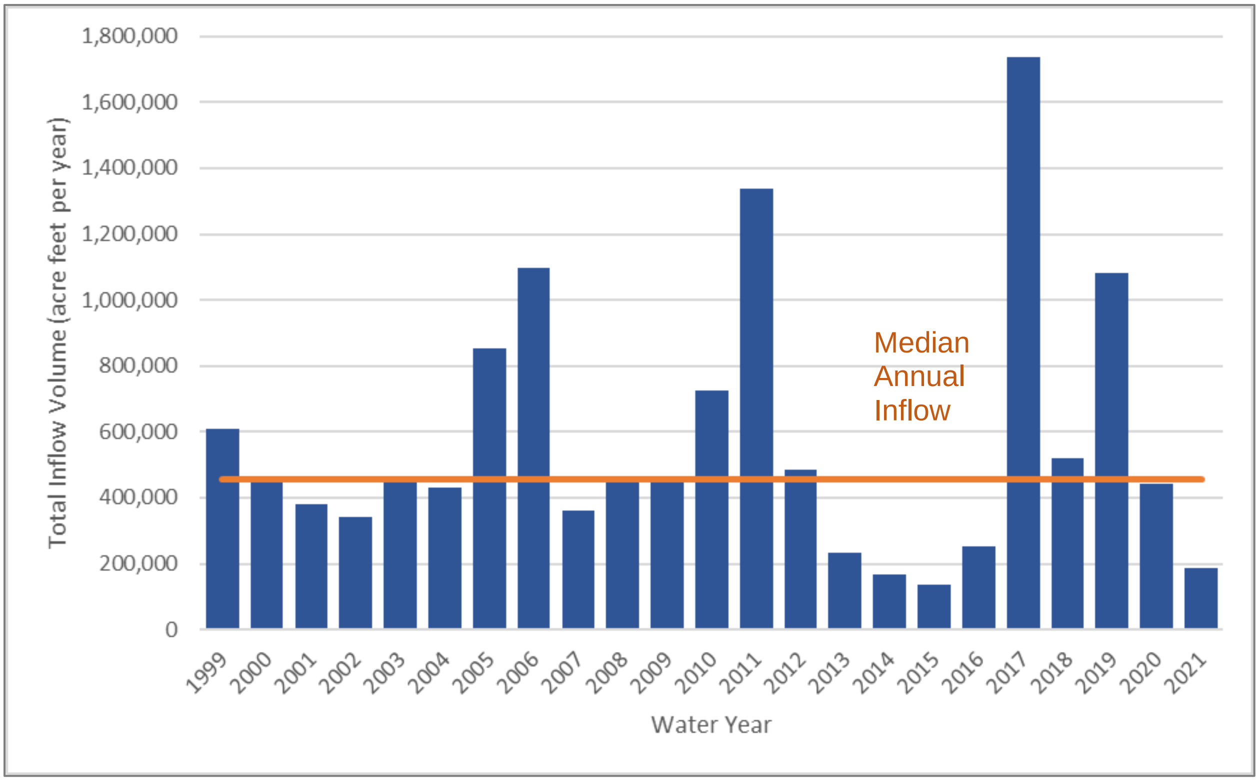


**Figure 3.3-1. Annual Inflow to the Kern River No. 1 Hydroelectric Project (WY 1999–2021)**

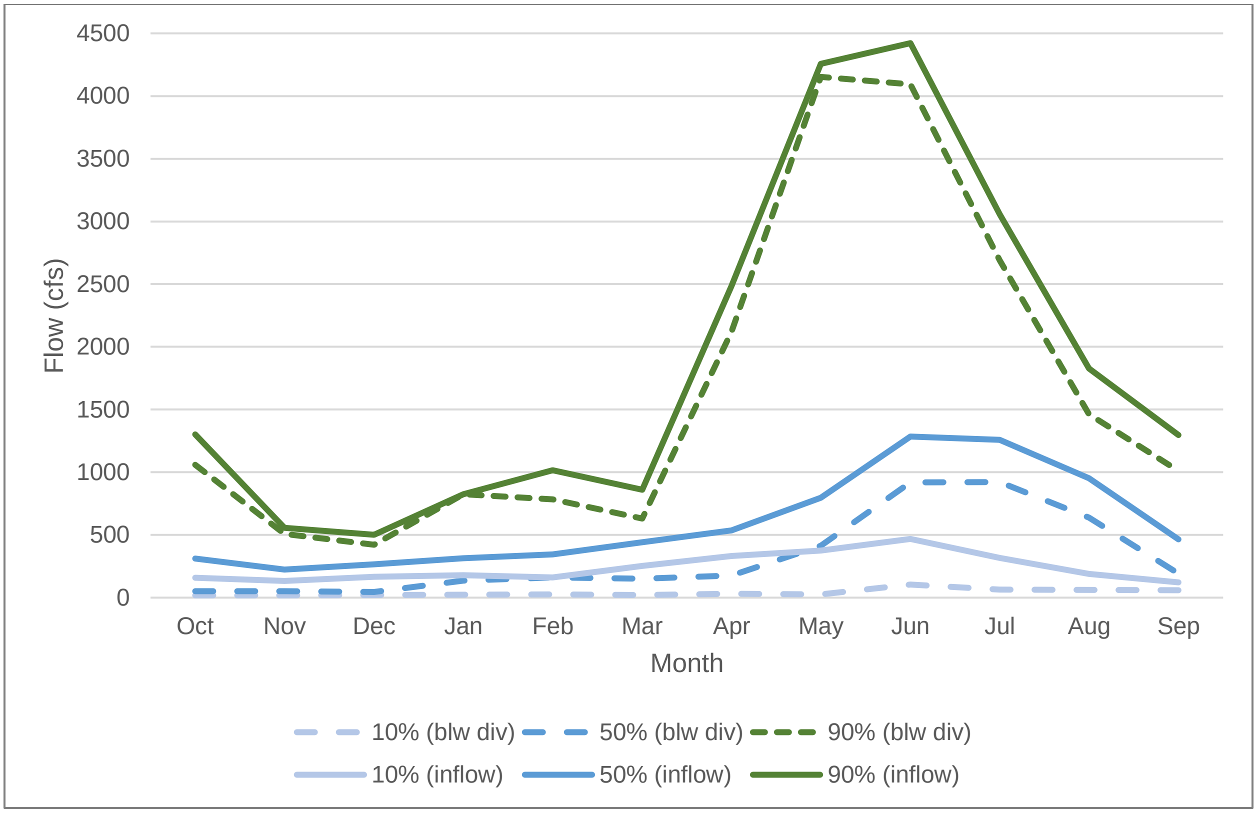


**Figure 3.3-2. Monthly Exceedance Inflow and Flow in the Bypass Reach (WY 1999–2021)**

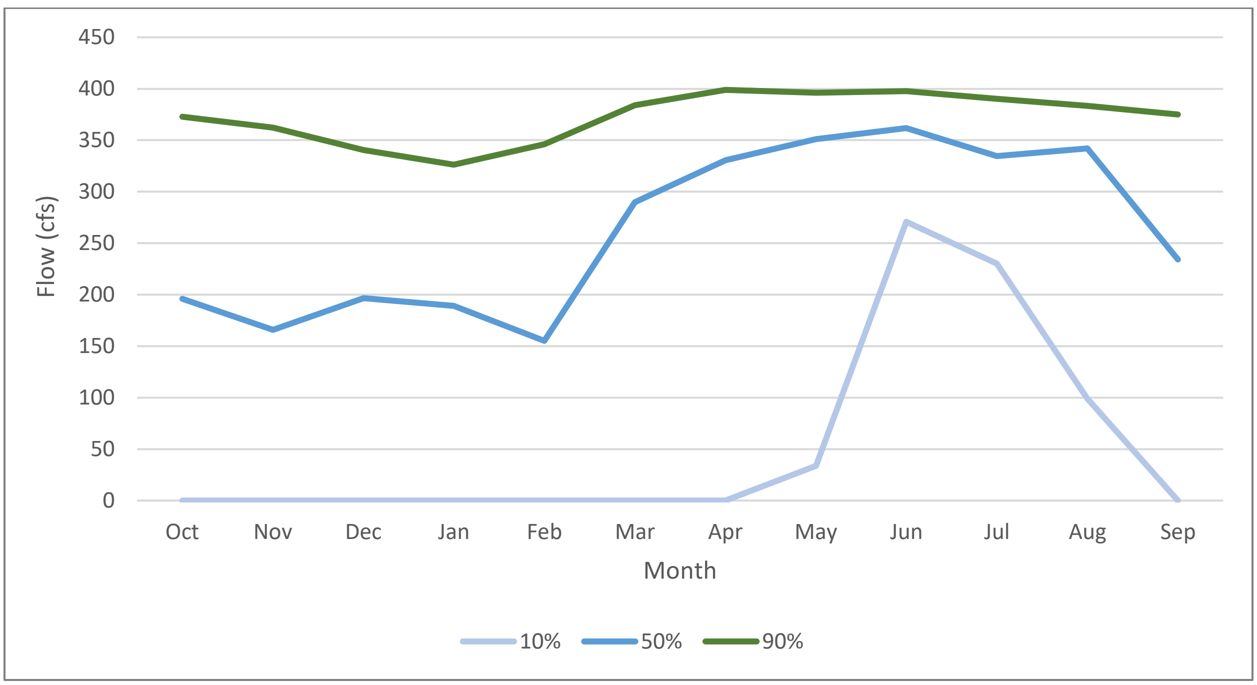


**Figure 3.3-3. Monthly Exceedance Flows in the Kern River No. 1 Conduit (WY 1999–2021)**

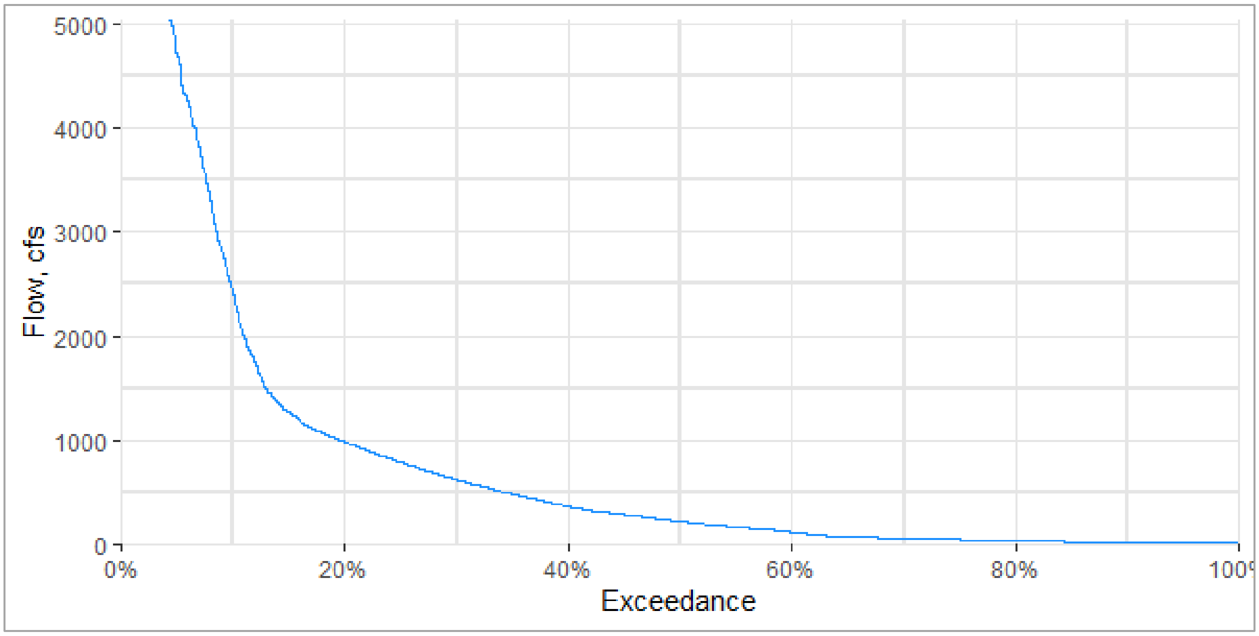


**Figure 3.3-4. Daily Exceedance Flows in the Bypass Reach (WY 1999–2021)**

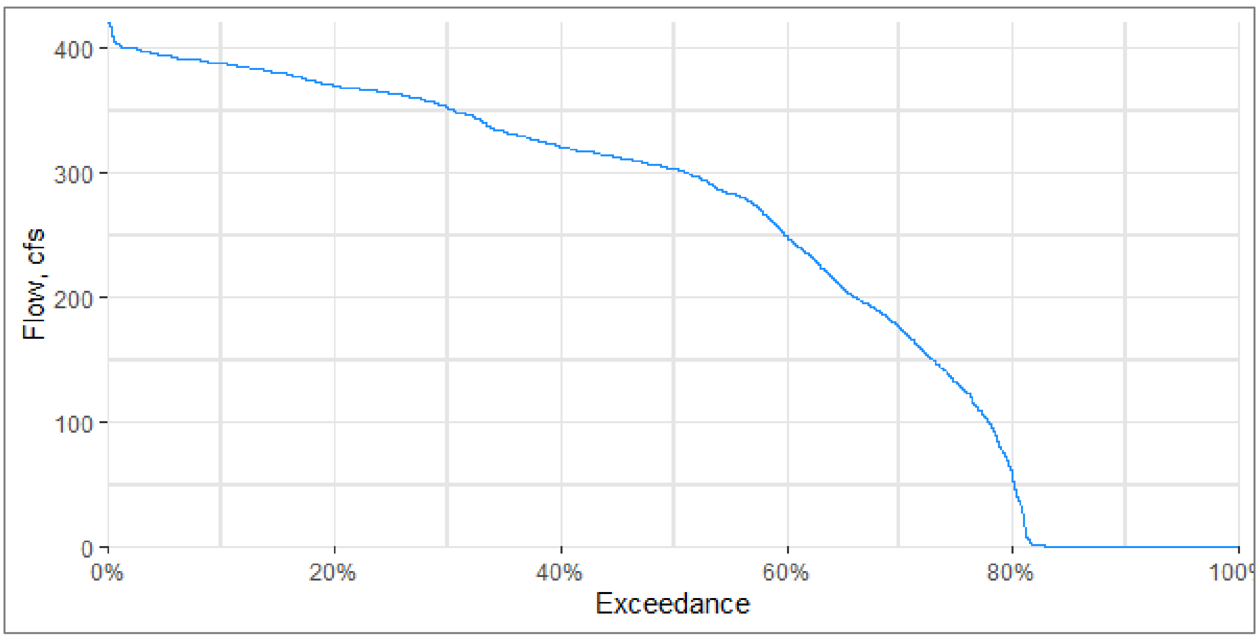


**Figure 3.3-5. Daily Exceedance Flows in the Kern River No. 1 Conduit (WY 1999–2021)**

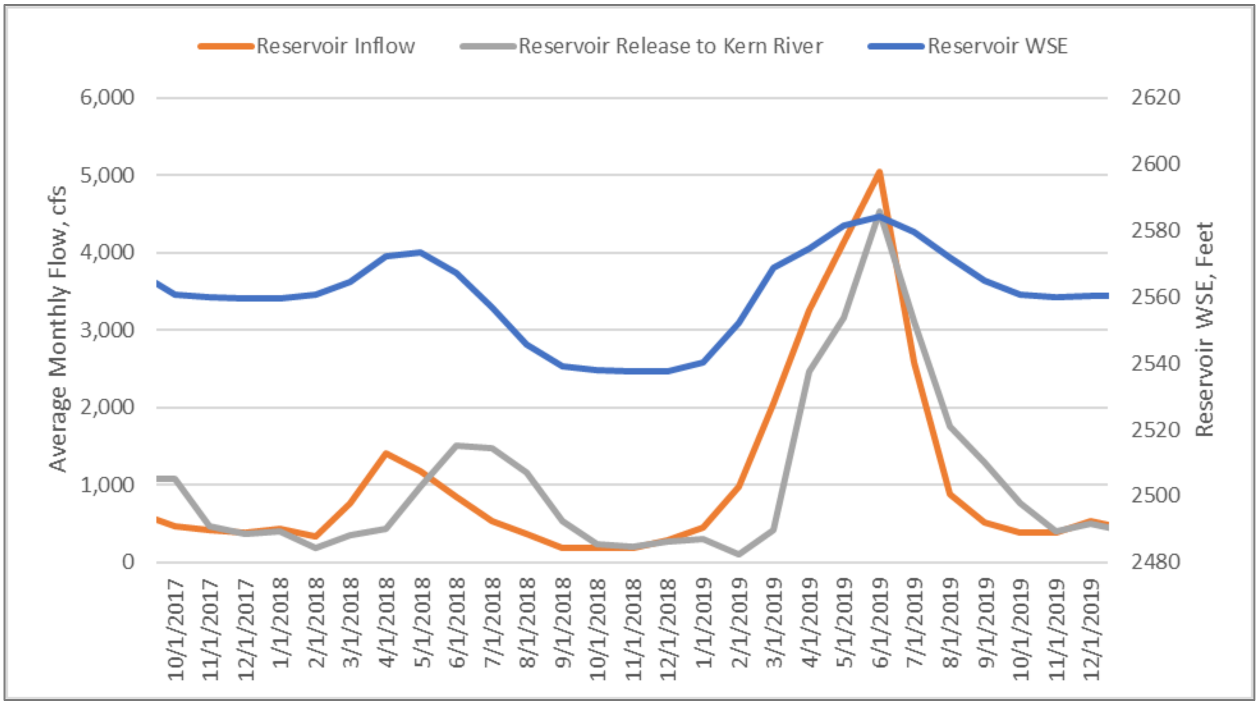


**Figure 3.3-6. Monthly Inflows and Outflows at Lake Isabella**

# APPENDIX 3.3-A

## Daily Flow (1999–2021) – Inflow, Bypass Reach, and Diversion Conduit Associated with the Kern River No. 1 Hydroelectric Project

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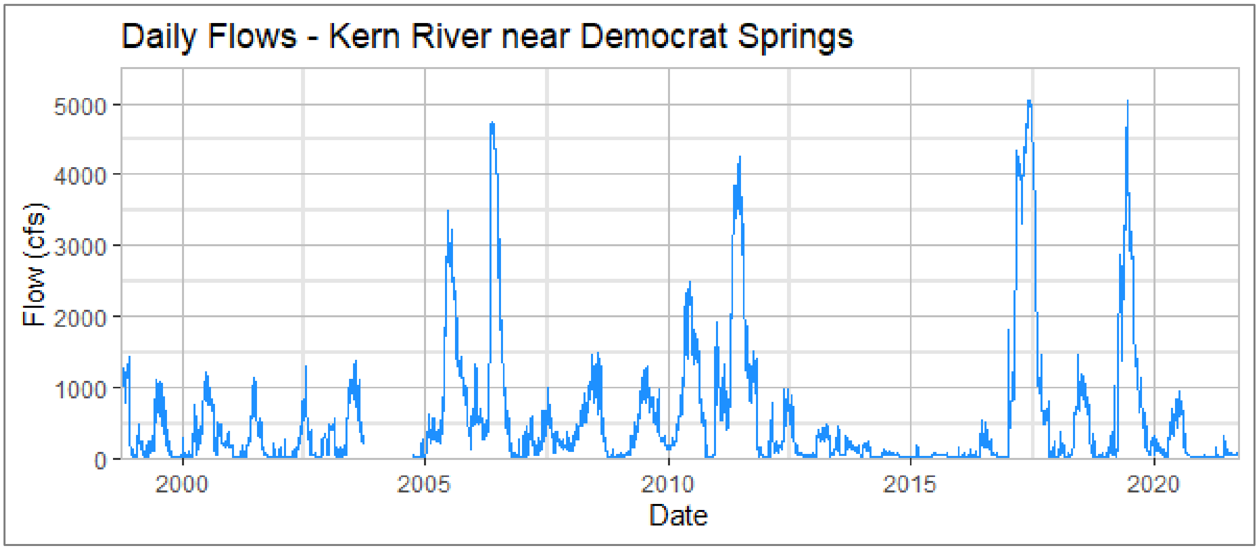
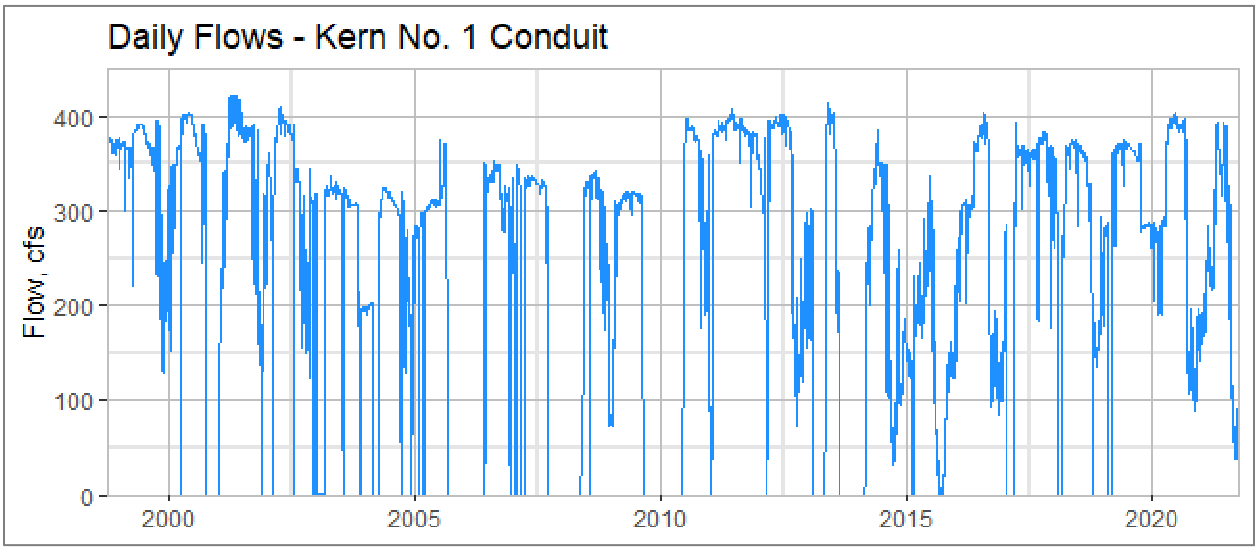
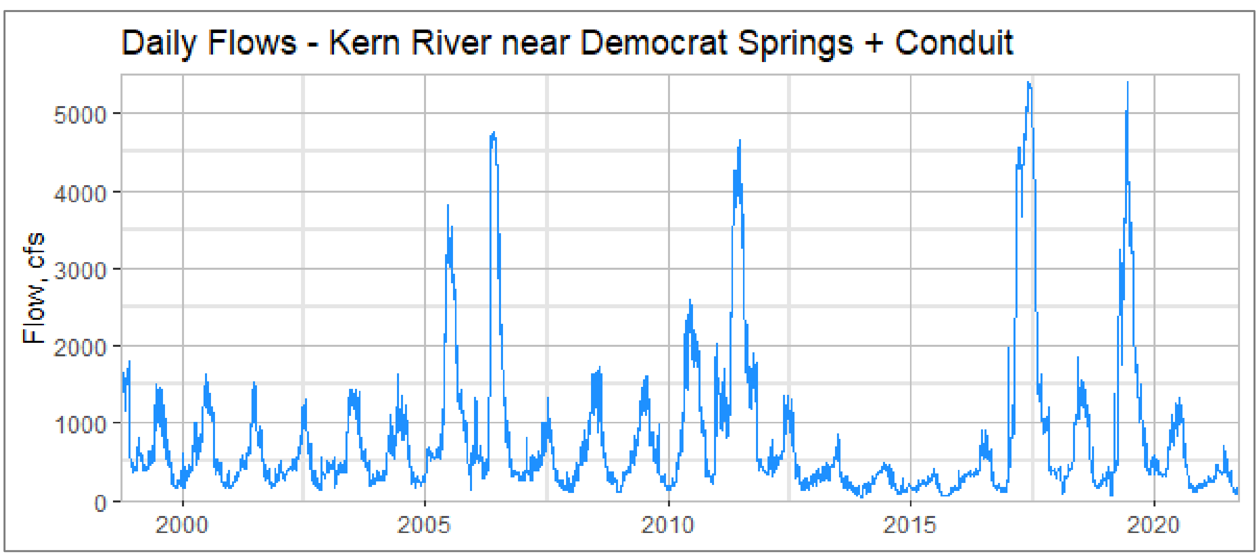

Daily Flows - Kern River near Democrat Springs
Flow (cfs)
5000
4000
3000
2000
1000
0
2000
2005
2010
2015
2020
Date


Daily Flows - Kern No. 1 Conduit
Flow, cfs
400
300
200
100
0
2000
2005
2010
2015
2020


Daily Flows - Kern River near Democrat Springs + Conduit
Flow, cfs
5000
4000
3000
2000
1000
0
2000
2005
2010
2015
2020

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# APPENDIX 3.3-B

## Table of Monthly Summary Statistics (maximum, minimum, average discharge) and Exceedances for Gaging Stations (1999–2021) – Inflow, Bypass Reach, and Diversion Conduit Associated with the Kern River No. 1 Hydroelectric Project

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**Table 3.3-B-1. Flow Statistics for Stream Gages Associated with the Kern River No. 1 Hydroelectric Project for the Period of Record (1999–2021)**

| Month | Monthly Exceedance Flows (cfs) | | | Maximum, Minimum, and Average Monthly Flows (cfs) | | |
|---|---|---|---|---|---|---|
| | 10% | 50% | 90% | Max | Min | Average |
| **Kern River near Democrat Springs (USGS Gage No. 11192500)** | | | | | | |
| Oct | 20 | 52 | 1060 | 1127 | 17 | 281 |
| Nov | 18 | 51 | 509 | 1146 | 16 | 146 |
| Dec | 20 | 45 | 422 | 530 | 17 | 123 |
| Jan | 23 | 135 | 824 | 1152 | 20 | 237 |
| Feb | 26 | 162 | 783 | 2275 | 22 | 314 |
| Mar | 21 | 152 | 631 | 4095 | 19 | 381 |
| Apr | 31 | 177 | 2121 | 3932 | 25 | 586 |
| May | 26 | 414 | 4153 | 4666 | 23 | 1059 |
| Jun | 104 | 918 | 4092 | 4861 | 63 | 1436 |
| Jul | 65 | 922 | 2691 | 3345 | 59 | 1140 |
| Aug | 62 | 638 | 1464 | 1952 | 59 | 664 |
| Sep | 58 | 191 | 1011 | 1318 | 54 | 337 |
| **Kern River No. 1 Conduit near Democrat Springs (USGS Gage No. 11192000)** | | | | | | |
| Oct | 0 | 196 | 373 | 380 | 0 | 192 |
| Nov | 0 | 166 | 362 | 379 | 0 | 173 |
| Dec | 0 | 196 | 341 | 367 | 0 | 177 |
| Jan | 0 | 189 | 326 | 369 | 0 | 175 |
| Feb | 0 | 155 | 346 | 381 | 0 | 159 |
| Mar | 0 | 290 | 384 | 390 | 0 | 232 |
| Apr | 0 | 331 | 399 | 404 | 0 | 283 |
| May | 34 | 351 | 396 | 401 | 0 | 313 |
| Jun | 271 | 362 | 398 | 399 | 187 | 346 |
| Jul | 230 | 335 | 390 | 393 | 173 | 328 |
| Aug | 99 | 342 | 383 | 388 | 33 | 295 |
| Sep | 0 | 234 | 375 | 384 | 0 | 214 |

| Month | Monthly Exceedance Flows (cfs) | | | Maximum, Minimum, and Average Monthly Flows (cfs) | | |
|---|---|---|---|---|---|---|
| | 10% | 50% | 90% | Max | Min | Average |
| **Kern River near Democrat Springs + Conduit (USGS Gage No. 11192501)** | | | | | | |
| Oct | 158 | 312 | 1302 | 1497 | 105 | 468 |
| Nov | 134 | 224 | 557 | 1515 | 117 | 315 |
| Dec | 166 | 265 | 501 | 749 | 72 | 298 |
| Jan | 180 | 313 | 824 | 1403 | 159 | 407 |
| Feb | 162 | 344 | 1016 | 2277 | 146 | 468 |
| Mar | 253 | 441 | 861 | 4412 | 219 | 619 |
| Apr | 333 | 537 | 2486 | 4291 | 231 | 868 |
| May | 375 | 796 | 4257 | 5026 | 276 | 1346 |
| Jun | 468 | 1285 | 4422 | 5215 | 325 | 1757 |
| Jul | 318 | 1258 | 3057 | 3704 | 238 | 1449 |
| Aug | 189 | 952 | 1828 | 2194 | 94 | 951 |
| Sep | 122 | 466 | 1297 | 1466 | 68 | 556 |

# APPENDIX 3.3-C

## Monthly Average Flows (cfs) by Year (1999–2021) – Inflow, Bypass Reach and Diversion Conduit Associated with the Kern River No. 1 Hydroelectric Project

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**Table 3.3-C-1. Monthly Average Flows (cfs) by Year for Stream Gages Associated with the Kern River No. 1 Hydroelectric Project for the Flow Data Period of Record (1999–2021)**

| Water Year and Location | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Kern River near Democrat Springs (USGS Gage No. 11192500)** | | | | | | | | | | | | |
| 1999 | 1089 | 1146 | 101 | 126 | 300 | 80 | 85 | 215 | 675 | 883 | 665 | 249 |
| 2000 | 31 | 23 | 24 | 48 | 32 | 188 | 382 | 396 | 931 | 961 | 611 | 166 |
| 2001 | 335 | 200 | 258 | 74 | 22 | 55 | 74 | 302 | 905 | 626 | 321 | 58 |
| 2002 | 25 | 82 | 29 | 54 | 75 | 20 | 60 | 152 | 511 | 659 | 264 | 54 |
| 2003 | 23 | 63 | 217 | 408 | 323 | 67 | 85 | 345 | 967 | 1115 | 784 | 322 |
| 2004 | No Data | | | | | | | | | | | 65 |
| 2005 | 30 | 29 | 60 | 329 | 292 | 385 | 327 | 1059 | 2842 | 2696 | 1952 | 1318 |
| 2006 | 992 | 611 | 492 | 873 | 574 | 388 | 806 | 4403 | 4044 | 2140 | 1021 | 443 |
| 2007 | 53 | 32 | 55 | 168 | 189 | 303 | 112 | 274 | 520 | 649 | 267 | 241 |
| 2008 | 213 | 162 | 207 | 234 | 344 | 555 | 677 | 937 | 1103 | 1017 | 816 | 191 |
| 2009 | 29 | 38 | 32 | 40 | 60 | 151 | 299 | 490 | 965 | 1072 | 816 | 611 |
| 2010 | 608 | 270 | 185 | 187 | 253 | 547 | 919 | 1897 | 2171 | 1621 | 1337 | 601 |
| 2011 | 136 | 29 | 530 | 1152 | 873 | 664 | 2082 | 3569 | 3678 | 2679 | 1509 | 1082 |
| 2012 | 1127 | 97 | 36 | 78 | 332 | 153 | 146 | 433 | 756 | 575 | 157 | 68 |
| 2013 | 33 | 31 | 35 | 147 | 325 | 311 | 357 | 75 | 198 | 116 | 137 | 197 |
| 2014 | 160 | 117 | 72 | 175 | 134 | 25 | 25 | 37 | 83 | 67 | 65 | 64 |
| 2015 | 25 | 22 | 21 | 20 | 101 | 24 | 28 | 25 | 63 | 65 | 61 | 60 |
| 2016 | 18 | 17 | 25 | 23 | 27 | 53 | 37 | 30 | 304 | 310 | 162 | 62 |
| 2017 | 26 | 22 | 20 | 710 | 2275 | 4095 | 3932 | 4666 | 4861 | 3345 | 1247 | 675 |
| 2018 | 682 | 80 | 36 | 112 | 105 | 33 | 61 | 599 | 1073 | 1022 | 724 | 187 |

| Water Year and Location | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| 2019 | 51 | 29 | 30 | 78 | 120 | 191 | 2138 | 2875 | 4113 | 2673 | 1359 | 905 |
| 2020 | 478 | 106 | 226 | 144 | 121 | 73 | 207 | 491 | 668 | 741 | 264 | 61 |
| 2021 | 17 | 16 | 17 | 23 | 25 | 19 | 44 | 23 | 154 | 59 | 59 | 58 |
| **Kern River No. 1 Conduit near Democrat Springs (USGS Gage No. 11192000)** | | | | | | | | | | | | |
| 1999 | 374 | 369 | 367 | 369 | 359 | 362 | 376 | 391 | 389 | 375 | 364 | 371 |
| 2000 | 307 | 166 | 229 | 257 | 327 | 327 | 400 | 401 | 398 | 376 | 353 | 300 |
| 2001 | 0 | 0 | 0 | 146 | 284 | 377 | 404 | 396 | 397 | 380 | 381 | 316 |
| 2002 | 245 | 142 | 265 | 329 | 259 | 390 | 398 | 392 | 385 | 291 | 331 | 228 |
| 2003 | 196 | 258 | 159 | 35 | 35 | 309 | 324 | 323 | 322 | 214 | 315 | 306 |
| 2004 | 306 | 176 | 196 | 197 | 107 | 0 | 259 | 323 | 319 | 310 | 302 | 234 |
| 2005 | 216 | 206 | 197 | 202 | 284 | 188 | 305 | 310 | 309 | 332 | 241 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 287 | 335 | 347 | 334 |
| 2007 | 295 | 317 | 239 | 189 | 213 | 138 | 331 | 333 | 331 | 326 | 326 | 44 |
| 2008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 285 | 282 | 332 | 315 |
| 2009 | 283 | 236 | 133 | 184 | 304 | 312 | 315 | 316 | 318 | 316 | 136 | 0 |
| 2010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 187 | 390 | 385 | 377 |
| 2011 | 331 | 263 | 219 | 251 | 381 | 389 | 389 | 397 | 397 | 390 | 388 | 384 |
| 2012 | 372 | 379 | 358 | 322 | 155 | 344 | 391 | 393 | 396 | 393 | 349 | 177 |
| 2013 | 145 | 173 | 231 | 161 | 0 | 0 | 3 | 371 | 398 | 290 | 104 | 0 |
| 2014 | 0 | 0 | 0 | 0 | 20 | 223 | 302 | 351 | 346 | 258 | 197 | 67 |
| 2015 | 130 | 106 | 161 | 138 | 78 | 195 | 203 | 251 | 261 | 173 | 33 | 8 |
| 2016 | 87 | 135 | 143 | 253 | 285 | 290 | 304 | 351 | 379 | 388 | 365 | 146 |
| 2017 | 150 | 122 | 176 | 42 | 1 | 317 | 360 | 359 | 354 | 360 | 342 | 371 |

| Water Year and Location | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| 2018 | 380 | 353 | 314 | 284 | 69 | 311 | 365 | 371 | 362 | 364 | 356 | 322 |
| 2019 | 162 | 157 | 235 | 223 | 25 | 354 | 358 | 367 | 368 | 367 | 360 | 359 |
| 2020 | 283 | 285 | 282 | 269 | 223 | 257 | 377 | 395 | 399 | 389 | 381 | 198 |
| 2021 | 144 | 137 | 166 | 180 | 248 | 242 | 355 | 348 | 373 | 254 | 96 | 58 |
| **Kern River near Democrat Springs + Conduit (USGS Gage No. 11192501)** | | | | | | | | | | | | |
| 1999 | 1462 | 1515 | 469 | 496 | 659 | 442 | 461 | 605 | 1064 | 1258 | 1029 | 620 |
| 2000 | 339 | 188 | 253 | 306 | 359 | 515 | 782 | 796 | 1329 | 1337 | 963 | 466 |
| 2001 | 335 | 200 | 258 | 220 | 306 | 431 | 478 | 697 | 1302 | 1007 | 703 | 374 |
| 2002 | 270 | 224 | 295 | 382 | 334 | 410 | 458 | 544 | 896 | 950 | 595 | 282 |
| 2003 | 219 | 321 | 376 | 442 | 358 | 376 | 409 | 668 | 1290 | 1328 | 1098 | 629 |
| 2004 | 479 | 221 | 275 | 313 | 300 | 536 | 823 | 790 | 1174 | 1001 | 793 | 424 |
| 2005 | 246 | 234 | 257 | 531 | 577 | 573 | 632 | 1369 | 3150 | 3030 | 2194 | 1318 |
| 2006 | 992 | 611 | 492 | 873 | 574 | 388 | 806 | 4450 | 4331 | 2474 | 1369 | 777 |
| 2007 | 348 | 349 | 294 | 357 | 402 | 441 | 442 | 606 | 851 | 974 | 593 | 286 |
| 2008 | 213 | 162 | 207 | 234 | 344 | 555 | 677 | 961 | 1389 | 1299 | 1149 | 506 |
| 2009 | 312 | 274 | 164 | 223 | 364 | 463 | 614 | 806 | 1285 | 1389 | 952 | 611 |
| 2010 | 608 | 270 | 185 | 187 | 253 | 547 | 919 | 1897 | 2357 | 2012 | 1723 | 978 |
| 2011 | 467 | 292 | 749 | 1403 | 1254 | 1052 | 2471 | 3967 | 4075 | 3068 | 1897 | 1466 |
| 2012 | 1497 | 476 | 394 | 401 | 487 | 498 | 537 | 825 | 1152 | 969 | 506 | 246 |
| 2013 | 178 | 204 | 265 | 307 | 325 | 311 | 360 | 446 | 596 | 406 | 241 | 197 |
| 2014 | 160 | 117 | 72 | 175 | 154 | 248 | 327 | 388 | 429 | 325 | 262 | 131 |
| 2015 | 156 | 128 | 182 | 159 | 178 | 219 | 231 | 276 | 325 | 238 | 94 | 68 |
| 2016 | 105 | 152 | 168 | 276 | 313 | 343 | 341 | 381 | 684 | 699 | 527 | 208 |

| Water Year and Location | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| 2017 | 176 | 144 | 196 | 752 | 2277 | 4412 | 4291 | 5026 | 5215 | 3704 | 1588 | 1047 |
| 2018 | 1061 | 433 | 350 | 395 | 174 | 345 | 426 | 969 | 1435 | 1385 | 1080 | 508 |
| 2019 | 212 | 186 | 265 | 301 | 146 | 545 | 2496 | 3243 | 4482 | 3040 | 1719 | 1264 |
| 2020 | 761 | 391 | 508 | 413 | 344 | 330 | 584 | 886 | 1066 | 1130 | 646 | 259 |
| 2021 | 161 | 154 | 183 | 202 | 273 | 261 | 399 | 370 | 527 | 313 | 154 | 116 |

# APPENDIX 3.3-D

## Annual Maximum Peak Flows (cfs) (1999–2021) – Inflow, Bypass Reach, and Diversion Conduit Associated with the Kern River No. 1 Hydroelectric Project

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**Table 3.3-D-1. Flow Statistics for Stream Gages Associated with the Kern River No. 1 Hydroelectric Project for the Flow Data Period of Record (1999–2021)**

| Water Year | Kern River near Democrat Springs | | Kern River No. 1 Conduit | | Kern River near Democrat Springs + Conduit | |
|---|---|---|---|---|---|---|
| | USGS Gage 11192500 | | USGS Gage 11192000 | | USGS Gage 11192501 | |
| | Flow (cfs) | Date | Flow (cfs) | Date | Flow (cfs) | Date |
| 1999 | 1430 | 11/24/1998 | 396 | 9/28/1999 | 1810 | 11/24/1998 |
| 2000 | 1230 | 7/1/2000 | 403 | 5/19/2000 | 1620 | 7/1/2000 |
| 2001 | 1150 | 6/20/2001 | 421 | 3/30/2001 | 1540 | 6/20/2001 |
| 2002 | 1300 | 7/15/2002 | 410 | 4/5/2002 | 1300 | 7/15/2002 |
| 2003 | 1390 | 7/22/2003 | 345 | 11/9/2002 | 1440 | 6/23/2003 |
| 2004 | No Data | | 325 | 5/9/2004 | 1630 | 6/7/2004 |
| 2005 | 3500 | 6/20/2005 | 375 | 7/8/2005 | 3810 | 6/20/2005 |
| 2006 | 4740 | 5/16/2006 | 353 | 8/6/2006 | 4750 | 5/29/2006 |
| 2007 | 1010 | 7/12/2007 | 349 | 1/21/2007 | 1330 | 7/12/2007 |
| 2008 | 1500 | 7/14/2008 | 342 | 8/24/2008 | 1740 | 8/8/2008 |
| 2009 | 1290 | 7/22/2009 | 322 | 10/9/2008 | 1610 | 7/22/2009 |
| 2010 | 2490 | 6/10/2010 | 398 | 7/13/2010 | 2600 | 6/10/2010 |
| 2011 | 4250 | 6/14/2011 | 407 | 6/15/2011 | 4660 | 6/14/2011 |
| 2012 | 1420 | 10/22/2011 | 402 | 6/17/2012 | 1780 | 10/22/2011 |
| 2013 | 481 | 4/5/2013 | 414 | 5/25/2013 | 864 | 7/2/2013 |
| 2014 | 230 | 2/14/2014 | 386 | 5/21/2014 | 480 | 6/2/2014 |
| 2015 | 201 | 2/12/2015 | 336 | 6/22/2015 | 422 | 6/22/2015 |
| 2016 | 533 | 6/8/2016 | 404 | 7/26/2016 | 917 | 7/6/2016 |
| 2017 | 5040 | 5/25/2017 | 394 | 3/24/2017 | 5400 | 5/25/2017 |
| 2018 | 1470 | 6/6/20*18 | 384 | 10/4/2017 | 1850 | 6/6/2018 |
| 2019 | 5040 | 6/12/2019 | 375 | 5/31/2019 | 5410 | 6/12/2019 |
| 2020 | 954 | 7/9/2020 | 403 | 6/7/2020 | 1340 | 7/9/2020 |
| 2021 | 331 | 6/7/2021 | 393 | 4/19/2021 | 718 | 6/7/2021 |

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# APPENDIX 3.3-E

## Example Operations Associated with the Kern River No. 1 Hydroelectric Project

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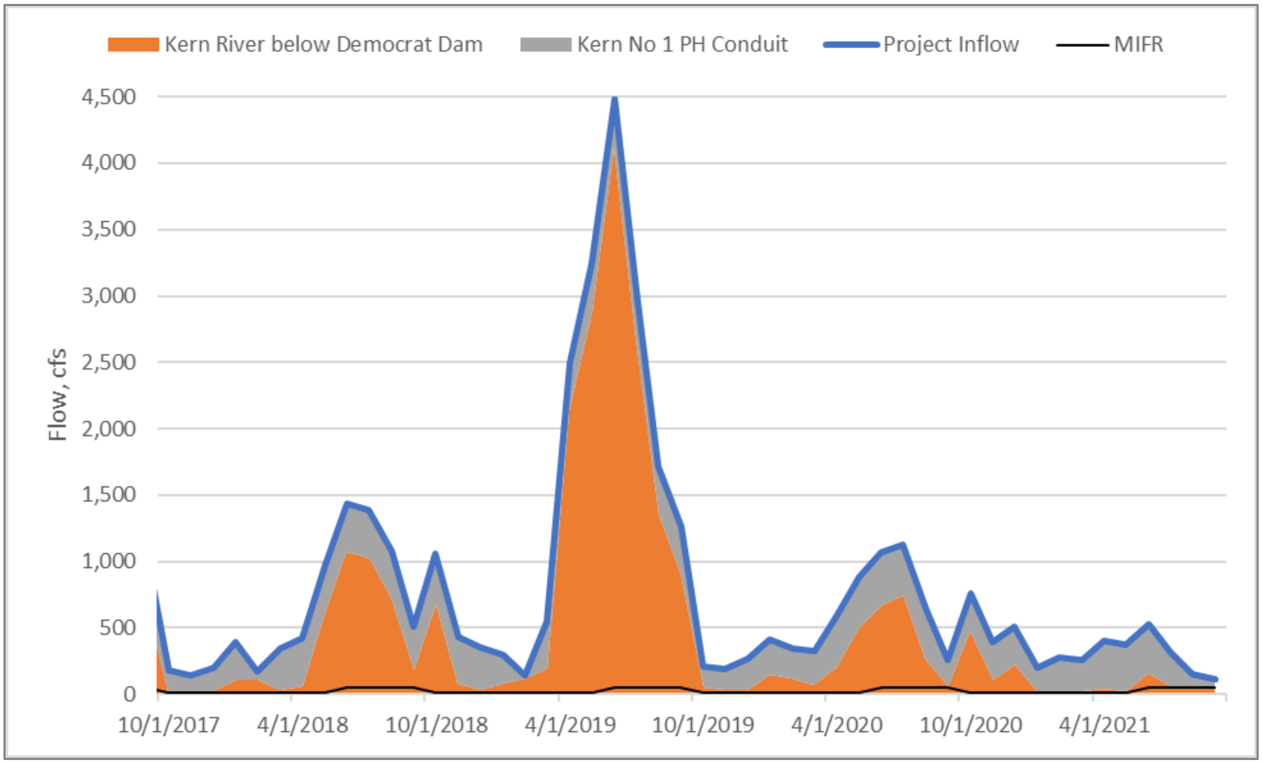


**Figure 3.3-E-1. Project Operations in Water Years 2017 through 2021**

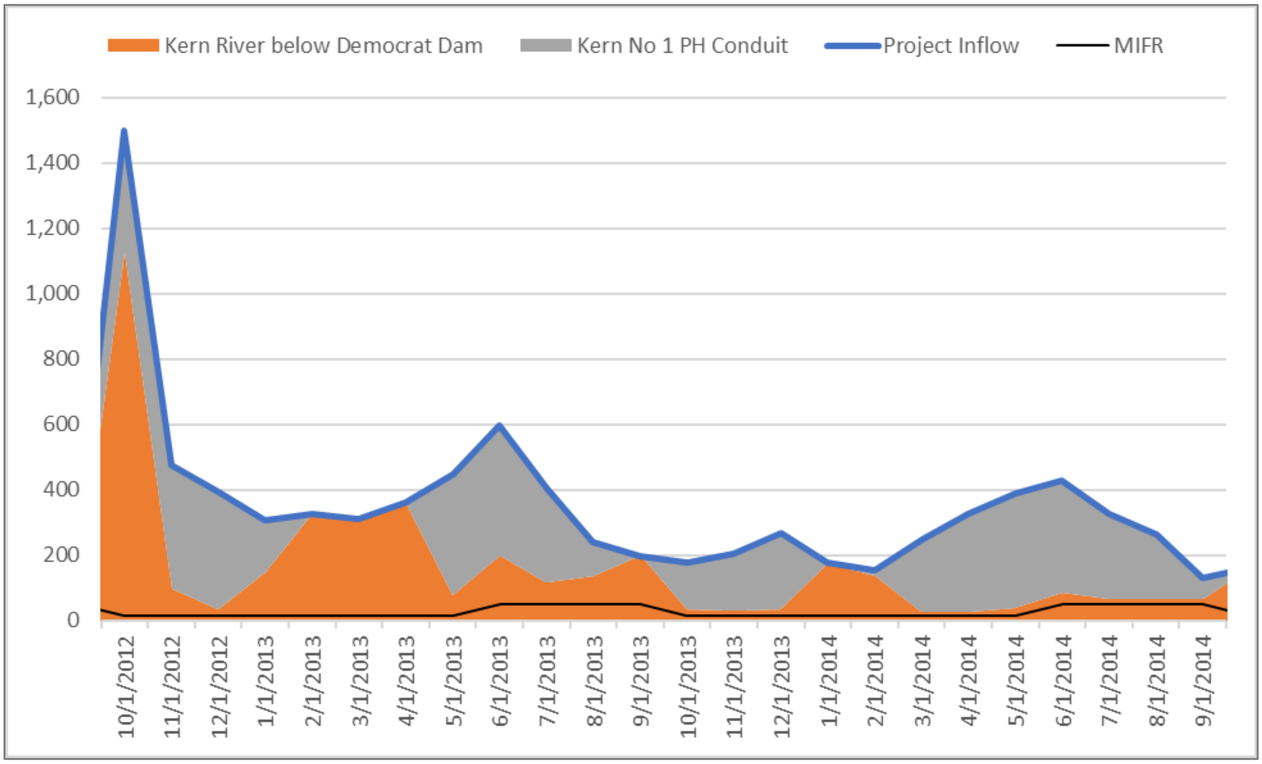


**Figure 3.3-E-2. Project Operations in Water Years 2013 through 2014**

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## LIST OF ACRONYMS

| | |
|---|---|
| AWQC | Ambient Water Quality Criteria |
| CCR | California Code of Regulations |
| CEDEN | California Environmental Data Exchange Network |
| CFR | Code of Federal Regulations |
| CRWQCB | California Regional Water Quality Control Board |
| CTR | California Toxics Rule |
| FERC or Commission | Federal Energy Regulatory Commission |
| IRIS | Integrated Risk Information System |
| MCL | Maximum Contaminant Level |
| NTR | National Toxics Rule |
| Project | Kern River No. 1 Hydroelectric Project |
| SCE | Southern California Edison Company |
| STORET | Storage and Retrieval |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |

## 3.4 WATER QUALITY

This section describes water quality in Kern River, as it relates to Southern California Edison Company's (SCE) Kern River No. 1 Hydroelectric Project (Project). The Federal Energy Regulatory Commission's (FERC) content requirements for this section are specified in Title 18 of the Code of Federal Regulations Chapter I § 5.6(d)(3)(iii). The FERC regulations require information on both water quantity (water use and hydrology) and water quality for waters affected by the Project. This section presents information on water quality. Information on water quantity is addressed in Section 3.3, Water Use and Hydrology.

The information presented in this section provides an overview of the existing physical and chemical water quality conditions in the vicinity of the Project. Water quality information presented in this section was derived from published reports and publicly available databases.

### 3.4.1 Information Sources

This section was prepared utilizing the following information sources:

- Water quality standards
  - Water Quality Control Plan for the Tulare Lake Basin (CRWQCB 2018)
  - California Toxics Rule (CTR) "Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (Federal Register, 65 FR 31682, United States Environmental Protection Agency [USEPA] 2000)
  - National Toxics Rule (NTR) Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants" (Federal Register, 57 FR 60848, USEPA 1992)
- Published study reports and data
  - Application for New License for the Kern River No. 1 Hydroelectric Project (SCE 1994)
  - Kern River No. 1 Hydroelectric Project (FERC No. 1930) Temperature Monitoring Summary Report (SCE 2008)
  - United States Geological Survey's (USGS) National Water Information System (NWIS) (USGS 2015) and USEPA storage and retrieval (STORET) (USEPA 2015) online databases provided water quality information that was collected by the USGS and other agencies (California Environmental Data Exchange Network [CEDEN])

### 3.4.2 Applicable State and Federally Approved Water Quality Standards and Objectives

The State of California has responsibility for maintaining water quality through implementation of the Federal Clean Water Act. Existing beneficial uses that apply to the surface waters within the Kern River Watershed are identified in the Water Quality Control Plan for the Tulare Lake Basin (Basin Plan) (CRWQCB 2018). Beneficial uses identified in the Basin Plan that pertain to the Kern River from Lake Isabella to the Kern River No. 1 Powerhouse (inclusive of the bypass reach) include: (1) hydropower generation; (2) water contact recreation (3) non-contact water recreation; (4) warm freshwater habitat; (5) cold freshwater habitat; (6) wildlife habitat; and (7) rare, threatened, or endangered species.

The water quality objectives include both numeric and narrative standards for surface water that are based on criteria that protect both human health and aquatic life. If water quality is maintained at levels consistent with these objectives, beneficial uses are considered to be protected. Applicable water quality objectives and standards in the Basin Plan are provided in Table 3.4-1.

The Basin Plan for chemical constituents provides numeric water quality objectives that are derived from various sources. These objectives include references to maximum contaminant levels (MCLs) that are provided in Title 22 of the California Code of Regulations which sets standards for waters designated for domestic or municipal use. Additional, and often more stringent criteria are provided by the CTR “Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California” (Federal Register, 65 FR 31682, USEPA 2000) and the NTR Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants” (Federal Register, 57 FR 60848, USEPA 1992) to protect aquatic life, and human health. The CTR and NTR pertinent toxicity standards are provided in Table 3.4-1.

### 3.4.3 Summary of Existing Water Quality Information

Water quality data collected in 1992 as part of the previous relicensing proceeding is provided in Table 3.4-2 and Table 3.4-3 (SCE 1994). A description of the monitoring sites is provided in Table 3.4-4. Additional water quality data in 2005 from CEDEN is provided in Table 3.4-5. Historic water quality sampling locations are shown on Map 3.4-1. Existing information sources indicate that the physical and water chemistry conditions in the bypass reach associated with the Project are of high quality and generally conform to regulatory water quality objectives and standards. No persistent, widespread water quality issues were found. There are no agriculture or water treatment plants that discharge into the bypass reach. Grazing allotments, managed by the United States Forest Service, are present in the vicinity of the bypass reach.

Review of the historical water quality data collected from sample locations in the bypass reach indicates that generally all the analyzed constituents are in compliance with current regulatory standards.

### 3.4.4 Water Temperature

Water temperature data in the bypass reach was collected in 1992 as part of the previous relicensing effort and in 1999–2007 as part of the Kern River No. 1 Hydroelectric Project Temperature Monitoring Study. As part of the previous relicensing effort, water temperature was measured in March and September of 1992 at six locations in the bypass reach (Table 3.4-3). The water temperature measurements ranged from 12.6° Celsius (°C) – 15.2°C in March (flow = 29 cubic feet per second [cfs]) and 21.5°C – 22.0°C in September (flow = 62 cfs).

More extensive water temperature data were collected as part of the Kern River No. 1 Hydroelectric Project Temperature Monitoring Program from 1999–2007 at three locations in the bypass reach (SCE 2008). The three temperature collection sites were (1) downstream of Democrat Dam; (2) below Stark Creek; and (3) upstream of Kern River No. 1 Powerhouse. Water temperature was collected continuously from May through October of each year. The mean and maximum monthly average temperatures for each year are provided in Table 3.4-6. Figure 3.4-1 provides an illustration of longitudinal water temperatures in the bypass reach during the monitoring period.

Temperatures entering the bypass reach are generally warm during the summer and exceed 20°C (monthly average) during July, August, and September. June average water temperature can also exceed 20°C in some years. For most months on the record, moderate warming (usually less than 1°C) was observed as water traveled from Democrat Dam downstream to the Kern River No. 1 Powerhouse.

The bypass reach is classified in the Basin Plan as WARM/COLD (CRWQCB 2018), however the data indicate that the reach does not meet the COLD designation for at least 50% of the days monitored (SCE 2008). The warming seen in the bypass reach did not exceed the 2.77 or 3.88°C (5 or 7° Fahrenheit [°F]) maximum allowed by the WARM/COLD designations. For the entire monitoring period (nine years May–October) warming only reached or exceeded 2.77°C (5°F) for less than 1% of the days monitored. These days were all in the month of May, when water temperatures were relatively cool and habitat conditions would not be adversely affected (SCE 2008).

### 3.4.5 References

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# TABLES

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## Table 3.4-1. Applicable Water Quality Standards and Objectives

| Analyte | Units | State and Federal Criteria | | |
|---|---|---|---|---|
| | | Basin Plan[1] | California Toxic Rule[2] | National Toxics Rule[3] |
| **In-Situ Measurements** | | | | |
| Oxygen, dissolved | mg/L | 5.0/7.0[4] | NS | NS |
| Secchi Depth | Meter | NS | NS | NS |
| pH | unitless | 6.5–8.3 | NS | 6.5–9.0 |
| Water Temperature | Fahrenheit | NS | NS | NS |
| Specific Conductance | µS/cm | 300 | NS | NS |
| **General Parameters and Metals** | | | | |
| Alkalinity (as $CaCO_3$) | mg/L | NS | NS | >20[5] |
| Aluminum | mg/L | 0.2 | NS | NS |
| Ammonia as $NH_3$ | mg/L | 0.025[6] | NS | NS |
| Antimony | µg/L | 6 | 14 | 14 |
| Arsenic – Total | µg/L | 10 | 150/340[7] | 150/340[7] |
| Benzene | µg/L | 1 | 1.2 | 1.2 |
| Beryllium | µg/L | 4 | NS | NS |
| Bicarbonate (as $CaCO_3$) | | NS | NS | NS |
| Boron – Total | | NS | NS | NS |
| Cadmium | µg/L | 5 | Hardness Dependent[7,8] | Hardness Dependent[7,8] |
| Calcium | | NS | NS | NS |
| Carbonate (as $CaCO_3$) | | NS | NS | >20[5] |
| Chemical Oxygen Demand | | NS | NS | NS |
| Chloride | mg/L | 250[9] | NS | NS |
| Chlorophyll-a | | NS | NS | NS |
| Chromium - Total | µg/L | 50 | NS | NS |
| Cobalt | | NS | NS | NS |
| Color | | NS[9,10] | NS | NS |
| Copper – Total | mg/L | 1[9] | 1.3[11] and Hardness Dependent[7,8] | 1.3[11] and Hardness Dependent[7,8] |
| Cryptosporidium | | NS | NS | NS |
| Cyanide | µg/L | 150 | 5.2/22[7] | 5.2/22[7] |
| Ethyl-benzene | µg/L | 300 | 3,100 | 3,100 |

| Analyte | Units | State and Federal Criteria | | |
|---|---|---|---|---|
| | | Basin Plan[1] | California Toxic Rule[2] | National Toxics Rule[3] |
| **General Parameters and Metals (continued)** | | | | |
| Fecal Coliform (3x5) | MPN/ 100 mL | 200/400[12] | NS | NS |
| Fecal Streptococci | | NS | NS | NS |
| Fluoride | mg/L | 2 | NS | NS |
| Foaming Agents | mg/L | 0.5[9] | NS | NS |
| Giardia | | NS | NS | NS |
| Hardness (as $CaCO_3$) | | NS | NS | >20[5] |
| Iron – Total | mg/L | 0.3[9] | NS | NS |
| Lead – Total | µg/L | 15 | Hardness Dependent [7,8] | Hardness Dependent [7,8] |
| Magnesium | | NS | NS | NS |
| Manganese – Total | µg/L | 50[9] | NS | NS |
| Mercury – Total | µg/L | 2 | 0.05 | 0.77/1.4[7] |
| Methyl mercury | mg/Kg fish | NS | | 0.3[13] |
| Methyl-tertiary-butyl Ether (MtBE) | µg/L | 5[9] | NS | NS |
| Nickel | µg/L | 100 | 610[11]; 4,600[14] and Hardness Dependent [7,8] | 610[11]; 4,600[14] and Hardness Dependent [7,8] |
| Nitrate ($NO_3$) | mg/L | 45 | NS | NS |
| Nitrite (as nitrogen) | mg/L | 1 | NS | NS |
| Nitrogen- Total Kjeldahl (TKN) | | NS | NS | NS |
| Odor | | NS[9.10] | NS | NS |
| Organic Carbon | | NS | NS | NS |
| Ortho-phosphate (o-$PO_4$-P) | | NS | NS | NS |
| Phosphorus | | NS | NS | NS |
| Potassium | | NS | NS | NS |
| Selenium | µg/L | 50 | 5[7] | Confirm no 5/20 5[7] |
| Silica | | NS | NS | NS |
| Silver | µg/L | 100[9] | Hardness Dependent [7,8] | Hardness Dependent [7,8] |
| Sodium | | NS | NS | NS |

| Analyte | Units | State and Federal Criteria | | |
|---|---|---|---|---|
| | | Basin Plan[1] | California Toxic Rule[2] | National Toxics Rule[3] |
| **General Parameters and Metals (continued)** | | | | |
| Sulfate ($SO_4$) | mg/L | 250[9] | NS | NS |
| Thallium | µg/L | 2 | 1.7[11], 6.3[14] | 1.7[11], 6.3[14] |
| Toluene | µg/L | 150 | 6800[11], 200000[14] | 6800[11], 200000[14] |
| Total Coliform (3x5, 6 hr hold) | | NS | NS | NS |
| Total Dissolved Solids | mg/L | 500[9] | NS | 250000[10] |
| Total Petroleum Hydrocarbons (as gasoline and as diesel) | | NS | NS | Narr[15] |
| Total Suspended Solids | | NS | NS | NS |
| Turbidity | NTU | Narr[16] | Narr[16] | NS |
| Xylenes – Total | µg/L | 1750 | NS | NS |
| Zinc – Total | mg/L | 5[9] | Hardness Dependent[10] | Hardness Dependent[10] |

Sources: USEPA 1976, 1992, 1996, 2000, 2001, and 2007.

Notes: NS = no standard available

1 The Basin Plan for the Tulare Lake Basin – Third Edition (May 2018)

2 California Toxics Rules are based primarily on USEPA standards developed under the Clean Water Act for human consumption of water and aquatic organisms with an adult risk for carcinogens estimated to be one in one million as contained in the Integrated Risk Information System (IRIS) as of October 1, 1996.

3 The National Toxics Rules are based on USEPA standards developed under the Clean Water Act for human consumption of water and aquatic organisms with an adult risk for carcinogens estimated to be one in one million as contained in the IRIS as of October 1, 1996. These criteria are to be applied to all states not complying with the Clean Water Act section 303(c)(2)(B).

4 For water designated as WARM (5.0 mg/l) and COLD or SPWN (7.0 mg/l).

5 20 mg/L or more as CaCO3 for freshwater aquatic life except where natural concentrations are less (USEPA's 1976 'Red Book). The 'Red Book' also recommends that natural alkalinity not be reduced by more than 25%.

6 Taste and odor threshold.

7 Freshwater Aquatic Life Protection, continuous concentration (4-day average)/maximum concentration (1-hour average).

8 Criteria is expressed as a function of hardness and decreases as hardness decreases. The actual criteria is calculated based in the hardness (as $CaCO_3$) of the sample water.

9 The criteria listed are secondary Maximum Concentration Levels for California drinking water quality objectives that do not necessarily indicate a toxic amount of contaminate. Rather these standards dictate water quality objectives designed to preserve taste, odor, or appearance of drinking water.[5] 20 mg/L or more as $CaCO_3$ for freshwater aquatic life except where natural concentrations are less (USEPA's 1976 'Red Book). The 'Red Book' also recommends that natural alkalinity not be reduced by more than 25%.

10 Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses. Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses. (Sacramento and San Joaquin River Basin Plan, Chapter III: Water Quality Objectives, pgs. 5 and 7, 6 September 2002).

11 CTR and NTR human health (30-day average); Drinking Water Sources (consumption of water an aquatic organisms).

[12] In all waters designated for REC-1, the E. coli concentration, based on a minimum of not less than 5 samples equally spaced over a 30-day period, shall not exceed a geometric mean of 200/100 ml and shall not exceed 400/100 ml in any single sample.

[13] This value is an Ambient Water Quality Criteria (AWQC) for methylmercury and was published by the USEPA in a document titled Water Quality Criterion for the Protection of Human Health: Methylmercury – Final (EPA – 823-R-01-001, January 2001). This AWQC replaces the AWQC for total mercury published in 1980 and partially updated in 1997.

[14] CTR human health (30-day average); Other Waters (aquatic organism consumption only).

[15] From Compilation of Water Quality Goals – TPH-diesel: taste and odor threshold and USEPA SNARL = 100 µg/L. TPH-gasoline: taste and odor threshold and proposed USEPA SNARL = 5 mg/L.

[16] Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits: where natural turbidity is between 0 and 5 NTU's, increases shall not exceed 1 NTU. Where natural turbidity is between 5 and 50 NTU's, increases shall not exceed 20%. Where natural turbidity is between 50 and 100 NTU's, increases shall not exceed 10 NTU's. Finally, where natural turbidity is greater than 100 NTU's, increases shall not exceed 10%.

**Table 3.4-2. Water Quality Laboratory Results from 1994 Kern River No. 1 Hydroelectric Project License Application (Reproduction of Table 2-9 from SCE 1994) Note: values shaded in green did not comply with Basin Plan or Toxic Rule criteria**

| Station | KR1-U | KR1-1 | | KR1-2 | | KR1-3 | | DLR | Basin Plan or Toxic Rule Criteria | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| Date Sampled | 9/23/92 | 3/31/92 | 9/23/92 | 3/31/92 | 9/23/92 | 3/31/92 | 9/23/92 | | | |
| Time Sampled | 1040 | 1100 | 1220 | 1345 | 1330 | 1455 | 1430 | | | |
| pH | 8 | 7.6 | 7.6 | 8.0 | 8.0 | 8.1 | 8.0 | 0.1 | 6.5-8.3 BP | pH Units |
| Elec. Cond. @ 25°C | - | 160 | 200 | 170 | 200 | 180 | 200 | 1 | 300 BP | µmhos/cm |
| Total Dissolved Solids @ 180°C | - | 115 | 105 | 115 | 105 | 120 | 110 | 10 | 500(1) BP | mg/l |
| Total Suspended Solids | - | 9.3 | 13.7 | 0.9 | 5.9 | 0.8 | 1.1 | 0.5 | NS | mg/kg |
| Hardness as $CaCO_3$ | - | 39.3 | 52 | 48.5 | 53.4 | 57.7 | 53.6 | 0.3 | >20 NTR | mg/l |
| Turbidity | - | - | 2.6 | - | 1.9 | - | 0.45 | 0.05 | FT | NT units |
| Calcium | - | 11.6 | 16.2 | 14.8 | 16.6 | 18 | 16.5 | 0.1 | *NS | mg/l |
| Magnesium | - | 2.5 | 2.8 | 2.8 | 2.9 | 3.1 | 3 | 0.01 | NS | mg/l |
| Sodium | - | 14.0 | 18.1 | 13.3 | 18.2 | 11.4 | 19.5 | 0.1 | NS | mg/l |
| Potassium | - | 1.6 | 2 | 1.8 | 2 | 1.8 | 2.1 | 0.1 | NS | mg/l |
| Carbonate | - | nd | nd | nd | nd | nd | nd | 2.6 | NS | mg/l |
| Bicarbonate | - | 68.7 | 84.3 | 73.0 | 84.3 | 77.4 | 84.3 | 2.6 | NS | mg/l |
| Chloride | - | 5.2 | 6.9 | 5.5 | 6.8 | 6.2 | 7.7 | 1.8 | 250(1) BP | mg/l |
| Fluoride | - | 0.21 | 0.36 | 0.21 | 0.38 | 0.22 | 0.36 | 0.05 | 2 BP | mg/l |
| Ortho-phosphate | - | 0.12 | nd | 0.12 | nd | nd | nd | 0.1 | NS | mg/l |
| Total Kjeldahl Nitrogen | - | nd | 0.9 | nd | 0.4 | nd | 0.3 | 0.2 | NS | mg/l |
| Nitrate as $NO_3$ | - | nd | 0.4 | nd | nd | nd | nd | 0.4 | 45(2) BP | mg/l |
| Ammonia as $NH_3$ | - | nd | 0.45 | nd | nd | nd | 0.04 | 0.02 | 0.025 BP | mg/l |

| Station | KR1-U | KR1-1 | | KR1-2 | | KR1-3 | | DLR | Basin Plan or Toxic Rule Criteria | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| **Date Sampled** | **9/23/92** | **3/31/92** | **9/23/92** | **3/31/92** | **9/23/92** | **3/31/92** | **9/23/92** | | | |
| **Time Sampled** | **1040** | **1100** | **1220** | **1345** | **1330** | **1455** | **1430** | | | |
| Nitrite Nitrogen | - | nd | nd | nd | nd | nd | nd | 0.1 | 1.0(3)$^{BP}$ | mg/l |
| Oil and Grease | - | nd | 16 | nd | nd | nd | nd | 2 | NS | mg/l |
| Biochemical Oxygen Demand | - | 1.8 | 1.5 | 1.22 | 3.3 | 0.6 | 0.9 | 0.3 | NS | mg O/L |
| Chlorophyll A | - | nd | nd | nd | nd | nd | nd | 5 | * | mg/m$^3$ |
| Total Coliform | > 1600 | 300 | > 1600 | 500 | > 1600 | 300 | 500 | 2 | NS | MPN/100 ml |
| Fecal Coliform | 23 | 240 | 50 | 50 | nd | 14 | 13 | 2.2 | 200/400(4) $^{BP}$ | MPN/100 ml |
| Dissolved Arsenic | 9.9 | 5.7 | 10 | 5.9 | 9.5 | 5.9 | 9.9 | 2 | ** | µg/L |
| Total Arsenic | 11 | 6.4 | 11 | 6.0 | 11 | 5.8 | 11 | 2 | 10 $^{BP}$ | µg/L |
| Dissolved Copper | - | nd | nd | nd | nd | nd | nd | 10 | ** | µg/L |
| Total Copper | - | nd | nd | nd | nd | nd | nd | 10 | 1000(1) $^{BP}$ | µg/L |
| Dissolved Lead | - | nd | nd | nd | nd | nd | nd | 5 | ** | µg/L |
| Total Lead | - | nd | nd | nd | 5 | nd | nd | 5 | 15 $^{BP}$ | µg/L |
| Dissolved Molybdenum | - | nd | nd | nd | 11 | nd | nd | 10 | NS | µg/L |
| Total Molybdenum | - | nd | nd | nd | nd | nd | nd | 10 | NS | µg/L |
| Dissolved Zinc | - | nd | nd | nd | nd | nd | nd | 10 | ** | µg/L |
| Total Zinc | - | 21 | 18 | 31 | 22 | 24 | 17 | 10 | 5000(6)$^{BP}$ | µg/L |
| Dissolved Mercury | - | nd | nd | nd | nd | nd | nd | 0.2 | ** | µg/L |
| Total Mercury | - | nd | nd | nd | nd | nd | nd | 0.2 | 2/5/.012(5) | µg/L |
| Total Tungsten | - | - | nd | - | nd | - | nd | 1 | NS | µg/L |
| Dissolved Tungsten | - | nd | nd | nd | nd | nd | nd | 2 | NS | µg/L |

| Station | KR1-U | KR1-1 | | KR1-2 | | KR1-3 | | DLR | Basin Plan or Toxic Rule Criteria | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| **Date Sampled** | **9/23/92** | **3/31/92** | **9/23/92** | **3/31/92** | **9/23/92** | **3/31/92** | **9/23/92** | | | |
| **Time Sampled** | **1040** | **1100** | **1220** | **1345** | **1330** | **1455** | **1430** | | | |
| Total Alpha Particle | - | 2 | nd | 3 | nd | 3 | nd | 2 | 15(2) | pCl/l |
| Total Beta Particle | - | nd | nd | nd | nd | 4 | nd | 3 | 50(2) | pCl/l |

Notes: - = not sampled
(1) = Secondary MCL as per Title 22 of the California Code of Regulations (CCR), Division 4
(2) = Primary MCL as per Title 22 of CCR, Division 4, Chapter 15.
(3) = Primary MCL set by EPA pursuant to the Safe Drinking Water Act
(4) = In waters designated as REC-1, fecal coliform concentration based on a minimum of not less than five samples for any 30 day period, shall not exceed a geometric mean of 200 MPN, nor shall more than ten percent of total samples during any 30 day period exceed 400 MPN."
(5) = Primary MCL as per Title 22/Basin Plan Criteria/Surface Water Plan Criteria
(6) = Secondary MCL as per Title 22 and Surface Water Plan Criteria
** = Numerical standards based on total concentrations.
BP = Basin Plan is source of most stringent criteria
CTR = CA Toxic Rule is source of most stringent criteria
DLR = detection limit for reporting purposes
FT = See Table 3.4-1 Footnote 16
KR1 = Kern River No. 1 Hydroelectric Project
nd = not detected
NS - no standard available
NTR = National Toxics Rule is source of most stringent criteria

**Table 3.4-3. In-situ Water Quality Measurements in 1992 (Reproduction of Table 2-10 from SCE 1994) Note: values shaded in green did not comply with Basin Plan or Toxic Rule criteria**

| Station | KR1-U | KR1-1 | | KR1-2 | | KR1-3 | | KR1-4 | | KR1-5 | Basin or Surface Water Plan Criteria |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date Sampled | 9/23/92 | 3/31/92 | 9/23/92 | 3/31/92 | 9/23/92 | 3/31/92 | 9/23/92 | 3/31/92 | 9/23/92 | 3/31/92 | |
| Time Sampled | 1630 | 1055 | 1245 | 1340 | 1340 | 1450 | 1430 | 1540 | 1540 | 1255 | |
| Flow (cfs) | 62 | 29 | 62 | 29 | 62 | 29 | 62 | 29 | 62 | 29 | |
| Air Temperature (°C) | 25 | 10.7 | 30.0 | 11.5 | 26.0 | 14 | 26.5 | 13.0 | 24.0 | 12 | NS |
| Water Temperature (°C) | 21.5 | 12.6 | 21.5 | 14.5 | 21.5 | 15.2 | 22 | 14.3 | 21 | 13.6 | NS |
| pH | 8.4 | 7 | 7.4 | 8.3 | 8.3 | 8.6 | 8.2 | 8.1 | 8 | 8.5 | 6.5–8.3[BP] |
| Conductivity (µS) | 182 | 161 | 179 | 168 | 180 | 172 | 196 | 155 | 191 | 164 | 300[BP] |
| Total Dissolved Solids (mg/l) | 97.8 | 79 | 91 | 83 | 96 | 85 | 99 | 78 | 99 | 82 | 500[BP] |
| Dissolved Oxygen (mg/l) | 7.5 | 8.9 | 7.4 | 9.4 | 8.3 | 9.5 | 8.5 | 9.2 | 6.5 | 9.5 | 5.0/7.0[1 BP] |

Notes: BP = Basin Plan is source of most stringent criteria
KR1 = Kern River No. 1 Hydroelectric Project

[1] Freshwater Aquatic Life Protection, continuous concentration (4-day average)/maximum concentration (1-hour average).

### Table 3.4-4. Location of Water Quality Measurements in 1992

| Station | Description | Elevation (feet) |
|---|---|---|
| KR1-U | Kern River at Democrat Springs boating take-out | 1,920 |
| KR1-1 | Kern River at 200 feet upstream of Democrat Dam | 1,920 |
| KR1-2 | Kern River just downstream of Live Oak Picnic Area | 1,370 |
| KR1-3 | Kern River at 600 feet upstream of Powerhouse No. 1 | 920 |
| KR1-4 | Kern River just downstream of Powerhouse No. 1 | 910 |
| KR1-5 | Lucas Creek at 30 feet upstream of Kern River | 1,560 |

Source: SCE 1994

Notes: KR1 = Kern River No. 1 Hydroelectric Project

**Table 3.4-5. Water Quality Measurements from 2005 CEDEN Data Collection. Note: values shaded in green did not comply with Basin Plan or Toxic Rule criteria**

| Station | CEDEN-554KER050 | CEDEN-554KER060 | CEDEN-554KER070 | CEDEN-558KER080 | Basin or Surface Water Plan Criteria | Units |
|---|---|---|---|---|---|---|
| **Date Sampled** | **1/26/2005** | **1/26/2005** | **1/26/2005** | **1/26/2005** | | |
| **Time Sampled** | **0928** | **1000** | **1028** | **1050** | | |
| Ammonium as N | 0.03 | 0.03 – 0.07 | 0.04 | 0.06 | 0.025[BP] | mg/l |
| Manganese | 77 | 87 – 88 | 72 | 83 | NS | µg/l |
| Iron | 470 | 440 – 480 | 360 | 360 | NS | µg/l |
| Phosphorus as P | 0.07 | 0.07 | 0.07 | 0.07 | NS | mg/l |
| Alkalinity as $CaCO_3$, total | 60 | 59-60 | 60 | 59 | NS | mg/l |
| Total dissolved solids | 93 | 91-95 | 85 – 99 | 100 | 500[BP] | mg/l |
| Potassium | 2.6 | 2.5 – 2.6 | 2.5 | 2.6 | NS | mg/l |
| Calcium | 16 | 16 | 16 | 16 | NS | mg/l |
| Boron | 0.12 | 0.12 | 0.12 | 0.13 | NS | mg/l |
| Sodium | 13 | 13 | 13 | 14 | NS | mg/l |
| Magnesium | 2.6 | 2.6 | 2.6 | 2.7 | NS | mg/l |

Notes: BP = Basin Plan is source of most stringent criteria
CTR = CA Toxic Rule is source of most stringent criteria
NTR = National Toxics Rule is source of most stringent criteria

**Table 3.4-6. Comparison of Monthly Mean and Maximum Water Temperatures Recorded Downstream of Democrat Dam, Below Stark Creek, and Upstream of Kern River No. 1 Powerhouse (reproduction of Table 3-5 from SCE 2008)**

| Month | Downstream of Democrat Dam | | Below Stark Creek | | Upstream of Kern River No. 1 Powerhouse | |
|---|---|---|---|---|---|---|
| | Mean (°C) | Maximum | Mean (°C) | Maximum | Mean (°C) | Maximum |
| **1999** | | | | | | |
| May | 15.1 | 19.1 | 16.7 | 21.6 | 17.6 | 22.1 |
| June | 18.1 | 21.3 | 18.7 | 21.4 | 19.3 | 22.3 |
| July | 21.0 | 22.9 | 21.4 | 23.4 | 21.6[1] | 23.1[1] |
| August | 22.2 | 24.6 | 22.5 | 24.6 | 22.8 | 25.0 |
| September | 21.6 | 23.6 | 21.9 | 23.6 | 22.2 | 24.0 |
| October | 17.1[2] | 20.6[2] | 17.5 | 21.6 | 18.9 | 21.8 |
| **2000** | | | | | | |
| May | 17.0[3] | 19.8 | 17.6 | 21.1 | 18.3 | 22.3 |
| June | 19.4 | 21.6 | 20.1 | 22.6 | 20.6 | 23.1 |
| July | 21.3 | 23.8 | 21.9 | 24.1 | 22.3 | 24.4 |
| August | 23.0 | 26.2 | 23.3 | 25.0 | 23.7 | 25.6 |
| September | 20.6[4] | 24.3 | 21.2 | 23.8 | 21.6 | 24.0 |
| October | 17.6 | 20.8 | 17.5 | 21.8 | 17.8 | 21.3 |
| **2001** | | | | | | |
| May[5] | 18.9 | 21.1 | 19.2 | 23.6 | 20.0 | 22.8 |
| June | 19.9 | 22.6 | 20.3 | 22.6 | 20.7 | 23.0 |
| July[6] | 22.5 | 24.1 | 22.7 | 24.6 | 23.2 | 26.1 |
| August[7] | 23.3 | 25.0 | 23.6 | 27.3 | 24.2 | 26.4 |
| September[8] | 21.8 | 24.3 | 21.8 | 26.0 | 22.6 | 25.9 |
| October[9] | 17.9 | 22.4 | 19.5 | 23.3 | 18.6 | 22.5 |
| **2002** | | | | | | |
| May | 16.9 | 20.9 | 18.0 | 24.3 | 18.6 | 23.7 |
| June | 20.1 | 22.8 | 20.6 | 23.3 | 21.3 | 24.0 |
| July | 23.1 | 24.6 | 23.5 | 26.3 | 23.9 | 26.6 |
| August | 22.6 | 24.5 | 22.9 | 27.3 | 23.3 | 26.1 |
| September | 21.0 | 23.8 | 21.3 | 27.0 | 21.9 | 25.6 |
| October | 16.3 | 19.3 | 16.2 | 21.0 | 17.0 | 19.6 |
| **2003** | | | | | | |
| May | 15.6 | 19.3 | 16.6 | 21.3 | 16.9 | 21.5 |
| June | 19.1 | 21.2 | 19.6 | 20.8 | 20.4 | 22.2 |
| July | 21.8 | 24.2 | 22.1 | 24.3 | 22.7 | 25.4 |
| August | 23.3 | 25.1 | 23.4 | 24.3 | 23.9 | 25.9 |

| Month | Downstream of Democrat Dam | | Below Stark Creek | | Upstream of Kern River No. 1 Powerhouse | |
|---|---|---|---|---|---|---|
| | Mean (°C) | Maximum | Mean (°C) | Maximum | Mean (°C) | Maximum |
| September | 22.5 | 25.1 | 22.6 | 24.2 | 22.9 | 25.9 |
| October | 18.9 | 21.6 | 18.9 | 22.1 | 19.3 | 22.5 |
| **2004** | | | | | | |
| May | 16.7[10] | 18.0[10] | 17.7 | 20.7 | 18.0 | 21.0 |
| June | 21.3[11] | 24.1[11] | 20.3 | 22.4 | 20.7 | 23.2 |
| July | 22.6 | 24.4 | 22.9 | 24.4 | 23.4 | 26.5 |
| August | 23.4 | 24.7 | 23.5 | 25.6 | 23.9 | 25.8 |
| September | 20.7 | 23.7 | 20.7 | 25.3 | 21.0 | 26.3 |
| October | 16.4 | 19.9 | 16.5 | 22.0 | 16.8 | 20.7 |
| **2005** | | | | | | |
| May | 15.2 | 18.1 | – [13] | – [13] | 16.3 | 19.0 |
| June | 16.5 | 19.5 | – [13] | – [13] | 17.4 | 20.2 |
| July | 19.0 | 21.8 | – [13] | – [13] | 20.1 | 22.3 |
| August[12] | 21.0 | 23.1 | – [13] | – [13] | 21.8 | 23.1 |
| September[12] | 20.7 | 23.0 | – [13] | – [13] | 21.0 | 22.8 |
| October[12] | 17.4 | 20.3 | – [13] | – [13] | 17.9 | 20.6 |
| **2006** | | | | | | |
| May[14] | 15.0 | 17.2 | 15.5 | 17.6 | 15.9 | 17.9 |
| June | 17.4 | 20.4 | 17.9 | 20.7 | 18.3 | 21.0 |
| July | 20.2 | 22.9 | 20.8 | 23.4 | 21.2 | 23.5 |
| August | 22.0 | 23.5 | 22.3 | 23.9 | 22.7 | 24.5 |
| September[15] | 21.2 | 23.8 | 21.1 | 24.8 | 21.6 | 25.0 |
| October[15] | 16.6 | 19.8 | 15.3 | 19.1 | 16.9 | 19.9 |
| **2007** | | | | | | |
| May | 17.3 | 20.1 | 18.0 | 21.6 | 18.5 | 21.7 |
| June | 20.2 | 22.0 | 20.7 | 23.5 | 21.2 | 23.9 |
| July | 22.7 | 24.5 | 22.5 | 24.8 | 23.5 | 25.4 |
| August | 23.0 | 25.7 | 23.4 | 26.8 | 23.5 | 26.2 |
| September[16] | 21.0 | 25.1 | 21.1 | 27.9 | 21.0 | 25.0 |
| October[16] | 16.2 | 18.9 | 15.7 | 19.7 | 16.0 | 19.5 |

Notes: KR1 = Kern River No. 1 Hydroelectric Project

[1] 15 day average due to data loss

[2] 18 day average due to data loss

[3] 30 day average due to data loss

[4] 29 day average due to data loss

[5] 24 day average Downstream of Democrat

[6] 23 day average Below Stark Creek

[7] 29 day average Below Stark Creek and 20 day average Upstream of KR1 Powerhouse

[8] 27 day average Below Stark Creek

[9] 10 day average Below Stark Creek

[10] Based on 25-day month

[11] Based on 4-day month

[12] Project was offline after August 21, 2005

[13] Stark Creek temperature recorders were buried by sediment and lost.

[14] Project was offline before May 26, 2006

[15] Changing water levels during September-October may have exposed the temperature recorders at Stark Creek to warmer temperatures than are representative of the river

[16] Project was offline after September 7, 2007

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# FIGURES

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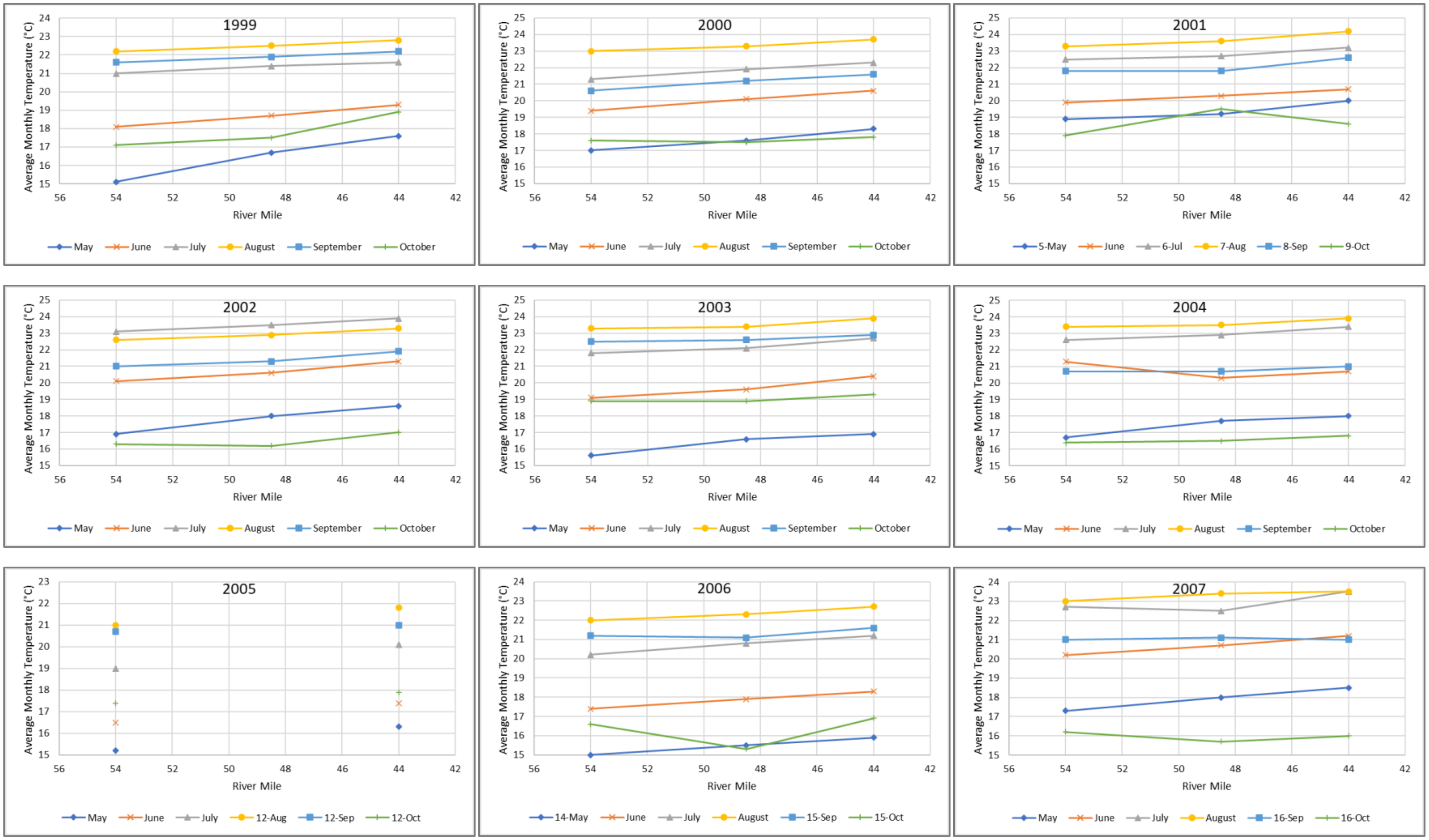


**Figure 3.4-1. Average Monthly Water Temperature by River Mile (May–October 1999–2007)**

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# MAPS

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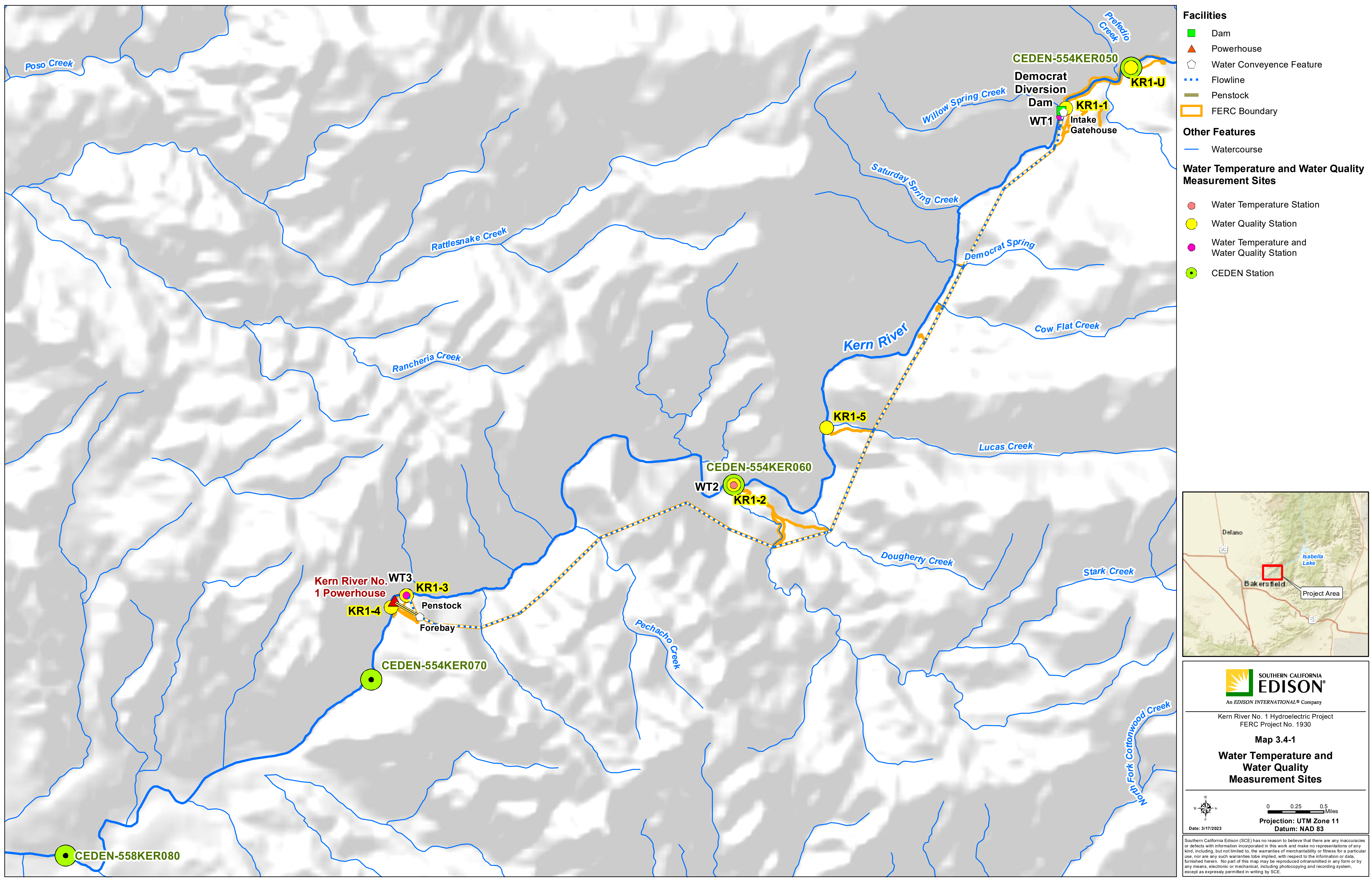


C:\GIS\237800343\map\Kern River 1\HydroMaps\SCE_Kern1_H2O_Temp_Qual_Locations_17i11i_01.mxd

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## LIST OF ACRONYMS

| | |
|---|---|
| Army Corps | U.S. Army Corps of Engineers |
| CalFish | California Fish |
| CEDEN | California Environmental Data Exchange Network |
| CESA | California Endangered Species Act |
| CFGC | California Fish and Game Commission |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CNDDB | California Natural Diversity Database |
| CRLF | California red-legged frog |
| DO | Dissolved oxygen |
| DPS | distinct population segments |
| EA | EA Engineering |
| FERC or Commission | Federal Energy Regulatory Commission |
| fps | feet per second |
| FYLF | Foothill yellow-legged frog |
| GGS | Giant garter snake |
| PG&E | Pacific Gas and Electric Company |
| Project | Kern River No. 1 Hydroelectric Project |
| Regional Water Board | California Regional Water Quality Control Board |
| SCE | Southern California Edison Company |
| State Water Board | California State Water Resources Control Board |
| USFS or Forest Service | United States Forest Service |
| WPT | Western Pond Turtle |

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## 3.5 FISH AND AQUATIC RESOURCES

This section describes the aquatic physical environment and fish and aquatic community in Kern River as they pertain to Southern California Edison Company's (SCE) Kern River No. 1 Hydroelectric Project (Project), including the Democrat Dam impoundment and the river reach between Democrat Dam and the Kern River No. 1 Tailrace (bypass reach[1]), (Maps 2-1 and Maps 2-3a–g). The Federal Energy Regulatory Commission's (FERC) content requirements for this section are specified in Title 18 of the Code of Federal Regulations (CFR) Chapter I § 5.6(d)(3)(iv).

In addition, this section describes rare, threatened, and endangered aquatic resources in the vicinity of the Project. The FERC content requirements for this information are specified in 18 CFR Chapter I § 5.6(d)(3)(vii). A description of terrestrial resources in the vicinity of the Project, including rare, threatened, and endangered terrestrial species is included in Section 3.6, Botanical and Wildlife Resources.

### 3.5.1 Information Sources

This section was developed using existing information available from the following sources:

- California Fish Website, Fish Species by Watersheds: Lake Isabella-Kern River-180300010607 (CalFish 2020)
- FERC's Final Environmental Assessment for Hydropower License, Kern River No. 1 Hydroelectric Project, FERC Project No. 1930-014 (FERC 1998)
- SCE's Application for New License for the Kern River No. 1 Hydroelectric Project (SCE 1994)
- Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: A Guide to the Early Life Histories (Wang 1986)
- SCE's Final Report Kern River No. 1 Hydroelectric Project Smallmouth Bass Study (SCE 2009)
- California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) (CNDDB 2022)
- Nonindigenous Aquatic Species Database (USGS 2020a)
- Sensitive Freshwater Mussel Surveys in the Pacific Southwest Region: Assessment of Conservation Status (Howard 2010)
- CDFW Fish Stocking Records

[1] A bypass reach is a segment of a river downstream of a diversion facility where Project operations result in the diversion of a portion of the water from that reach.

- Natural Resource Information System (NRIS) (U.S. Forest Service [Forest Service] 2022)
- U.S. Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation System (IPaC) website (USFWS 2022)
- Species Status Assessment Report for the Foothill Yellow-legged Frog (*Rana boylii*), Version 2.0 (USFWS 2021)
- California Fish and Game Commission Notice of Findings for Foothill Yellow-legged Frog (*Rana boylii*) (CFGC 2020)
- Revised Designation of Critical Habitat for California Red-Legged Frog: Final Rule. Federal Register, Vol. 75, No. 51 (USFWS 2010)
- Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*) (USFWS 2017)

### 3.5.2 Aquatic Physical Environment

The following provides an overview of the aquatic physical environment in the vicinity of the Project.

#### 3.5.2.1 Hydrology

**Historic Hydrology**

Historically, the Kern River was in an isolated watershed with limited connectivity to other larger rivers and the ocean. The Kern River flowed into Kern Lake and Buena Vista Lake, both now dry, and occasionally connected to the San Joaquin River during exceptionally wet years when the Buena Vista and Tulare lakes flooded into one another and connected to the San Joaquin River via Fresno Slough (Moyle 2002). During these periods, the Kern River may have been accessible to Central Valley steelhead (*Oncorhynchus mykiss*); however, the historic southern limit of Central Valley steelhead distribution is considered the Kings River, north of the Kern River (NMFS 2014). After the construction of Isabella Dam in 1953, the winter floods connecting Buena Vista and Tulare lakes ceased as well as the occasional connection of the Kern River to the San Joaquin River (Audubon Society 2020).

**Current Hydrology**

The Kern River is a highly regulated river, with numerous diversions and impoundments both upstream and downstream of the Project. A detailed description of the FERC projects in the watershed is provided in Section 3.2, Description of the River Basin (Map 3.2-2). Inflow to the Project is primarily dependent on flow releases from the U.S. Army Corps of Engineers' (Army Corps) Isabella Dam, located approximately 20 river miles upstream of Democrat Dam (Map 2-1). Isabella Dam impounds Lake Isabella which provides flood control, irrigation, and recreational benefits. Flow releases from Isabella Dam are overseen by a watermaster.

Generally, releases from Isabella Dam (inflow to the Project) peak during the summer coinciding with irrigation releases. (Figure 3.5.1). SCE patterns of diversions are provided in Figure 3.5.2. Once flows are discharged from the Kern River No. 1 Powerhouse, flows are immediately diverted again by the Kern Canyon Project (FERC No. 178), located immediately below the Kern River No. 1 Powerhouse Tailrace.[2]

In recent years, flows from Isabella Dam have been influenced by extreme drought conditions and an ongoing major dam safety remediation project that began in 2006 to enhance the spillway capacity and fortify the existing main and auxiliary dams. To address dam safety concerns, storage in Lake Isabella was initially reduced from the maximum storage capacity of 568,075 acre-feet to 72,000 acre-feet. The non-flood season restriction limit was increased to 361,250 acre-feet in February 2021 and will be effective until the remediation project is completed (anticipated in 2023). Information on the remediation project at Isabella Dam is provided in Section 3.2, General Description of the River Basin.

#### 3.5.2.2 Channel Gradient, Channel Geometry, and Riparian Vegetation

The Kern River Basin / Watershed is characterized by steep slopes and deeply incised channels within rugged canyons. These channels have limited geomorphic landform development and are confined by narrow V-shaped valley bottoms and steep-sided slopes with substrates dominated by bedrock and coarse sediment (i.e., boulders). The lower Kern River, specifically within the bypass reach, is a bedrock-controlled stream that is limited in its ability to adjust either vertically or laterally.

The Kern River between Democrat Dam and the Kern River No. 1 Powerhouse (bypass reach) is a moderately steep stream dominated by boulders and bedrock. As detailed in Section 3.2, General Description of the River Basin, the gradients from Isabella Dam to the mouth of the Kern Canyon and from Democrat Dam Impoundment to Kern River No. 1 Powerhouse are 1.1% and 1.8%, respectively. The largest tributaries in the vicinity of the Project are Lucas and Stark creeks, containing upstream drainages of approximately nine square miles.

Monitoring conducted during the previous relicensing effort characterized the bypass reach as dominated by broad runs (39.6%), pools (27%), and cascades (14.8%). The remaining habitat types were composed of narrow and wide riffles, braided low-gradient cascades, and runs (EA 1986).

The riparian community is limited to a narrow band along the banks of the Kern River. During the previous relicensing, SCE estimated that about 58 acres of riparian vegetation occurred in the bypass reach (SCE 1994). The riparian area along the bypass reach is limited by several factors including a narrow and incised floodplain, steep canyon slopes, low rainfall, high stream gradient, high flows, and large boulder and bedrock substrate (limited gravel or fine sediment). Typical riparian species found along the bypass reach

[2] On October 15, 2020, the Kern Canyon Project was transferred from Pacific Gas and Electric Company to Kern & Tule Hydro, LLC. At the time of transfer, the Kern Canyon Diversion was inoperative due to damage from a January 5, 2017, rockslide. Since that time, the new licensee has been making repairs to the Kern Canyon Diversion Dam.

and documented in the 1994 License Application included Fremont Cottonwood, interior live oak, sycamore, willows, digger pine, mugwort, horsetails, nettle, buttonbush and Mexican rush. The 1994 investigation also noted limited riparian areas that were present along the water conveyance system, where localized leakage has promoted the establishment of riparian species. More recently, SCE conducted a spatial analysis that quantified the amount of riparian habitat in the bypass reach (58 acres), adjacent the Democrat Dam Impoundment (32 acres), and in the vicinity of Project flumes, conduits, and adits (11 acres) (see Section 3.9, Wetland, Riparian, and Littoral Habitat).

#### 3.5.2.3 Fish Barriers

There are no fish passage barriers in the bypass reach between Democrat Dam and the Kern River No. 1 Powerhouse Tailrace. Democrat Dam is an upstream fish passage barrier with no fish passage infrastructure. Due to the spillway crest configuration, low head, and discharge directly to the Kern River channel, Democrat Dam provides downstream fish passage only during spill events.

#### 3.5.2.4 Water Temperature

SCE conducted water temperature and dissolved oxygen (DO) monitoring in the bypass reach between 1999 and 2007 in fulfillment of the requirements of its FERC license. The final temperature monitoring report indicated that temperatures in the bypass are generally warm during the summer months and typically peak in the month of August when temperatures exceed 22° Celsius (°C) (see Table 3.5-1). At the time of the study, the California State Water Resources Control Board (State Water Board) classified the Kern River in the Project vicinity as a WARM/COLD designation in its Basin Plan (SCE 2008). During project relicensing, the State Water Board's inland surface waters objective for waters designated as COLD freshwater fish habitat was to not allow an increase in water temperature more than 2.8°C above the natural receiving water temperature. SCE's monitoring indicated that the bypass reach did not meet the characteristics of the historical COLD designation for at least half of the days monitored in the May–October monitoring period. The surface waters temperature objective has since been revised to a 5°C warming threshold for both WARM and COLD waters (Regional Water Board 2019). The study also determined that water diverted from Democrat Dam is discharged back to the stream at nearly the same temperature as the upstream end of the reach. DO monitoring suggested that DO concentrations were generally high and met Basin Plan standards. Finally, SCE concluded that water temperatures in the bypass reach met the objectives of the Basin Plan.

Additional water temperature and DO data collection by third parties occurred at various times between 2002 and 2016 in the vicinity of Democrat Dam and the Lower Richbar recreation site (CEDEN 2023). This data, collected under the California Surface Water Ambient Monitoring Program (SWAMP) also included conductance, turbidity, water temperature, pH, E. coli, nitrogen, ammonia, alkalinity, phosphorus, and manganese. Water temperature data collected under the SWAMP program shows similar patterns of elevated temperatures in the summer months and lower temperatures in the fall and winter months (Table 3.5-2).

Water temperatures collected by SCE have served multiple objectives, including characterizing any Project-related effects to the Kern River and also comparing the results with the temperature preferences of fish species at the Project (Section 3.5.4).

#### 3.5.2.5 Fish Habitat

SCE completed fish population monitoring in the bypass reach between 1999 and 2008 and habitat simulation modeling (PHABSIM) to provide an index of the amount of habitat available at a range of flows. The resulting metric (weighted usable area or WUA) as a function of flow was developed for smallmouth bass (*Micropterus dolomieu*) (Figure 3.5-3) and hardhead (*Mylopharodon conocephalus*) (Figure 3.5-4). The study found that WUA for hardhead reaches maximum values at higher flows than smallmouth bass but at flows substantially less than summer irrigation releases. Specifically, hardhead WUA peaked at approximately 150 cfs for adults and at the lowest modeled flow (15 cfs) for juvenile hardhead. In general, the WUA for hardhead decreases with increasing flows. The WUA for smallmouth bass peaked between 25–40 cfs for adults and 25 cfs for juveniles. As flows increase, WUA for all lifestages decreases.

The minimum instream flows under the Project license provide near maximum WUA for smallmouth bass. In addition, the minimum instream flows correspond with maximum WUA for juvenile hardhead. However, minimum instream flows generally only occur in drier years and in the fall and winter months. The higher flows characteristic of the spring months and during the summer irrigation season result in decreased habitat for smallmouth bass and juvenile hardhead. Spring and summer irrigation flows above 150 cfs reduce habitat availability for adult hardhead.

#### 3.5.2.6 Fish Entrainment

Fish passing in front of the diversion intake structures near the dam may be entrained if intake water velocities exceed fish swimming ability. One intake is located immediately adjacent to the diversion dam and the other intake is located approximately 40 feet upstream and oriented perpendicular to the flow. Trash racks are constructed of bar material on 2-inch centers, with widths of 36 feet and 30 feet, respectively. Fish can subsequently suffer death or injury if entrained and pass through the turbines at the powerhouse. The Project intakes were specially designed to produce relatively low approach velocities reducing entrainment potential.

During the previous relicensing, the potential for entrainment of fish at the diversion intake near Democrat Dam was evaluated by comparing Project intake velocities with existing swimming performance information for largemouth bass(*Micropterus salmoides*), smallmouth bass, white crappie (*Pomoxis annularis*), mosquitofish (*Gambusia affinis*), Sacramento hitch (*Lavinia exilicauda exilicauda*), carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), and brown bullhead (*Ameiurus nebulosus*) (SCE 1994). SCE collected velocity measurements immediately adjacent to the intakes (channel upstream of two trash screens). At a diversion flow of 397 cfs, or 96.4% of maximum capacity, SCE measured an average approach velocity[3] of 0.25 feet per second (fps) (with a range of 0.13 – 0.41 fps) at the intake oriented parallel to the flow and 0.86 fps (0.74 – 1.09 fps) at the intake oriented perpendicular to flow. In addition, SCE measured average bypass velocities[4] of 0.44 and 0.41 fps for each screen (SCE 1994).

Potential for entrainment was evaluated considering the relative size range of fish collected in the Democrat Dam Impoundment (Table 3.5-3) and the relative swimming speed of each species. The entrainment analysis concluded that the only species potentially entrained at the intakes would be small largemouth bass (44 to 61 millimeters [mm]). This conclusion was based on the swimming speed of 0.5 fps for largemouth bass with an average length of 82 mm at (Dahlberg et al. 1968) and the swimming speed of 1.1 fps to 1.9 fps for largemouth bass 81 mm to 224 mm in length (Beamish 1978). FERC determined that all other gamefish sampled from the impoundment have swimming speeds greater than the screens' approach velocities (FERC 1998).

Since relicensing, additional swimming performance estimates have been completed for some of the native fish that are present in the Project vicinity, including hardhead, Sacramento pikeminnow (*Ptychocheilus grandis*), and Sacramento sucker (*Catostomus occidentalis*). Specifically, Myrick and Cech (2000) measured swimming performance in 19.1 to 28.5 centimeter (cm) (total length) fish at water temperatures between 10–20°C. Critical swimming velocities for all sizes and temperatures ranged between 0.39 and 0.57 meters (m)/sec. Myrick and Cech recommended that water diversion approach velocities for Sacramento hitch in the 20–30 cm total length range should not exceed 0.3 to 1.0 m/s (0.98–3.28 fps) and 0.4 to 1.0 m/s (1.31–3.28 fps) for hardhead, Sacramento pikeminnow, and Sacramento sucker in the 20–30 cm total length range. These recommended velocities are all above the average approach and bypass velocities measured during the previous relicensing, and do not exceed the swimming capabilities of the Kern River native minnows.

#### 3.5.2.7 Fish and Aquatic Community

The following provides an overview of the aquatic community in the vicinity of the Project. Information on special-status aquatic species known to occur or potentially occurring in the vicinity of the Project is provided in Section 3.5.4.

The bypass reach generally contains transitional-zone fish assemblages with supplemental cold-water species stocked during cooler months. Democrat Dam Impoundment and the bypass reach contain an assemblage of native and non-native fish species. The fish community in the bypass reach is mostly comprised of transition zone native Sacramento sucker, hardhead, and Sacramento pikeminnow (*Ptychocheilus grandis*). The bypass reach also includes a mix of non-native smallmouth bass and hatchery-origin rainbow trout (*Oncorhynchus mykiss*) and other less common centrarchids (bass and sunfish), ictalurids (catfish) and non-native cyprinids (minnows). During the previous relicensing, SCE collected largemouth bass, smallmouth bass, white

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[3] The component of the measured velocity that carries fish toward the intake.

[4] The component of the measured velocity that tends to carry objects past the screens.

crappie, mosquitofish, hitch (*Lavinia exilcauda*), carp, channel catfish, and brown bullhead in the Democrat Dam Impoundment.

**Historic Fish Population Monitoring Surveys**

SCE conducted annual fish population monitoring in the bypass reach between 1999 and 2008 as required by License Article 403. Specifically, Article 403 required SCE to study the adequacy of license-required minimum flows in protecting and enhancing the smallmouth bass fishery in the bypass reach. However, the study also evaluated the status of other fish species in the Kern River, including hardhead and the effects of flow and other physical factors on the species.

During the 1999–2008 monitoring period, SCE documented the presence of Sacramento sucker, Sacramento pikeminnow, yellow bullhead (*Ameiurus natalis*), hardhead, rainbow trout, white catfish (*Ameiurus catus*), smallmouth bass, largemouth bass, mosquitofish, channel catfish, goldfish (*Carassius auratus*), threadfin shad (*Dorosoma petenense*), carp, and white crappie (SCE 2009). In general, Sacramento sucker, Sacramento pikeminnow, smallmouth bass, and threadfin shad[5], comprised the greatest percentage of individuals collected during the fishery surveys, with relative abundances fluctuating between the four species during any given year (Table 3.5-4 and Figure 3.5-5). During some years, threadfin shad were abundant during fish population monitoring. As threadfin shad are a lacustrine species, these observations are likely attributed to spill events from Lake Isabella during wet years. When adjusted for biomass, Sacramento sucker consistently provided the largest biomass component of species across monitoring years. Of the species collected, Sacramento sucker, Sacramento pikeminnow, hardhead, and rainbow trout are native to the bypass reach, with the collected rainbow trout likely being of hatchery origin.

The monitoring study summary report concluded that overall, the minimum streamflow required under the current license appears to be suitable for smallmouth bass. However, high irrigation flows released from upstream Lake Isabella in the spring and summer (independent of Project operations) decreased available habitat and may have led to a negative effect on recruitment. The high summer irrigation flows also contributed to a decrease in hardhead habitat, although to a lesser extent than smallmouth bass

Based on literature reviews, the monitoring study found that water temperatures in the bypass reach were generally within the preference range for smallmouth bass (Table 3.5-5). The study also investigated temperature preferences for hardhead (Table 3.5-6). The warmer temperatures in the summer months in the bypass reach are within the preferred temperature range of hardheads.

More recently, SCE conducted fish population monitoring immediately upstream of the Project as a requirement of its Borel Project license. In 2020, SCE conducted electrofishing surveys at two locations between Isabella Dam and Democrat Dam

[5] Threadfin shad are not a riverine species and were likely introduced into the bypass reach from Lake Isabella during a spill event. For the purposes of displaying resident species at the Project, threadfin shad are excluded from the species table.

Impoundment. Similar to the Kern River No. 1 monitoring, results illustrated a fishery dominated by Sacramento sucker (86.9%), followed by smallmouth bass (7.8%), and Sacramento pikeminnow (Figure 3.5-6). The 2020 surveys also noted the presence of white catfish, channel catfish, white crappie, brown bullhead, channel catfish, green sunfish, hardhead, largemouth bass, and rainbow trout (SCE 2021). Additional surveys at the Borel Project were completed during 2001, 2005, 2006, and 2012.

#### 3.5.2.8 Stocking

CDFW currently stocks rainbow trout at three locations within the Kern River Canyon, including in the bypass reach near the Richbar picnic areas (Table 3.5-7). Review of fish stocking records for 2022 indicates that CDFW typically stocks trout twice annually at the three Kern River Canyon locations during the month of May when lower water temperatures are conducive to stocking. This is essentially a put-and-take fishery, with no known natural recruitment due to elevated water temperatures during the summer months and limited spawning habitat.

#### 3.5.2.9 Rare, Threatened, and Endangered Aquatic Resources

This section identifies special-status aquatic species in the vicinity of the Project that are: (1) listed, proposed for listing, or candidate for listing as threatened or endangered under the federal Endangered Species Act (ESA); (2) listed, proposed for listing, or under review as rare, threatened, or endangered under the California Endangered Species Act (CESA); (3) designated by CDFW as Fully Protected or Species of Special Concern; and/or (4) designated by the United States Forest Service (Forest Service) (Region 5) as sensitive or Species of Conservation Concern (Tables 3.5-8 and 3.5-9).

The list of special-status aquatic species with the potential to occur in the vicinity of the Project was developed by querying the following resources:

- USFWS Information for Planning and Consultation (IPaC) portal for federally listed and proposed endangered, threatened, and candidate species and their designated critical habitat (USFWS 2022)
- CDFW CNDDB (CNDDB 2022)
- Region 5 Regional Forester's Sensitive Animal Species List (USFS 2023)

**<u>Fish</u>**

*HARDHEAD*

Hardhead (spp.) are classified as a Forest Service Sensitive Species and a Species of Special Concern by the CDFW. The Forest Service defines sensitive species as those identified by a Regional Forester that are not listed or proposed for listing under the ESA for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Similarly, the CDFW Species of Special Concern designation includes those that have declining population levels, limited ranges, and/or continuing threats that have made them vulnerable to extinction.

Hardhead are large cyprinids native to the Sacramento and San Joaquin River drainages and are native to the upper Kern River downstream of South Creek (Stephens et al. 1995). Hardhead have restrictive microhabitat preferences and prefer large, warm streams containing deep, rock-bottomed pools and runs with sand-gravel-boulder substrates, low turbidity, and low water velocities (0.66 to 1.3 fps; Moyle 2002; Moyle and Daniels 1982). They prefer warmer temperatures (greater than 20°C for growth, and 24°C to 28°C for optimal physiological performance), and most often occur in streams with temperatures over 20°C. Hardhead belong to the pikeminnow-hardhead-sucker assemblage and are generally found with Sacramento pikeminnow (Moyle 2002). They are omnivorous; juveniles feed on aquatic macroinvertebrates and small snails, while adults feed on large invertebrates and plants such as filamentous algae (Moyle 2002).

Hardhead sexually mature after 3 years and primarily spawn in April and May (Moyle 2002). Adults located in larger rivers sometimes migrate upstream to spawn, while others move only short distances from their home pool (Moyle 2002; Grant and Maslin 1999). Females produce 7,000 to 24,000 eggs per year. Hardhead spawn over gravel and rocky substrate in riffles, runs, or at the heads of pools. Larval and post-larval fish utilize dense cover along stream margins and move into deeper habitats as they grow (CalFish 2020). Juveniles feed on plankton, cladocerans, insects, and small snails. In the intermittent pools of the upper San Joaquin River, they will also feed on filamentous algae (Wang 1986).

Hardhead were found consistently in the bypass reach during the 1999–2008 fishery monitoring efforts. However, hardhead abundance is likely reduced by predation from non-native smallmouth bass, which is typical for other local watersheds where the species co-occur (Brown and Moyle 1993). Hardhead may also be adversely affected by habitat loss, including the disappearance of large to medium-size cool- to warmwater streams with deep pool habitat (Moyle 2002). The final fishery monitoring report for the current Project license indicates that hardhead abundance has fluctuated over the course of the study and have almost always been a minor component (less than 4% cumulatively in the bypass reach) of the fish fauna. Among the monitoring locations, hardhead appear to be most prevalent in the upper portion of the bypass reach near USGS gaging station 11192000.

*SACRAMENTO HITCH*

Sacramento hitch are also classified as a Species of Special Concern by the CDFW. Sacramento hitch are a deep-bodied minnow native to the California Central Valley and are found in cool and clear, low-gradient streams. They inhabit sandy runs or pools where aquatic vegetation is present. They are tolerant of water temperatures greater than 30°C and in salinities as high as 9 parts per thousand. In stream environments, hitch feed in the water column or the surface for insects. Sacramento hitch typically spawn between February and July at 1–3 years old. Hitch generally live for a total of 4–6 years.

Hitch were last documented at the Project in 1986 as part of the previous relicensing studies. However, they were absent from any of the post-1999 Kern River No. 1 and Borel Project surveys and are assumed to no longer be present in the lower Kern River.

*DELTA SMELT*

Delta smelt (*Hypomesus transpacificus*) are federally-listed as threatened under the ESA and state-level endangered. The official range for delta smelt encompasses the state of California, with critical habitat having been designated in the California Delta and portions of the San Francisco Bay. Delta smelt typically inhabit estuary or brackish waters of the California Delta. Although the species appears on the official species list from the USFWS in the vicinity of the Project, the species does not occur in the Kern River Watershed and the river is hydrologically disconnected from the San Joaquin River and Delta.

**Mollusks**

*WESTERN PEARLSHELL MUSSEL*

Western pearlshell mussel (*Margaritifera falcata*) is a Forest Service Sensitive Species (USFS 2019), and a state Species of Special Concern (CDFW 2020). Review of the CNDDB indicates that western pearlshell mussels have been documented in the vicinity of the Project. According to the CNDDB, western pearlshell mussel were documented in upper Kern River above Lake Isabella, along with additional observations in small streams west of Lake Isabella (e.g., Cedar Creek and unknown stream in the Glennville quad, likely Poso Creek). Western pearlshell mussels were documented historically in the lower Kern River but were not found in recent efforts in 2008–2009 to relocate them at their historical locations (Howard et al. 2015). In addition, western pearlshell mussel occurrences are not widely published, due to their cultural importance to Native American Tribes.

*WESTERN RIDGED MUSSEL*

Western ridged mussel (*Gonidea angulate)* is currently a candidate for listing as endangered under the ESA and is classified as a Species of Special Concern by the CDFW. Like the western pearlshell mussel, they were documented at the Project vicinity in historical surveys but were not present in recent surveys at historical locations (Howard et al. 2015) and are presumed extirpated from southern California and most of the Central Valley (Xeres Society 2020).

**Crustaceans**

*VERNAL FAIRY SHRIMP*

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*) are listed as threatened under the ESA. No critical habitat is present for the species and the species does not occur in the vicinity of the Project. Fairy shrimp is found within vernal pools in the Central Valley that are disconnected from the Kern River Watershed.

## Amphibian and Reptiles

### *Foothill Yellow-Legged Frog*

Several populations (i.e., clades) of the foothill yellow-legged frog (FYLF) (*Rana boylii*) are listed as threatened or endangered under the CESA (California Fish and Game Commission 2020). The Project is within the CDFW East/Southern Sierra clade that is Endangered under CESA. On December 28, 2021, the USFWS proposed to list four distinct population segments (DPS) of this species. The bypass reach is located within the USFWS South Sierra DPS for FYLF, which is proposed for listing as endangered under the ESA. The USFS also classifies FYLF as a Forest sensitive species.

The historical distribution of the FYLF extended from the Willamette River drainage in Oregon south to at least the Upper San Gabriel River in Los Angeles County, California. Within this latitudinal distribution, the taxon occupied foothill and mountain streams between the Pacific coast and the Sierra-Cascade crest, from sea level to approximately 1,524 meters (5,000 feet). The current distribution of the FYLF generally follows the historical distribution of the species except with range contractions in the southern and, to a lesser extent, northern parts of the species' range. As shown in Map 3.5.1, there were several historical occurrences of FYLF in the vicinity of the Project, dated between 1911 and 1968 (CNDDB 2022). However, all FYLF south of Johnsondale, California (Tulare County) were extirpated during the 1970s or earlier (USFWS 2021). FYLF were also extirpated from Caliente Creek (Kern County, east of Bakersfield) during the mid-1970s as a result of extreme flooding events (USFWS 2021). The last recorded occurrence of FYLF near Kern River was in 2018 in the upper North Fork Kern River, above Lake Isabella (CNDDB 2022).

### *California Red-Legged Frog*

The California red-legged frog (CRLF) (*Rana draytonii*) has been a federally threatened species since June 24, 1996 (USFWS 1996) and is also a California state Species of Special Concern. It is endemic (native and restricted) to California and Baja California, Mexico, at elevations ranging from sea level to approximately 5,000 feet (1,500 meters). Records of the CRLF are known from Riverside County to Mendocino County along the Coast Range; from Calaveras County to Butte County in the Sierra Nevada; and in Baja California, Mexico.

The Project is located outside the current range of the CRLF as defined by USFWS (2010). The closest known occurrences are in Fresno County, approximately 100 miles north of the Project, and in San Luis Obispo County, approximately 50 miles west of the Project.

### *Giant Garter Snake*

The giant garter snake (GGS) (*Thamophis gigas*) was federally listed as a threatened species on October 20, 1993. The GGS is also listed as threatened under CESA.

Historically, the GGS inhabited the Sacramento and San Joaquin Valleys from the vicinity of Chico, in Butte County southward to Buena Vista Lake, near Bakersfield in Kern

County, California. The eastern and western boundaries of the GGS include the foothills occurring along each side of the Central Valley below approximately 300 feet in elevation. The species is strongly associated with large wetland habitats (tule marshes) along the broad floodplains of the Central Valley. The Kern River No. 1 Powerhouse, at the downstream end of the Project, is located at approximately 950 feet in elevation, well above the historic elevation range of the species. In addition, the Project vicinity does not support large wetlands that characterize the typical habitat for this species.

*WESTERN POND TURTLE*

The southwestern pond turtle (WPT) (*Emys marmorata pallida*) is purely an aquatic species. It is a Forest Service sensitive species and a California species of special concern. WPT are known in the Kern River Watershed from observations in Lake Isabella, two locations near the mouth of the Kern Canyon, and an undated observation near the confluence of the Kern River and Bodfish Creek below Lake Isabella (FERC 1997, CDFW 2022). All four of these locations are upstream of the Project. During the previous relicensing, FERC determined that the swift and variable currents associated with irrigation releases and the limited amount of suitable emergent vegetation makes the bypass reach unlikely to support populations of WPT.

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# TABLES

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**Table 3.5-1. Comparison of Monthly Mean and Maximum Water Temperatures Recorded downstream of Democrat Dam, below Stark Creek and upstream of Kern River No. 1 Powerhouse**

| Month | Downstream of Democrat Dam | | Below Stark Creek | | Upstream of Powerhouse | |
|---|---|---|---|---|---|---|
| | Mean (°C) | Maximum | Mean (°C) | Maximum | Mean (°C) | Maximum |
| **1999** | | | | | | |
| May | 15.1 | 19.1 | 16.7 | 21.6 | 17.6 | 22.1 |
| June | 18.1 | 21.3 | 18.7 | 21.4 | 19.3 | 22.3 |
| July | 21 | 22.9 | 21.4 | 23.4 | 21.6 [1] | 23.1 [1] |
| August | 22.2 | 24.6 | 22.5 | 24.6 | 22.8 | 25 |
| September | 21.6 | 23.6 | 21.9 | 23.6 | 22.2 | 24 |
| October | 17.1 [2] | 20.6 [2] | 17.5 | 21.6 | 18.9 | 21.8 |
| **2000** | | | | | | |
| May | 17.0 [3] | 19.8 | 17.6 | 21.1 | 18.3 | 22.3 |
| June | 19.4 | 21.6 | 20.1 | 22.6 | 20.6 | 23.1 |
| July | 21.3 | 23.8 | 21.9 | 24.1 | 22.3 | 24.4 |
| August | 23 | 26.2 | 23.3 | 25 | 23.7 | 25.6 |
| September | 20.6 [4] | 24.3 | 21.2 | 23.8 | 21.6 | 24 |
| October | 17.6 | 20.8 | 17.5 | 21.8 | 17.8 | 21.3 |
| **2001** | | | | | | |
| May | 18.9 | 21.1 | 19.2 | 23.6 | 20 | 22.8 |
| June | 19.9 | 22.6 | 20.3 | 22.6 | 20.7 | 23 |
| July | 22.5 | 24.1 | 22.7 | 24.6 | 23.2 | 26.1 |
| August | 23.3 | 25 | 23.6 | 27.3 | 24.2 | 26.4 |
| September | 21.8 | 24.3 | 21.8 | 26 | 22.6 | 25.9 |
| October | 17.9 | 22.4 | 19.5 | 23.3 | 18.6 | 22.5 |
| **2002** | | | | | | |
| May | 16.9 | 20.9 | 18 | 24.3 | 18.6 | 23.7 |
| June | 20.1 | 22.8 | 20.6 | 23.3 | 21.3 | 24 |
| July | 23.1 | 24.6 | 23.5 | 26.3 | 23.9 | 26.6 |
| August | 22.6 | 24.5 | 22.9 | 27.3 | 23.3 | 26.1 |
| September | 21 | 23.8 | 21.3 | 27 | 21.9 | 25.6 |
| October | 16.3 | 19.3 | 16.2 | 21 | 17 | 19.6 |

| Month | Downstream of Democrat Dam | | Below Stark Creek | | Upstream of Powerhouse | |
|---|---|---|---|---|---|---|
| | Mean (°C) | Maximum | Mean (°C) | Maximum | Mean (°C) | Maximum |
| **2003** | | | | | | |
| May | 15.6 | 19.3 | 16.6 | 21.3 | 16.9 | 21.5 |
| June | 19.1 | 21.2 | 19.6 | 20.8 | 20.4 | 22.2 |
| July | 21.8 | 24.2 | 22.1 | 24.3 | 22.7 | 25.4 |
| August | 23.3 | 25.1 | 23.4 | 24.3 | 23.9 | 25.9 |
| September | 22.5 | 25.1 | 22.6 | 24.2 | 22.9 | 25.9 |
| October | 18.9 | 21.6 | 18.9 | 22.1 | 19.3 | 22.5 |
| **2004** | | | | | | |
| May | 16.7 [10] | 18.0 [10] | 17.7 | 20.7 | 18 | 21 |
| June | 21.3 [11] | 24.1 [11] | 20.3 | 22.4 | 20.7 | 23.2 |
| July | 22.6 | 24.4 | 22.9 | 24.4 | 23.4 | 26.5 |
| August | 23.4 | 24.7 | 23.5 | 25.6 | 23.9 | 25.8 |
| September | 20.7 | 23.7 | 20.7 | 25.3 | 21 | 26.3 |
| October | 16.4 | 19.9 | 16.5 | 22 | 16.8 | 20.7 |
| **2005** | | | | | | |
| May | 15.2 | 18.1 | --[13] | --[13] | 16.3 | 19 |
| June | 16.5 | 19.5 | --[13] | --[13] | 17.4 | 20.2 |
| July | 19 | 21.8 | --[13] | --[13] | 20.1 | 22.3 |
| August | 21 | 23.1 | --[13] | --[13] | 21.8 | 23.1 |
| September | 20.7 | 23 | --[13] | --[13] | 21 | 22.8 |
| October | 17.4 | 20.3 | --[13] | --[13] | 17.9 | 20.6 |
| **2006** | | | | | | |
| May | 15 | 17.2 | 15.5 | 17.6 | 15.9 | 17.9 |
| June | 17.4 | 20.4 | 17.9 | 20.7 | 18.3 | 21 |
| July | 20.2 | 22.9 | 20.8 | 23.4 | 21.2 | 23.5 |
| August | 22 | 23.5 | 22.3 | 23.9 | 22.7 | 24.5 |
| September | 21.2 | 23.8 | 21.1 | 24.8 | 21.6 | 25 |
| October | 16.6 | 19.8 | 15.3 | 19.1 | 16.9 | 19.9 |

| Month | Downstream of Democrat Dam | | Below Stark Creek | | Upstream of Powerhouse | |
|---|---|---|---|---|---|---|
| | Mean (°C) | Maximum | Mean (°C) | Maximum | Mean (°C) | Maximum |
| **2007** | | | | | | |
| May | 17.3 | 20.1 | 18 | 21.6 | 18.5 | 21.7 |
| June | 20.2 | 22 | 20.7 | 23.5 | 21.2 | 23.9 |
| July | 22.7 | 24.5 | 22.5 | 24.8 | 23.5 | 25.4 |
| August | 23 | 25.7 | 23.4 | 26.8 | 23.5 | 26.2 |
| September | 21 | 25.1 | 21.1 | 27.9 | 21 | 25 |
| October | 16.2 | 18.9 | 15.7 | 19.7 | 16 | 19.5 |

Source: SCE 1994

[1] 15-day average due to data loss
[2] 18-day average due to data loss
[3] 30-day average due to data loss
[4] 29-day average due to data loss
[5] 24-day average Downstream of Democrat
[6] 23-day average Below Stark Creek
[7] 29-day average Below Stark Creek and 20-day average Upstream of Kern River No. 1 Powerhouse
[8] 27-day average Below Stark Creek
[9] 10-day average Below Stark Creek
[10] Based on 25-day month
[11] Based on 4-day month
[12] Project was offline after August 21, 2005
[13] Stark Creek temperature recorders were buried by sediment and lost.
[14] Project was offline before May 26, 2006
[15] Changing water levels during September-October may have exposed the temperature recorders at Stark Creek to warmer temperatures than are representative of the river
[16] Project was offline after September 7, 2007

**Table 3.5-2. Water Temperatures Collected Under the SWAMP from 2002 to 2016**

| Date Collected | Temp (°C) | Sampling Location |
|---|---|---|
| 3/27/2002 | 13.1 | Democrat |
| 3/27/2002 | 14.6 | Lower Richbar |
| 6/20/2002 | 20.3 | Democrat |
| 6/20/2002 | 22.5 | Lower Richbar |
| 9/18/2002 | 19.7 | Democrat |
| 9/18/2002 | 19.7 | Lower Richbar |
| 12/12/2002 | 9.8 | Democrat |
| 12/12/2002 | 9.7 | Lower Richbar |
| 3/4/2003 | 9.7 | Democrat |
| 3/4/2003 | 10.0 | Lower Richbar |
| 6/26/2003 | 20.7 | Democrat |
| 6/26/2003 | 20.9 | Lower Richbar |
| 11/4/2003 | 12.6 | Democrat |
| 11/4/2003 | 12.0 | Lower Richbar |
| 2/4/2004 | 7.6 | Democrat |
| 2/4/2004 | 8.2 | Lower Richbar |
| 5/26/2004 | 16.7 | Democrat |
| 5/26/2004 | 18.1 | Lower Richbar |
| 1/26/2005 | 9.3 | Democrat |
| 1/26/2005 | 9.7 | Lower Richbar |
| 5/6/2005 | 13.4 | Democrat |
| 5/6/2005 | 13.7 | Lower Richbar |
| 5/25/2016 | 16.3 | Democrat |
| 5/25/2016 | 16.8 | Lower Richbar |
| 6/8/2016 | 17.4 | Democrat |
| 6/8/2016 | 20.3 | Lower Richbar |
| 6/22/2016 | 19.3 | Democrat |
| 6/22/2016 | 21.5 | Lower Richbar |
| 7/13/2016 | 20.8 | Democrat |
| 7/13/2016 | 22.2 | Lower Richbar |
| 7/27/2016 | 22.0 | Democrat |
| 7/27/2016 | 23.6 | Lower Richbar |
| 8/10/2016 | 22.8 | Democrat |
| 8/10/2016 | 22.7 | Lower Richbar |
| 8/31/2016 | 23.0 | Democrat |
| 8/31/2016 | 22.5 | Lower Richbar |

## Table 3.5-3. Species and Fork Lengths (mm) of Fish Collected From the Project Diversion Pool

| Species | Range of fork lengths (mm) and (number) | | |
|---|---|---|---|
| | **Beach seine** | **Gill net** | **Electrofishing** |
| Largemouth bass | 44 – 61 (3) | 490 (1) | 345 – 466 (2) |
| Smallmouth bass | -- | -- | 130 – 155 (2) |
| White crappie | 125 – 185 (4) | 150 (1) | 176 – 192 (3) |
| Mosquitofish | 17 – 28 (13) | -- | -- |
| Hitch | 50f – 76 (3) | -- | -- |
| Carp | -- | 430 (1) | -- |
| Channel catfish | -- | -- | 125 (1) |
| Brown bullhead | -- | -- | 22 – 273 (5) |
| **Total number = 39** | **23** | **3** | **13** |

Source: FERC 1998

**Table 3.5-4. Number of Fish Collected (Sorted by Abundance) During 1999-2008 Fish Population Surveys**

| Species | OCT 1999 | JAN 2001 | OCT 2001 | OCT 2002 | NOV 2003 | OCT 2004 | OCT 2006 | OCT 2008 |
|---|---|---|---|---|---|---|---|---|
| Smallmouth Bass | 118 | 71 | 33 | 168 | 96 | 92 | 15 | 23 |
| Sacramento Sucker | 234 | 40 | 45 | 79 | 33 | 23 | 13 | 58 |
| White Catfish | 12 | 49 | 6 | 31 | 7 | 6 | 10 | 1 |
| Largemouth Bass | 6 | 8 | 10 | 17 | 21 | 17 | 16 | 0 |
| Sacramento Pikeminnow | 19 | 5 | 1 | 2 | 0 | 1 | 42 | 3 |
| Hardhead | 27 | 7 | 2 | 0 | 6 | 2 | 20 | 1 |
| Goldfish | 0 | 0 | 0 | 51 | 4 | 0 | 0 | 0 |
| Bullhead Catfish | 0 | 0 | 0 | 14 | 12 | 1 | 0 | 3 |
| Black Crappie | 0 | 0 | 0 | 14 | 10 | 0 | 0 | 0 |
| White Crappie | 0 | 2 | 1 | 18 | 2 | 0 | 0 | 0 |
| Mosquitofish | 0 | 0 | 13 | 1 | 1 | 5 | 0 | 0 |
| Channel Catfish | 2 | 3 | 2 | 7 | 0 | 1 | 0 | 0 |
| Carp | 1 | 1 | 2 | 2 | 0 | 0 | 0 | 0 |
| Rainbow Trout | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 |

Source: SCE 2009

Note: totals exclude threadfin shad. Their occurrence was associated with a spill events from Lake Isabella.

**Table 3.5-5. Lifestage Temperature Preferences for Smallmouth Based on a Literature Review**

| Smallmouth Bass Lifestage | Temperature Preferences (°C) | Lab-Based Temperature Preferences (°C) | Optimum Temperature (°C) |
|---|---|---|---|
| Spawning | 12 – 25 | >25 | N/A |
| Fry | >20 | 25 – 27 | 25 – 26 |
| Juvenile Rearing | >20 | 25 – 27 | 25 – 29 |
| Adult Rearing | 21 – 27 | 28 – 31 | 26 – 29 |

Source: SCE 2009

**Table 3.5-6. Lifestage Temperature Preferences for Hardhead Based on a Literature Review**

| Hardhead Lifestage | Lab-Based Acclimation Temperature (°C) | Temperature Preferences (°C) |
|---|---|---|
| Juvenile | 10 | 15.3 |
| | 30 | 28.6 |
| Adult | 12 | 20 |
| | 15 | 21 |
| | 18 | 19.6 |

Source: SCE 2009

**Table 3.5-7. 6-Year Fish Stocking Records (in total pounds) In the Kern River Canyon Below Lake Isabella. Section 1 is in the bypass reach and Section 2 and 3 are upstream of Democrat Dam**

| Year | Section 1 – Democrat to Live Oak (lbs.) RM 48.8 | Section 2 – Sandy Flat to Democrat Beach (lbs.) RM 57.5 | Section 3 – Keyesville below Isabella (lbs.) RM 71.8 |
|---|---|---|---|
| 2017 | 100 | 1,600* | 200 |
| 2018 | -- | 1,750 | -- |
| 2019 | 650 | 1,652 | 3,450 |
| 2020 | 700 | 600 | 1,600 |
| 2021 | 800 | 2,000 | -- |
| 2022 | 600 | 1,000 | 1,000 |

* The fish stocking in Section 2 in 2017 also included plants at the Sandy Flat and Hobo locations.

**Table 3.5-8. Special-Status Aquatic Amphibian and Reptile Species Potentially for Occurring in the Vicinity of the Project**

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| Amphibians | | | | | |
| *Rana boylii*<br>Foothill yellow-legged frog – South Sierra Distinct Population Segment (DPS) | FPE | FSS | SE | Perennial rocky (pebble or cobble) streams with cool, clear water in a variety of habitats from valley and foothill oak woodland, riparian forest, ponderosa pine, mixed conifer, coastal scrub, and mixed chaparral at elevations ranging from 0 to 6,370 feet. | **Unlikely to occur.** Although there are several historical occurrences of FYLF in the vicinity of the Kern No. 1 Hydroelectric Project, dated between 1911 and 1968 (CNDDB 2022). All FYLF occurrences south of Johnsondale, California (Tulare County) were extirpated during the 1970s or earlier (USFWS 2021). FYLF were also extirpated from Caliente Creek (Kern County, east of Bakersfield) during the mid-1970s as a result of extreme flooding events (USFWS 2021). The last recorded occurrence of FYLF near Kern River was in 2018 in the upper North Fork Kern River, above Lake Isabella (CNDDB 2022; see Map 3.5-1). |
| *Rana draytonii*<br>California red-legged frog | FT | — | SSC | Breeding habitat includes coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, backwater portions of streams, and artificial impoundments such as stock and irrigation ponds with emergent riparian vegetation. Dispersal habitat includes ephemeral and intermittent streams and adjacent upland areas. Usually occurs below 3,940 feet. USFWS has designated critical habitat for this species. | **Unlikely to occur.** The Project vicinity is outside the geographic range of this species. |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| **Reptiles** | | | | | |
| *Emys marmorata* Western pond turtle | — | FSS | SSC | Perennial wetlands and slow-moving creeks and ponds, from sea level to 6,000 ft in elevation, with overhanging vegetation and suitable basking sites such as logs and rocks above the waterline. | **Unlikely to occur.** The velocities from irrigation releases in Project vicinity result in limited habitat for the turtle. |
| *Thamnophis gigas* Giant garter snake | FT | — | ST | Uses a wide variety of habitats within the Californian Central Valley including forests, mixed woodlands, grasslands, chaparral, and agricultural lands below 300 feet in elevation. Often occurs near aquatic habitat including ponds, marshes, and streams where it freely retreats to when alarmed. | **Unlikely to occur.** The Project vicinity is outside the elevation range of the species and no suitable habitat is present |

Sources: USFWS Information for Planning and Consultation (IPaC) portal for federally listed and proposed endangered, threatened, and candidate species and their designated critical habitat (USFWS 2022); California Natural Diversity Database (CNDDB). 2022. Version 5.0. Online Database. California Department of Fish and Wildlife. Region 5 Regional Forester's Sensitive Animal Species List

Notes:

FE = Listed as endangered under the federal Endangered Species Act (ESA)
FPE=Proposed as endangered under the federal Endangered Species Act
FSS = U.S. Forest Service Sensitive Species
FSS = Forest Service Sensitive per Pacific Southwest Region's (Region 5) Regional Forester's Sensitive Animal Species List
FT = Listed as threatened under the federal ESA
SE = Listed as endangered under the California Endangered Species Act
SSC = Designated as a California Species of Special Concern
ST = Listed as threatened under the California Endangered Species Act

## Table 3.5-9. Special-Status Aquatic Species Potentially Occurring in the Vicinity of the Project

| Scientific/ Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| **Fish** | | | | | |
| *Lavinia exilicauda exilicauda*<br>Central Valley Hitch | -- | -- | SCC | Warm, lowland waters, prefer temperatures between 27 and 29°C | **Unlikely to Occur.** Found historically at the Project. However, no recent observation at the Project or upstream at the Borel Project |
| *Hypomesus transpacificus*<br>Delta smelt | FT | -- | SE | Estuarine or brackish waters up to 18 parts per thousand; spawn in shallow brackish water upstream of the mixing zone (zone of saltwater-freshwater interface) where salinity is around 2 parts per thousand. | **No potential to occur.** This species primarily occurs in the Sacramento-San Joaquin Delta. The Project vicinity is outside species' known range and outside designated critical habitat (USFWS 2022). |
| *Mylopharadon conocephalus*<br>Hardhead | -- | FSS | SSC | Native to the Sacramento and San Joaquin River drainages. Prefers large, warm streams containing deep, rock-bottomed pools and runs with sand-gravel-boulder substrates. | **Known to Occur.** Regularly documented in fish population surveys. Appear to be self-sustaining in the bypass reach. . |
| *Lampetra hubbsi*<br>Kern brook lamprey | -- | FSS | -- | Silty backwaters of large rivers in foothill regions (mean elevation 135 m). Sand, gravel, and rubble substrate. | **No potential to occur.** The Project vicinity is outside species known range. |
| **Mussels** | | | | | |
| *Margaritifera falcata*<br>Western Pearlshell mussel | -- | FSS | SSC | Shallow habitats in permanent creeks, rivers, and ponds with consistent flows and stable substrate. Often associated with salmonids. | **Not likely to occur.** No recent observations |
| *Gonidea angulate*<br>Western ridged mussel | FPE | -- | SSC | Found in low-gradient creeks and rivers from low to mid elevations. Associated with hardhead, sculpin, and tule perch on CA. | **Not likely to occur.** Presumed extirpated in southern California and most of Central Valley. |

| Scientific/ Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| **Crustaceans** | | | | | |
| *Branchinecta lynchi* Vernal fairy shrimp | FT | -- | -- | In shallow vernal pools disconnected from the river floodplain | **No potential to occur.** No suitable habitat in the vicinity and outside of the species known range. |

Sources: USFWS Information for Planning and Consultation (IPaC) portal for federally listed and proposed endangered, threatened, and candidate species and their designated critical habitat (USFWS 2022); California Natural Diversity Database (CNDDB). 2022. Version 5.0. Online Database. California Department of Fish and Wildlife. Region 5 Regional Forester's Sensitive Animal Species List

FE = Listed as endangered under the federal Endangered Species Act (ESA)
FPE=Proposed as endangered under the federal Endangered Species Act
FSS = Forest Service Sensitive per Pacific Southwest Region's (Region 5) Regional Forester's Sensitive Animal Species List
FSS = U.S. Forest Service Sensitive Species
FT = Listed as threatened under the federal ESA
SE = Listed as endangered under the California Endangered Species Act
SSC = Designated as a California Species of Special Concern
ST = Listed as threatened under the California Endangered Species Act

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# FIGURES

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**Figure 3.5-1. Monthly Exceedance Inflow and Flow in the Bypass Reach (WY 1999–2021)**

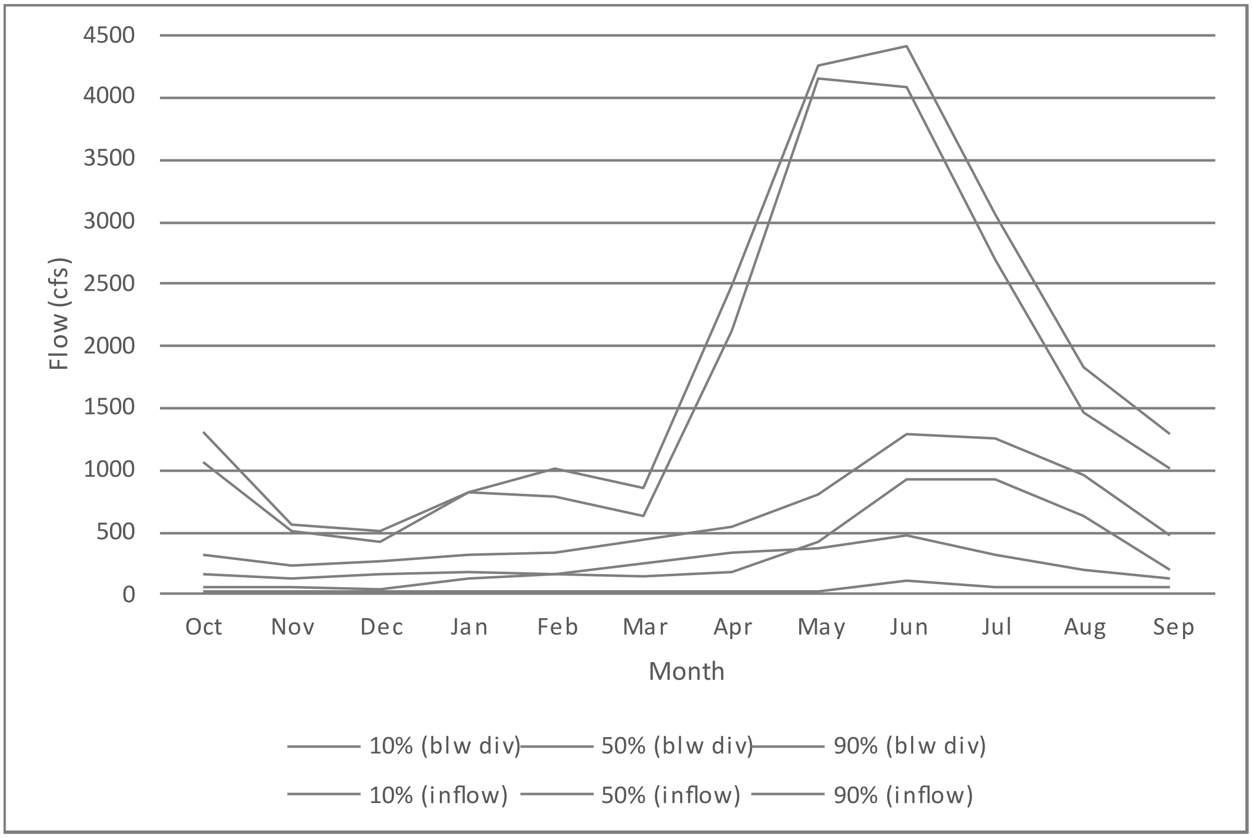


**Figure 3.5-2. Monthly Exceedance Flows in the Kern River No. 1 Conduit (WY 1999–2021)**

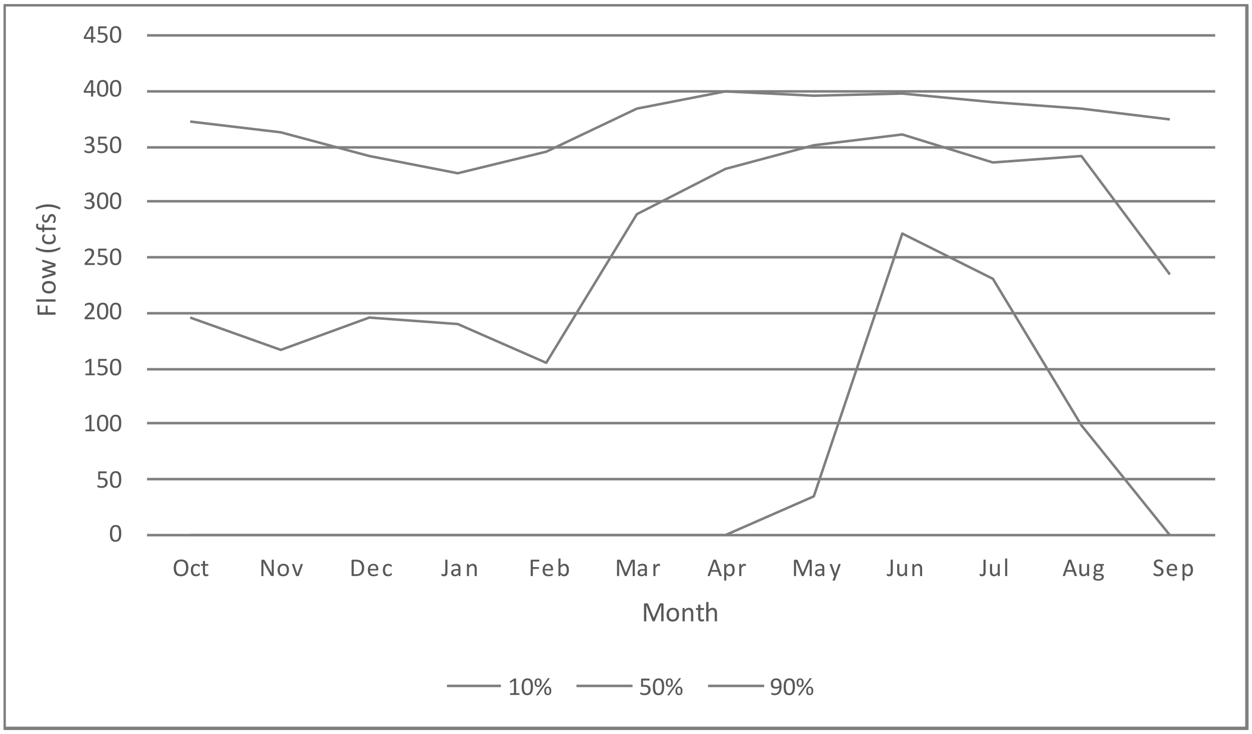
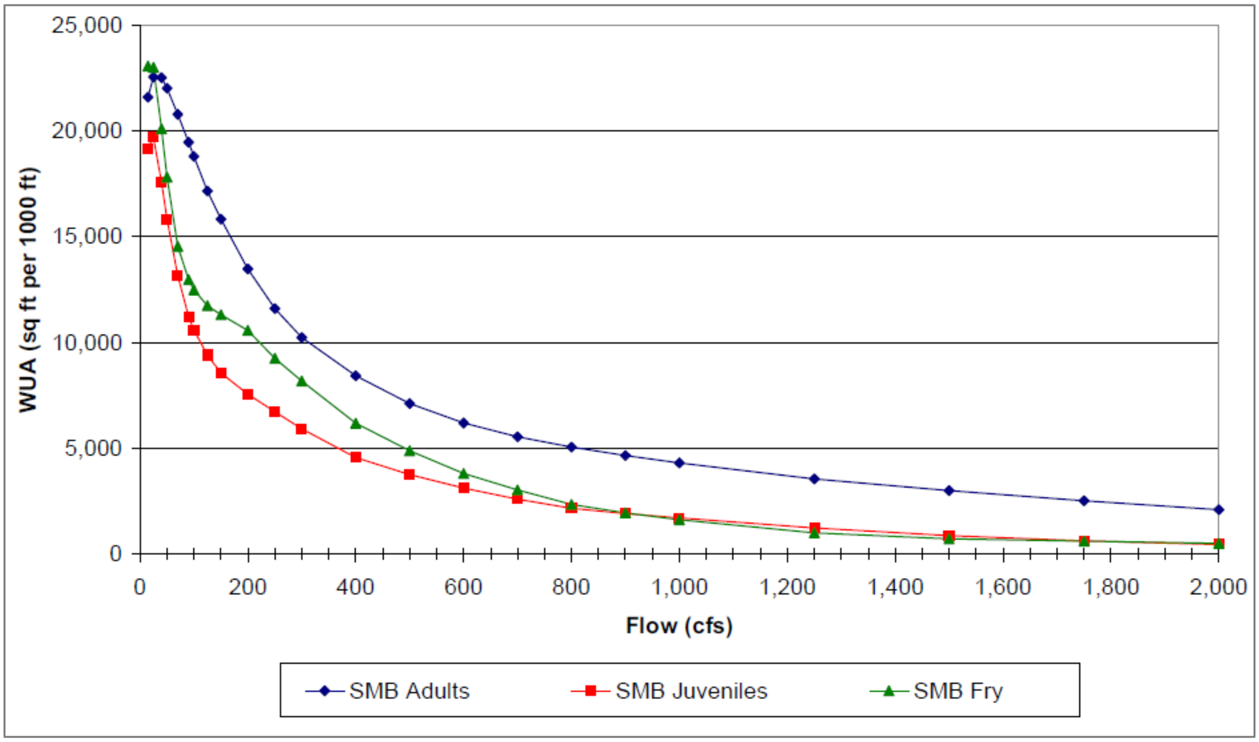
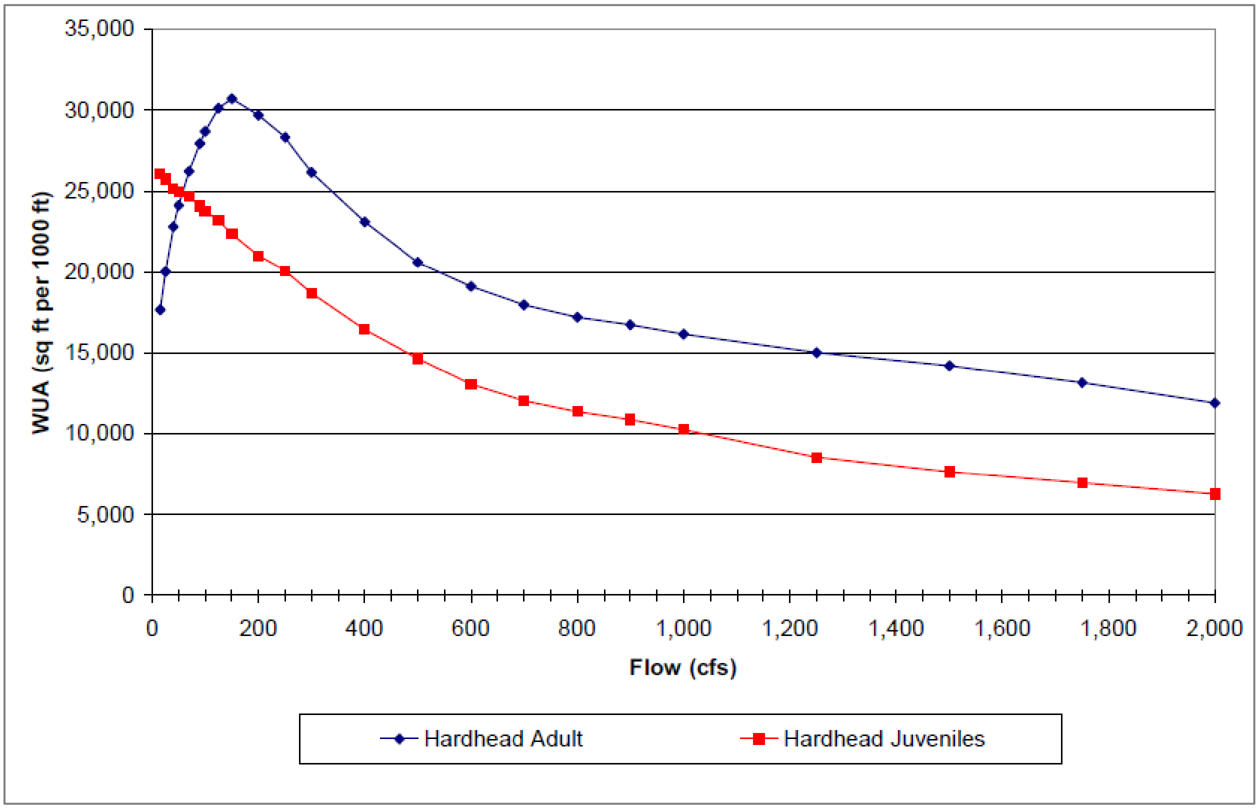


**Figure 3.5-3. Weighted Usable Area (sq. ft./1000 ft) as a Function of Flow for Smallmouth Bass (SMB) Lifestages in the Bypass Reach (Based on Pacific Gas and Electric Company [PG&E 1985] Kern River Habitat Suitability Criteria)**



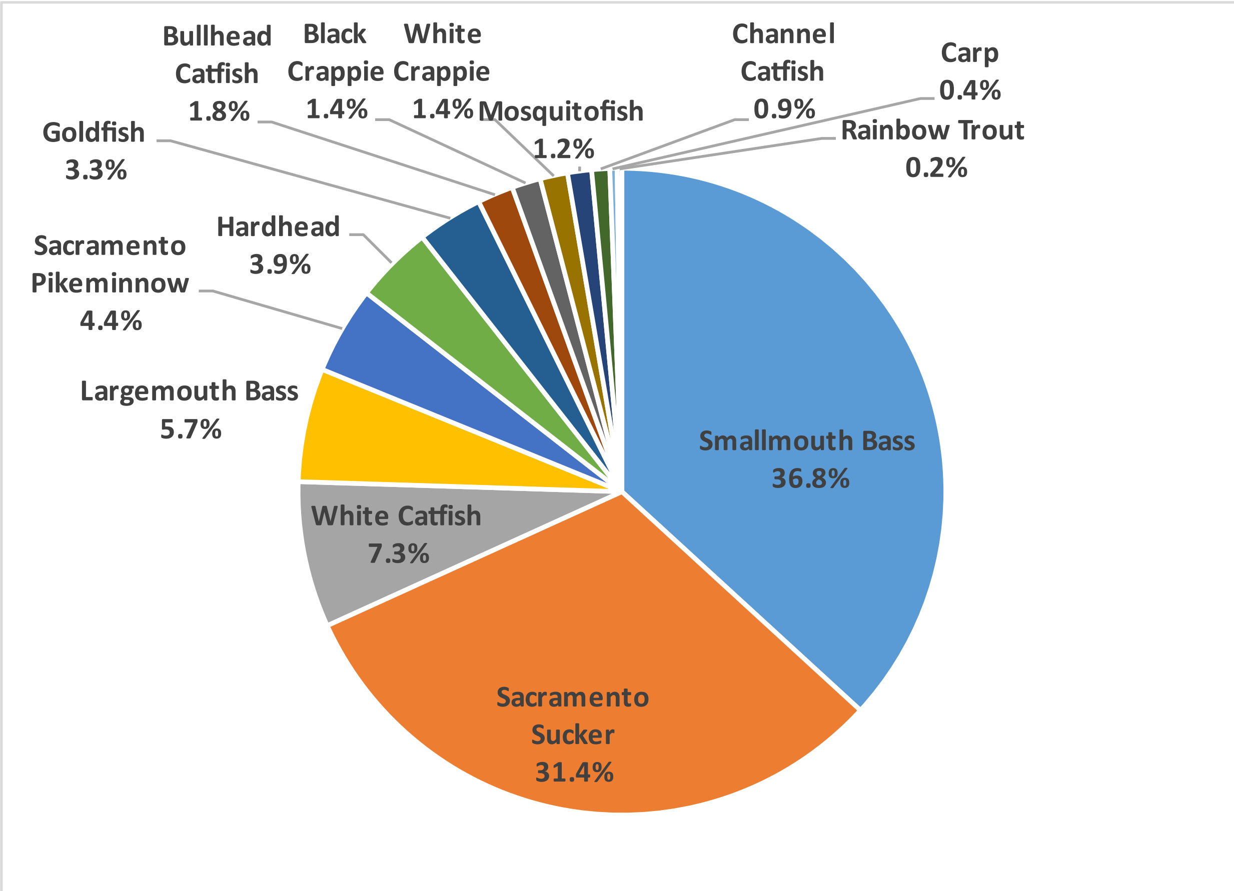

Source: SCE 2009

**Figure 3.5-4. Weighted Usable Area (sq. ft./1000 ft) As a Function of Flow for Hardhead Lifestages in the Bypass Reach**



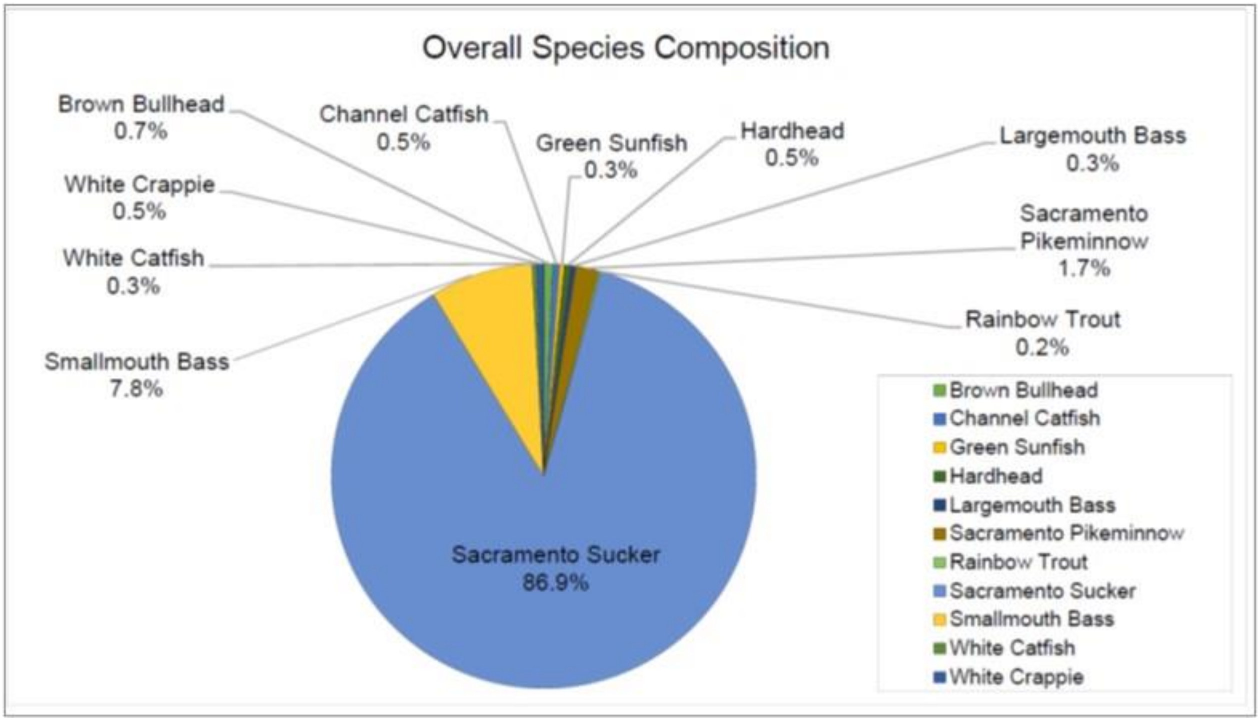

Source: SCE 2009

**Figure 3.5-5. 1999-2008 Kern River No. 1 Hydroelectric Project Fishery Monitoring Results Illustrating the Percent Species Composition of all Species and Years Combined**




Note: totals exclude threadfin shad; their occurrence was associated with a spill event from Lake Isabella.

**Figure 3.5-6. 2020 Borel Project Fishery Monitoring Results Illustrating the Percent Species Composition of all Species Combined**




Source: SCE 2021

# MAPS

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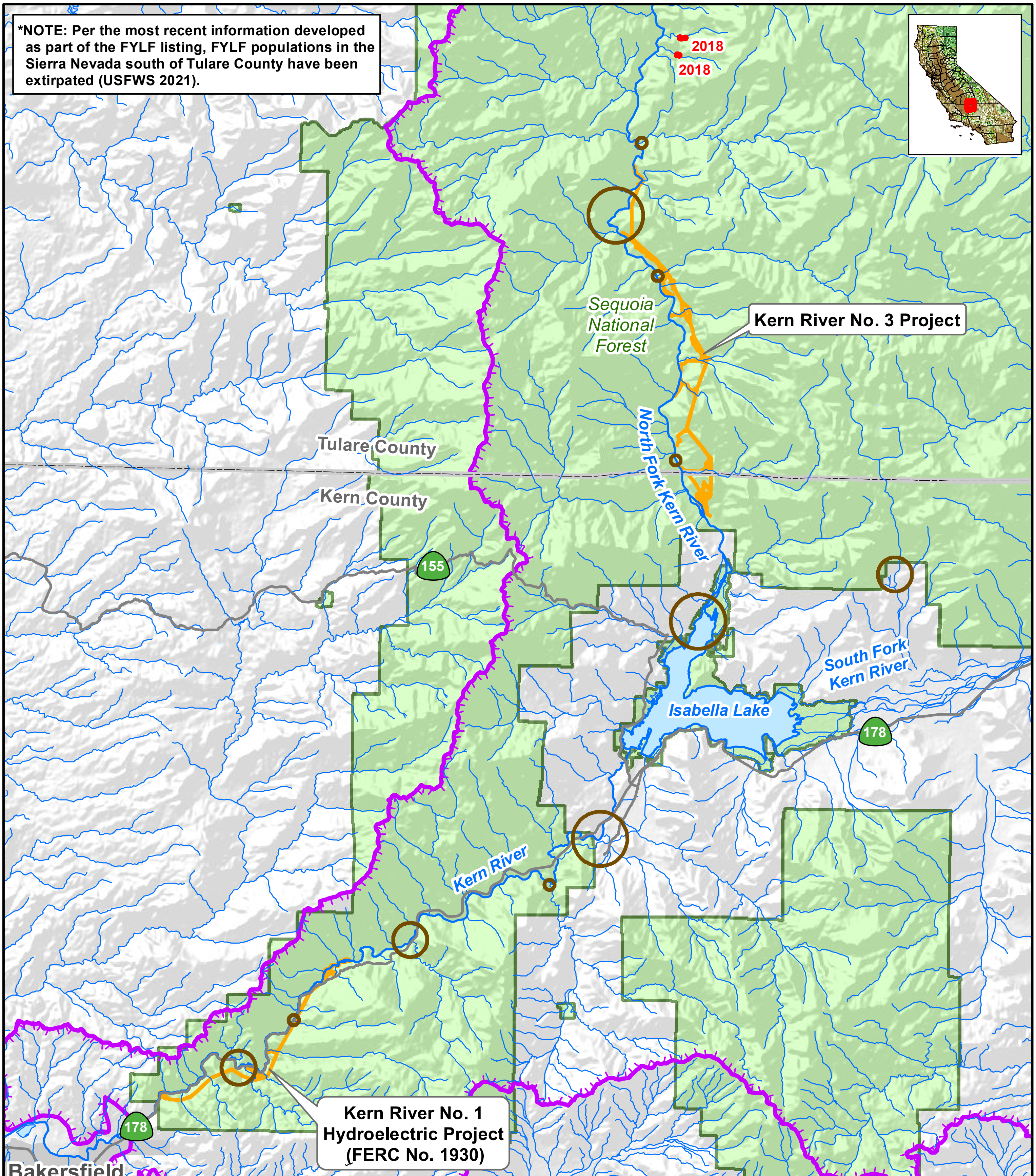


FERC Boundary
Kern River Basin
National Forest Service Lands
County Boundary

**PRESENCE/STATUS OF FYLF POPULATIONS***

Extirpated (1970's)
Presumed Extant (with year of last record)

* CNDDB, July 2022

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL® Company

Kern River No. 1 Hydroelectric Project
FERC Project No. 1930

**Map 3.5-1**

**Presence/Status of Foothill Yellow-legged Frogs in the Lower Kern River Basin**

**Projection: UTM Zone 11 N Datum: NAD 83**

0 2.5 5 Miles

**Date: 3/17/2023**

C:\GIS\237800343\map\Kern River 1\TerrestrialMaps\AmphibianMaps\SCE_Kern1_FYLF_Extirpation_8i11i_01.mxd

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## LIST OF ACRONYMS

| | |
|---|---|
| BCC | Birds of Conservation Concern |
| CALVEG | Classification and Assessment with LANDSAT of Visible Ecological Groupings |
| CAL-IPC | California Invasive Plant Council |
| CDFW | California Department of Fish and Wildlife |
| CE | California Endangered |
| CEQA | California Environmental Quality Act |
| CESA | California Endangered Species Act |
| CFP | California Fully Protected Species |
| CNDDB | California Natural Diversity Database |
| CNPS | California Native Plant Society |
| CR | California Rare |
| CRPR | California Rare Plant Ranking |
| CSC | California Species of Species Concern |
| CT | California Threatened |
| CWHR | California Wildlife Habitat Relationships |
| DDT | Dichloro-diphenyl-trichloroethane |
| ESA | Endangered Species Act |
| FC | Federal Candidate |
| FD | Federal Delisted |
| FE | Federally Endangered |
| FERC or Commission | Federal Energy Regulatory Commission |
| Forest Service | United States Forest Service |
| FPD | Federally Proposed for Delisting |
| FPE | Federally Proposed Endangered |
| FPT | Federally Proposed Threatened |
| FSCC | Sequoia National Forest Species of Conservation Concern |
| FT | Federally Threatened |
| GIS | Geographic Information System |
| Inventory | California Invasive Plant Inventory |
| IPaC | United States Fish and Wildlife Service Information, Planning, and Conservation System |
| LANDSAT | Land satellite |
| NNIP | Non-native Invasive Plant |
| NRIS | Natural Resource Information System |
| PAC | Protected Activity Center |
| Project | Kern River No. 1 Hydroelectric Project |

| | |
|---|---|
| SCE | Southern California Edison Company |
| SQF | Sequoia National Forest |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| VELB | valley elderberry longhorn beetle |

## 3.6 BOTANICAL AND WILDLIFE RESOURCES

This section describes botanical and terrestrial wildlife resources in the vicinity of Southern California Edison Company's (SCE) Kern River No. 1 Hydroelectric Project (Project). The Federal Energy Regulatory Commission's (FERC) content requirements for this section are specified in Title 18 of the Code of Federal Regulations Chapter I § 5.6 (d)(3)(v), and 5.6(d)(3)(vii), respectively. In addition, this section describes rare, threatened, and endangered botanical and terrestrial wildlife resources. A description of aquatic resources in the vicinity of the Project, including rare, threatened, and endangered aquatic resources, is included in Section 3.5, Fish and Aquatic Resources.

### 3.6.1 Information Sources

Information in this section is primarily based on data from resource agency files, reports, and databases; published literature; and to a lesser extent, applicable field studies published by SCE in 1994 and 2012.

The following sources were reviewed to obtain information on botanical and wildlife resources in the vicinity of the Project. The Project vicinity is defined to include areas within or immediately adjacent to the FERC Project boundary, as well as areas immediately adjacent to the Project-affected reach of the Kern River (bypass reach):

- Order Issuing New License for the Kern River No. 1 Hydroelectric Project No. 1930-014 (FERC 1998)
- The California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) (CNDDB 2022)
- The California Invasive Plant Council's (Cal-IPC's) California Invasive Plant Inventory (Cal-IPC 2022)
- The California Native Plant Society's (CNPS) Inventory of Rare, Threatened and Endangered Plants (CNPS 2022b)
- Final Environmental Assessment for Kern River No. 1 Hydroelectric Project – FERC No. 1930-014, California (Environmental Assessment) (FERC and Forest Service 1998)
- Order Issuing New License for the Kern River No. 1 Hydroelectric Project No. 1930-014 (FERC 1998)
- A Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988)
- Natural Resource Information System (NRIS) (United States Forest Service [Forest Service] 2022)
- Application for New License, Kern River No. 1 Hydroelectric Project – FERC Project No. 1930, Kern County, California (License Application) (SCE 1994)

- United States Fish and Wildlife Service's (USFWS) Birds of Conservation Concern (USFWS 2021)

- USFWS Information for Planning and Consultation (IPaC) website (USFWS 2022a)

### 3.6.2 Botanical Resources

This section describes botanical resources in the vicinity of the Project, including vegetation alliances and common plants; special-status plants; and non-native invasive plants (NNIP).

#### 3.6.2.1 Vegetation Alliances and Common Plants

Information on vegetation alliances was analyzed to characterize habitat conditions and identify common plant species in the vicinity of the Project. The term "alliance" corresponds closely to what plant ecologists call a community type and foresters call a forest type or stand. An alliance is characterized by the dominant species of plants (e.g., trees, shrubs, or herbaceous species) that make up the overstory. This usage is consistent with standards developed by the Federal Geographic Data Committee as part of the National Vegetation Classification System.

Information on vegetation alliances in the vicinity of the Project is based on Classification and Assessment with land satellite (LANDSAT) of Visible Ecological Groupings (CALVEG) mapping and vegetation alliance descriptions developed by the United States Forest Service (Forest Service) Region 5. The CALVEG system is used to classify existing vegetation present on federally managed forestlands based on LANDSAT color infrared satellite imagery. Data are verified using soil-vegetation maps and professional guidance from various sources statewide. CALVEG data for the Southern Sierra were updated by Forest Service in 2014.

Maps of vegetation alliances within 1 mile of the FERC Project boundary were developed using CALVEG Geographic Information System (GIS) data layers for the Southern Sierra and Central Valley ecoregion (Forest Service 2014) overlain on a map of the Kern River No. 1 Hydroelectric Project facilities. A 1-mile extent was determined to be the area sufficient to encompass no-disturbance buffers that state and Federal agencies use when determining potential impacts to wildlife species. Descriptions of each vegetation alliance present within 1 mile, including descriptions of common plant species found in each alliance, were obtained from the Forest Service Region 5 website.

In addition, the following Project-specific sources provided additional information on vegetation alliances in the immediate vicinity of the Project:

- License Application for the Kern River No. 1 Hydroelectric Project (SCE 1994)

- Environmental Assessment for the Kern River No. 1 Project (FERC and Forest Service 1998)

There are generally no regulatory protections associated with vegetation alliances. However, riparian habitats are afforded protections under Sections 1600–1607 of the California Fish and Game Code (as administered by CDFW).

Refer to Table 3.6-1 for a list of vegetation alliances that are present within 1 mile of the FERC Project boundary. Map 3.6-1 shows the extent of each vegetation alliance within 1 mile of the FERC Project boundary. A description of each vegetation alliance, including common plant species associated with each alliance, is provided in Appendix 3.6-A.

### 3.6.2.2 Special-Status Plants

This section describes special-status plants that are known to occur or may potentially occur in the vicinity of the Project.

For the purposes of this document, a special-status plant is defined as any plant species that is granted protection by a Federal or state agency. Federally listed plant species granted status by the USFWS under the Federal Endangered Species Act (ESA) include threatened (FT), endangered (FE), proposed threatened or endangered (FPT, FPE), candidate (FC), or listed species proposed for delisting (FPD).

State of California listed plant species, which are granted status by the CDFW under the California Endangered Species Act (CESA) include California threatened (CT), endangered (CE), rare (CR), and California Species of Special Concern (CSC).

CNPS maintains the California Rare Plant Rank (CRPR), a ranking system for rare, threatened, or endangered plants in California. Under the California Environmental Quality Act (CEQA), special-status plants include the following CRPR:

- 1A (presumed extirpated in California and either rare or extinct elsewhere)
- 1B (rare, threatened, or endangered in California and elsewhere)
- 2A (presumed extirpated in California, but common elsewhere)
- 2B (rare, threatened, or endangered in California, but common elsewhere)

A comprehensive list of special-status plant species was compiled from the following sources:

- Sequoia National Forest (SQF) Species of Conservation Concern (FSCC) List (Forest Service 2022)
- CNDDB (CNDDB 2022) was queried to generate a list of special-status plants occurring within 5 miles of the Kern River No. 1 Hydroelectric Project
- The CNPS Inventory of Rare, Threatened and Endangered Plants (CNPS 2022b) was queried to generate a list of special-status plants occurring within 5 miles of the Kern River No. 1 Hydroelectric Project

- The USFWS IPaC website was queried to generate a list of federal endangered and threatened species that occur or may potentially occur within the vicinity of the Project (USFWS 2022)

This comprehensive list was then evaluated to determine which plant species occur in the vicinity of the Project based a review of the following:

- A query of the SQF's NRIS (Forest Service 2022) to obtain more detailed information on known occurrences in the vicinity of the Project.

- Supplemental information (e.g., habitat descriptions and known occurrences) obtained from a review of the following Project-specific sources:

  – License Application for the Kern River No. 1 Hydroelectric Project (SCE 1994)

  – Environmental Assessment, for the Kern River No. 1 Project (FERC and Forest Service 1998)

The geographic location and elevation of the Project and vegetation alliances and other habitat features present was then reviewed to determine those species that may potentially occur.

Plant species on the comprehensive list were then categorized as follows:

- **Known to occur in the vicinity of the Project:** Special-status plants with recorded populations in the vicinity of the Project, as determined by CNDDB or SCE studies.

- **May potentially occur in the vicinity of the Project:** Special-status plants that may potentially occur in the vicinity of the Project based on the geographic location and elevation of the Project, and vegetation alliances and other habitat features present.

- **Unlikely to occur in the vicinity of the Project:** Special-status plants that are unlikely to occur because their range does not overlap the Project; or for which the vicinity of the Project does not support appropriate habitat.

Table 3.6-2 provides the comprehensive list of special-status plant species evaluated for their potential to occur in the vicinity of the Project. Species listed in the table are categorized as known to occur; potentially occurring in appropriate habitat; or unlikely to occur. Table 3.6-2 also summarizes pertinent information for each species, including status, blooming period, and preferred habitat, with information on the location of occurrences, if applicable. Map 3.6-2 provides the location of special-status plants in the vicinity of the Project and within 1 mile of the FERC Project boundary. Appendix 3.6-B provides life history information for special-status plants known to occur or potentially occurring in the vicinity of the Project, including information on the location of USFWS-designated Critical Habitat and applicable recovery plans.

Six special-status plant species are known to occur in the vicinity of the Project. These are:

- rose-flowered larkspur (*Delphinium purpusii*) – FSCC, CRPR 1B.3
- calico monkeyflower (*Diplacus pictus*) – FSCC, CRPR 1B.2
- greenhorn fritillary (*Fritillaria brandegeei*) – FSCC, CRPR 1B.3
- Shevock's golden aster (*Heterotheca shevockii*) – FSCC, CRPR 1B.3
- southern Sierra monardella (*Monardella linoides* spp. *anemonoides*) – CRPR 1B.3
- Bakersfield cactus (*Opuntia treleasei*) – FE, CE, CRPR 1B.1

Ten species have not been documented in the vicinity of the Project but have the potential to occur based on the geographic location and elevation of the Project and vegetation alliances present.

There is no USFWS-designated Critical Habitat for federally listed special-status plants in the vicinity of the Project; and no recovery plans are in effect.

Several of the species listed on Table 3.6-2 are considered unlikely to occur, either because the Project is outside the geographic or elevation range of the species, and/or the vicinity of the Project does not support appropriate habitat for the species.

#### 3.6.2.3 Non-Native Invasive Plants

Information on NNIPs potentially occurring in the vicinity of the Project was obtained from the California Invasive Plant Inventory (Inventory) (Cal-IPC 2022). Cal-IPC defines NNIPs as plants that (1) are not native to, yet can spread into, wildland ecosystems; and (2) that also displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes (Cal-IPC 2022).

The Inventory categorizes plants as High, Moderate, or Limited, according to the degree of ecological impact in California (Cal-IPC 2022).

- **High.** Severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
- **Moderate.** Substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

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

The Inventory was queried to obtain a list of NNIPs based on two parameters:

- Jepson region: The Inventory uses geographic floristic provinces and subdivisions within California as described by the Jepson Flora Project (2022). The Kern River No. 1 Hydroelectric Project is within the California Floristic Province and the southern Sierra Nevada foothills subdivision.

- Habitat types: Based on a comparison with vegetation alliances within 1 mile of the FERC Project boundary, four habitat types were selected: grassland, riparian, woodland, and scrub habitat.

The query of the Cal-IPC Inventory yielded a list of 154 NNIPs potentially occurring in the vicinity of the Project. Refer to Table 3.6-3 for a list of these species and the habitat(s) they typically occur in.

### 3.6.3 Wildlife Resources

This section describes wildlife resources in the vicinity of the Project, including wildlife habitats and common wildlife species; special-status wildlife; and game species.

#### 3.6.3.1 Wildlife Habitats and Common Wildlife Species

Information on wildlife habitats was obtained to characterize habitat conditions and identify common wildlife species in the vicinity of the Project. Wildlife habitats present were determined through use of a “crosswalk” between Forest Service CALVEG alliances and CDFW’s CWHR wildlife habitat classifications. The CALVEG–CWHR crosswalk was developed by the Forest Service and CDFW as a way to determine which wildlife habitats are likely to be present based on existing vegetation communities and forest structural characteristics. A table showing representative common wildlife species potentially occurring within these habitats was then developed based on a review of *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988) and CDFW’s California Wildlife Habitat Relationship System Database, Version 9.0 (CDFW 2022a).

Refer to Table 3.6-1 for a list of the wildlife habitats that occur within 1 mile of the FERC Project boundary. Habitat descriptions, excerpted from *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988), are provided in Appendix 3.6-C. Table 3.6-4 provides a list of representative common wildlife species that are found in the wildlife habitats in the vicinity of the Project.

### 3.6.3.2 Special-Status Wildlife

This section describes special-status wildlife that occur or may potentially occur in the vicinity of the Project. This section addresses only special-status terrestrial wildlife species. Aquatic species, including fish and aquatic amphibians and reptiles, are addressed in Section 3.5, Fish and Aquatic Resources.

For the purposes of this document, a special-status wildlife species is defined as any animal species that is granted status by a Federal, state, or local agency. Federally listed species granted status by USFWS under the ESA include FT, FE, FPT, FPE, FC, or FPD. Also included are those species listed by USFWS as Birds of Conservation Concern (BCC) which include “species, subspecies, and populations of all migratory nongame birds that, without additional conservation action, are likely to become candidates for listing under the ESA of 1973” (USFWS 2021).

State of California listed wildlife species which are granted status by the CDFW under the CESA include CT, CE, Fully Protected species (CFP), and CSC.

A comprehensive list of special-status wildlife species was compiled from the following sources:

- SQF Species of Conservation Concern List (Forest Service 2022)
- CNDDB (CNDDB 2022) was queried to generate a list of special-status wildlife occurring within 5 miles of the FERC Project boundary.
- CDFW’s *State and Federally Listed Endangered and Threatened Animals of California* (CDFW 2022b) was reviewed to generate a list of state-listed species potentially occurring in the vicinity of the Project.
- The USFWS IPaC website was queried to generate a list of federally endangered and threatened species that occur or may potentially occur within 5 miles of the FERC Project boundary (USFWS 2022a)
- USFWS’s *Birds of Conservation Concern* (USFWS 2021) was reviewed to obtain a list of BCC birds within the vicinity of the Project. The Project is within Bird Conservation Region 15 (Sierra Nevada). Therefore, the BCC within this region were included.

This comprehensive list was then evaluated to determine which wildlife species occur or may potentially occur in the vicinity of the Project based a review of the following:

- A query of the SQF’s NRIS (Forest Service 2022) to obtain more detailed information on known occurrences in the vicinity of the Project.

- Supplemental information (e.g., habitat descriptions and occurrences) obtained from a review of the following Project-specific sources:
  - License Application for the Kern River No. 1 Hydroelectric Project (SCE 1994)
  - Environmental Assessment for the Kern River No. 1 Project (FERC and Forest Service 1998)

The geographic location and elevation of the Project and vegetation alliances and other habitat features present were then reviewed to determine those species which may potentially occur. Wildlife species on the list were then categorized as follows:

- **Known to occur in the vicinity of the Project:** Wildlife species with recorded occurrences in the vicinity of the Project, as determined by CNDDB or SCE studies.
- **May potentially occur in the vicinity of the Project:** Wildlife species that may potentially occur in the vicinity of the Project based on the geographic location and elevation of the Project and wildlife habitats present.
- **Unlikely to occur in the vicinity of the Project:** Wildlife species that are unlikely to occur because their range does not overlap the Project; or for which the vicinity of the Project does not support appropriate habitat.

Table 3.6-5 provides a comprehensive list of special-status wildlife species evaluated for their potential to occur in the vicinity of the Project. Species listed in the table are categorized as known to occur; potentially occurring in appropriate habitat; or unlikely to occur. Table 3.6-5 also summarizes pertinent information for each species, including status and preferred habitat, with information on the location of the occurrence, if applicable. Map 3.6-3 provides the location of special-status wildlife that occur in the vicinity of the Project and within 1 mile of the FERC Project boundary. Appendix 3.6-D provides life history information for special-status wildlife categorized in Table 3.6-5 as known to occur or potentially occurring in the vicinity of the Project, including information on the location of USFWS-designated Critical Habitat and applicable recovery plans.

Eight special-status wildlife species are known to occur in the vicinity of the Project. These are:

- Kern Canyon slender salamander (*Batrachoseps simatus*) (FPT, FSCC, ST)
- relictual slender salamander (*Batrachoseps relictus*) (FPE, FSCC, CSC)
- yellow-blotched salamander (*Ensatina eschscholtzii croceator*) (FSCC, WL)
- coast horned lizard (*Phrynosoma blainvillii*) (CSC)
- California condor (*Gymnogyps californianus*) (FE, CE, CFP)

- Townsend's big-eared bat (*Corynorhinus townsendii*) (FSCC, CSC)
- fringed myotis bat (*Myotis thysanodes*) (FSCC, CSC)
- western mastiff bat (*Eumops perotis*) (CSC)

Twenty-eight species have not been documented in the vicinity of the Project but have the potential to occur based on geographic location and elevation of the Project and wildlife habitats present.

The Kern Canyon slender salamander and the relictual slender salamander were recently proposed for listing by USFWS as threatened and endangered, respectively. USFWS has also recently proposed designated Critical Habitat for both species (USFWS 2022b). Map 3.6-4 provides a map of the known occurrences of the Kern Canyon slender salamander and proposed Critical Habitat within the vicinity of the Project. Map 3.6-5 shows the location of known occurrences of relictual slender salamander and proposed Critical Habitat within the vicinity of the Project. Portions of the Project are within Kern Canyon slender salamander Critical Habitat Unit 3, encompassing Kern Canyon tributaries to Kern River starting from approximately 3 miles upstream from the Kern River No. 1 Powerhouse. In addition, portions of the Project are within Critical Habitat Unit 1 and Unit 2 for the relictual slender salamander, encompassing tributaries to Kern River from approximately 0.25 mile upstream from the Kern River No. 1 Powerhouse and Lucas Creek.

The USFWS has designated Critical Habitat for the California condor (USFWS 1976), however, the Project boundary does not include Critical Habitat. The closest Critical Habitat for California condor is located approximately 6 miles northeast of the Project area.

USFWS has designated Critical Habitat for the southwestern willow flycatcher (USFWS 2013), however there is no Critical Habitat in the vicinity of the Project. The closest designated Critical Habitat is located approximately 19 miles northeast of the Project area, upstream of Lake Isabella.

Several of the species listed on Table 3.6-5 are considered unlikely to occur, either because the Project is outside the known range of the species, and/or the vicinity of the Project does not support appropriate habitat.

#### 3.6.3.3 Game Species

A game species is an animal that is hunted for sport or pleasure. Information on game species potentially present in the vicinity of the Project is provided in this section because of their commercial and recreational value. Game species are regulated by CDFW and are defined under the California Fish and Game Code as follows:

- Resident and migratory game birds are defined in California Fish and Game Code § 3500. Examples of upland resident game birds listed include blue grouse, wild turkey, mountain quail, and California quail. Upland migratory game birds include (but are not limited to) Wilson's snipe, band-tailed pigeon, and mourning dove.

- Game mammals are defined in California Fish and Game Code § 3950(a) to include (but are not limited to) deer, wild pig, black bear, rabbits and hares, and tree squirrels, as game mammals. Note that mountain lions are included in § 3950 but are explicitly excluded as a game mammal in § 3950.1.

Game species described in the California Fish and Game Code were evaluated for their likelihood to occur based on the geographic and elevation range of the Project and wildlife habitats present. A table was then developed listing each species and its status; followed by a generalized habitat description and a summary of applicable CDFW hunting regulations.

Table 3.6-6 lists the resident and migratory game birds and game mammals that have the potential to occur in the vicinity of the Project, including their habitat requirements and a summary of state hunting regulations for each species. Hunting of game species is permitted during seasons regulated by the CDFW.

A brief summary of the game species in the vicinity of the Project, including resident game birds, migratory game birds and game mammals, is provided below.

**Resident and Migratory Game Birds**

Upland birds occurring in the vicinity of the Project that meet the definition of resident game birds (California Fish and Game Code §3500) include (but are not limited to) wild turkey, mountain quail, and California quail. Birds that meet the definition of migratory game birds (California Fish and Game Code §3500) include band-tailed pigeon and mourning dove.

**Game Mammals**

Provided below is a description of mule deer and other game mammals occurring in the vicinity of the Project.

*MULE DEER*

Mule deer are among the most visible and widespread wildlife species in California. The Project is within Deer Hunt Zone D8 and D9 (CDFW 2022c, 2022d). Deer hunting is regulated by California state law through CDFW. A hunting license and a hunting tag are required to take mule deer, and only bucks with antlers with demonstrable forks (or greater) may be taken, except during special hunts. Antlers must be forked on one side in the upper two-thirds section of the antler.

Three herds, the Greenhorn Deer Herd, the South Sierra Foothill Deer Herd, and the Piute Deer Herd are present in the vicinity of the Project (CDFW 2022c). The Greenhorn Herd is migratory and occupies higher elevation sites as well as lower elevations near recent wildfire or prescribed burned areas that attract the deer after snows have driven them to winter ranges. The northeast end of the Project lies within the southwest portion of the Greenhorn Herd unit (SCE 1994). The Southern Sierra Foothill Herd is a resident, non-migratory herd that occupies the western Sierra Nevada foothills across multiple

Deer Management Units. This herd is located near the Project, but away from the Project-related facilities (SCE 1994). The Piute Herd is also a resident, non-migratory herd that occupy various elevations throughout the year based on their response to weather and vegetation availability. This herd occupies land in the vicinity of the Project flowline, forebay, penstock, and forebay overflow spillway pipe (SCE 1994). The populations of these herds are stable to declining, although there is an overall decline in population numbers in California (CDFW 2022c). Survival rates of fawns have been low in the past few years, which can be attributed to weather conditions that affect forage production (CDFW 2022c).

*OTHER GAME MAMMALS*

Other game mammals occurring in the vicinity of the Project include, but are not limited to, western gray squirrel, wild pig, black bear, and gray fox. Table 3.6-6 provides the status, habitat requirements, and a summary of state hunting regulations for each of these species.

Beginning July 1, 2019, non-lead ammunition was required when taking any wildlife with a firearm anywhere in California (California Fish and Game Code § 3004.5).

### 3.6.4 References

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# TABLES

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## Table 3.6-1. Vegetation Alliances and Wildlife Habitats Occurring within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary

| CALVEG Vegetation Alliance[1] | CALVEG Code | CWHR Wildlife Habitat[2] |
|---|---|---|
| **Herb-Dominated Alliances** | | |
| Annual Grasses and Forbs Alliance | HG | Annual Grassland |
| **Shrub-Dominated Alliances** | | |
| Ultramafic Mixed Shrub Alliance | C1 | Mixed Chaparral |
| Baccharis (Riparian) Alliance | ML | Valley Foothill Riparian[3] |
| **Tree-Dominated Alliances** | | |
| Interior Mixed Hardwoods Alliance | NX | Montane Hardwood |
| Gray Pine Alliance | PD | Blue Oak-Foothill Pine |
| Blue Oak Alliance | QD | Blue Oak Woodland |
| Valley Oak Alliance | QL | Valley Oak Woodland |
| **Non-vegetated Areas** | | |
| Tilled Earth | A3 | Barren |
| **Aquatic Areas** | | |
| River/Stream/Canal | W1 | Riverine |

NOTES:

[1] Source : Forest Service. 2016. CALVEG Geographic Information Systems (GIS) data and vegetation descriptions. South Sierran Ecological Province. Available at: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192.

[2] Source: CDFW. 2022a. California Wildlife Habitat Relationship System Database, Version 9.0 (CWHR 2022).

[3] The *Baccharis* (riparian) alliance can be associated with desert riparian, montane riparian, and/or Valley foothill riparian CWHR wildlife habitat classifications.

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**Table 3.6-2. Special-Status Plant Species Known to Occur or Potentially Occurring in the Vicinity of the Kern River No. 1 Hydroelectric Project**

| Scientific/Common Name | Federal/ State Status | Sequoia National Forest Status | California Rare Plant Rank (CRPR) | Blooming Period/ Fertile | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|---|
| **Known to Occur in the Vicinity of the Project** | | | | | | |
| *Delphinium purpusii*<br>rose-flowered larkspur | — | FSCC | 1B.3 | April–May | A perennial herb that grows on rocky, often carbonate soils in chaparral, cismontane woodland, and pinyon and juniper woodland. Elevation: 1,000–4,470 feet. | **Known to occur.** A CNDDB query yielded six occurrences of rose-flowered larkspur located along Kern River in the vicinity of the Project[1]. An additional occurrence was recorded within the 1-mile buffer of the Project. These occurrences were recorded in 1933, 1969, 1972, 1982, 2005, and two occurrences in 2010. |
| *Diplacus pictus* (*Mimulus pictus*)<br>calico monkeyflower | — | FSCC | 1B.2 | March–May | An annual herb found in granitic, disturbed areas in broad-leafed upland forest and cismontane woodland. Elevation: 330–4,770 feet. | **Known to occur**. Based on review of FERC and Forest Service 1998, individuals were found north side of Kern River across from Democrat Hot Springs and near Richbar Day Use Area (*no GIS data available for this occurrence*).<br>A CNDDB query yielded two records for this species in the vicinity of the Project:<br>• A large polygon (1956) (generalized occurrence) encompassing Project facilities from the Lucas Creek Trail and downstream to Tunnel No. 14 northeast of Pacheco Creek; and<br>• A 1983 detection adjacent to Democrat Dam Impoundment. |
| *Fritillaria brandegeei*<br>Greenhorn fritillary | — | FSCC | 1B.3 | April–June | A perennial herb (bulbiferous) that found on granitic areas in lower montane coniferous forest. Elevation: 4,430–7,000 feet. | **Known to occur.** A CNDDB query yielded one occurrence located near the confluence of Dougherty Creek and Kern River, in the vicinity of the Project. This occurrence was recorded in 1982. |
| *Heterotheca shevockii*<br>Shevock's golden aster | — | FSCC | 1B.3 | August–November | A perennial herb that grows in chaparral and cismontane woodland. Elevation: 760–3,000 feet. | **Known to occur.** The query of NRIS/CNDDB query yielded two occurrences within the vicinity of the Project:<br>• A 1996 detection adjacent to the Steel Flume trail (NRIS); and<br>• A continuous polygon encompassing both sides of the Kern River from Conduit No 2 downstream to Tunnel No. 14 northeast of Pacheco Creek (CNDDB).<br>NRIS records one additional occurrence along SR 178 approximately 0.25 mile east of the Kern River No. 1 Powerhouse. |
| *Monardella linoides* ssp. *anemonoides*<br>southern Sierra monardella | — | — | 1B.3 | June–August | A perennial herb found in chaparral, cismontane woodland, and lower montane coniferous forest. Elevation: 2,200–8,040 feet. | **Known to occur.** A CNDDB query yielded one occurrence in the vicinity of the Project, a generalized polygon encompassing the Democrat Diversion Dam impoundment and the Willow Spring Creek Road (also referred to as Democrat Dam Road). This occurrence was recorded in 1935. |
| *Opuntia treleasei*<br>Bakersfield cactus | FE/CE | — | 1B.1 | April–May | A perennial cactus that grows on sandy or gravelly soils in chenopod scrub, cismontane woodland, and valley and foothill grassland. Elevation: 400–4,830 feet. | **Known to occur**. A CNDDB query yielded one occurrence in the vicinity of the Project along the Kern River approximately 0.25 mile west of Stark Creek Road. This occurrence was recorded in 2010. |
| **May Potentially Occur in the Vicinity of the Project** | | | | | | |
| *Calochortus striatus*<br>alkali mariposa lily | — | FSCC | 1B.2 | April–June | A perennial bulbiferous herb that grows on alkaline and mesic soils in chaparral, chenopod scrub, Mojavean desert scrub, and meadows and seeps. Elevation: 230–5,235 feet. | **May potentially occur.** The Project is within the geographic range and contains suitable habitat for this species. |
| *Camissonia integrifolia*<br>Kern River evening-primrose | — | FSCC | 1B.3 | April (May) | An annual herb that grows in chaparral and Mojavean desert scrub. Elevation: 2,295–3,935 feet. | **May potentially occur.** The Project is within the geographic range and contains suitable habitat for this species. |

| Scientific/Common Name | Federal/ State Status | Sequoia National Forest Status | California Rare Plant Rank (CRPR) | Blooming Period/ Fertile | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|---|
| *Clarkia springvillensis*<br>Springville Clarkia | FT/CE | — | 1B.2 | April–July | An annual herb that grows on granitic soils in chaparral, cismontane woodland, and valley and foothill grassland. Elevation: 805–4,005 feet. | **May potentially occur.** The Project is within the geographic range and contains suitable habitat for this species. |
| *Hesperocyparis nevadensis*<br>Piute cypress | — | FSCC | 1B.2 | N/A | A perennial evergreen tree that grows in closed-cone coniferous forest, chaparral, cismontane woodland, and pinyon and juniper woodland. Elevation: 2,360–6,005 feet. | **May potentially occur.** The Project is within the geographic range and contains suitable habitat for this species. |
| *Pseudobahia peirsonii*<br>San Joaquin adobe sunburst | FT/CE | — | 1B.1 | February–April | An annual herb that grows on adobe clay soils in cismontane woodland and valley and foothill grassland. Elevation: 295–2,670 feet. | **May potentially occur.** The Project supports suitable habitat and is within the elevational range of this species. A CNDDB query yielded three records within a 5-mile buffer of the Project. |
| *Eriastrium tracyi*<br>Tracy's eriastrum | — | FSCC | 3.2 | May–July | An annual herb found in chaparral, cismontane woodland, and valley and foothill grassland. Elevation: 1,035–5,840 feet. | **May potentially occur.** The Project supports suitable habitat and is within the elevational range of this species. |
| *Eschoscholzia lemmonii*<br>Tejon poppy | — | — | 1B.1 | March–May | An annual herb that grows in chenopod scrub and valley and foothill grassland. Elevation: 530–3,330 feet. | **May potentially occur.** The Project is within the geographic range and contains suitable habitat for this species. A CNDDB query yielded one record of this species located approximately 3 miles northwest of Kern River No. 1 Powerhouse. |
| *Fritillaria striata*<br>striped adobe lily | CT | FSCC | 1B.1 | February–April | A perennial herb (bulbiferous) that grows on clay soils in cismontane woodland and valley and foothill grassland. Elevation: 450–4,850 feet. | **May potentially occur.** The Project is within the geographic range and contains suitable habitat for this species. A CNDDB query yielded seven records within a 5-mile buffer of the Project. |
| *Navarretia setiloba*<br>Piute Mountains navarretia | — | — | 1B.1 | April–July | An annual herb that grows on clay or gravelly loam soils in cismontane woodland, pinyon and juniper woodland, and valley and foothill grassland. Elevation: 950–7,000 feet. | **May potentially occur.** The Project supports suitable habitat and is within the elevational range of this species.<br>A CNDDB query yielded three records of this species within a 5-mile buffer of the Project. |
| *Stylocline citreolum*<br>oil neststraw | — | — | 1B.1 | March–April | An annual herb that grows on clay soils in chenopod scrub, coastal scrub, and valley and foothill grassland. Only known extant populations are from the interior coast ranges. Elevation: 170–1,330 feet. | **May potentially occur.** The Project supports suitable habitat and is within the elevational range of this species. |
| **Unlikely to Occur in the Vicinity of the Project** | | | | | | |
| *Caulanthus californicus*<br>California jewelflower | FE/CE | — | 1B.1 | February–May | An annual herb that grows on sandy soils in chenopod scrub, pinyon and juniper woodland, and valley and foothill grassland. Extirpated from the San Joaquin Valley, now known only from Santa Barbara canyon, Carrizo Plain, and the Kreyenhagen Hills. Elevation: 200–3,300 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. |
| *Cordylanthus eremicus* ssp. *kernensis*<br>Kern Plateau bird's-beak | — | FSCC | 1B.3 | July–September | A hemiparasitic annual herb that grows in Great Basin scrub, Joshua tree "woodland", pinyon and juniper woodland, and upper montane coniferous forest. Elevation: 5,495–9,845 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Eremalche parryi* ssp. *kernensis*<br>Kern mallow | FE | — | 1B.2 | January–May | An annual herb that grows on dry and open sandy to clay soils in chenopod scrub, pinyon and juniper woodland, and valley and foothill grassland; often found at edge of balds. Elevation: 230–4,300 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. |
| *Layia leucopappa*<br>Comanche Point layia | — | — | 1B.1 | March–April | An annual herb that grows in chenopod scrub and valley and foothill grassland, found only in Kern County. Elevation: 330–1,170 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. |

| Scientific/Common Name | Federal/ State Status | Sequoia National Forest Status | California Rare Plant Rank (CRPR) | Blooming Period/ Fertile | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|---|
| *Monolopia (=Lembertia) congdonii* San Joaquin woolly-threads | FE | — | 1B.2 | February–May | An annual herb that grows in chenopod scrub and sandy valley and foothill grassland. Elevation: 200–2,670 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. Populations in the lower Kern River are believed to be extirpated (USFWS 1998). |
| *Streptanthus cordatus* var. *piutensis* Piute Mountains jewel-flower | — | FSCC | 1B.2 | May–July | A perennial herb that grows on clay and metamorphic soils in broad-leafed upland forest, closed-cone coniferous forest, and pinyon and juniper woodland. Elevation: 3,595–5,990 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is outside of the elevational range of this species. |
| *Symphyotrichum defoliatum* San Bernardino aster | — | FSCC | 1B.2 | July–November | A perennial rhizomatous herb that grows on streambanks in cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, marshes and swamps, and valley and foothill grassland (vernally mesic). Elevation: 5–6,695 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. |
| *Astragalus ertterae* Walker Pass milk-vetch | — | FSCC | 1B.3 | April–May | A perennial herb that grows on granitic, sandy soils in pinyon and juniper woodland. Elevation: 5,595–6,235 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Astragalus lentiginosus* var. *kernensis* Kern Plateau milk-vetch | — | FSCC | 1B.2 | June–July | A perennial herb that grows on sandy soils in meadows and seeps, and subalpine coniferous forest. Elevation: 7,350–9,025 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Astragalus shevockii* Little Kern (Shevock's) milk-vetch | — | FSCC | 1B.3 | June–July | A perennial herb that grows on granitic and sandy soils in upper montane coniferous forest. Elevation: 6,200–6,445 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Astragalus subvestitus* Kern County milk-vetch | — | FSCC | 4.3 | June–July | A perennial herb that grows on gravelly and sandy soils in Great Basin scrub, meadows and seeps, and pinyon and juniper woodland. Elevation: 7,645–9,025 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Atriplex tularensis* Bakersfield saltbush | CE | — | 1A | June–October | An annual herb that grows in chenopod scrub. Elevation: 295–655 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. |
| *Boechera evadens* hidden rockcress | — | FSCC | 1B.3 | May–August | A perennial herb that grows on rocky soils in upper montane coniferous forest. Elevation: 8,400–9,350 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Boechera tularensis* Tulare rockcress | — | FSCC | 1B.3 | June–July | A perennial herb that grows along slopes and roadsides on rocky soils in subalpine coniferous forest and upper montane coniferous forest. Elevation: 5,990–10,990 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Botrychium crenulatum* scalloped moonwort | — | FSCC | 2B.2 | June–September | A perennial rhizomatous herb that grows in bogs and ferns, lower montane coniferous forest, meadows and seeps, marshes and swamps (freshwater), and upper montane coniferous forest. Elevation: 4,160–10,760 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Calochortus westonii* Shirley Meadows star-tulip (mariposa lily) | — | FSCC | 1B.2 | May–June | A perennial herb (bulbiferous) that grows on granitic soils in broad-leafed upland forest, lower montane coniferous forest, and meadows and seeps. Elevation: 4,920–6,905 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Calyptridium pygmaeum* Pygmy pussypaws | — | FSCC | 1B.2 | June–August | An annual herb that grows on gravelly and sandy soils in subalpine coniferous forest and upper montane coniferous forest. Elevation: 6,495–10,205 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Carlquistia muirii* Muir's tarplant | — | FSCC | 1B.3 | July–August | A perennial rhizomatous herb that grows on granitic soils in chaparral (montane), lower montane coniferous forest, and upper montane coniferous forest. Elevation: 2,475–8,205 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |

| Scientific/Common Name | Federal/ State Status | Sequoia National Forest Status | California Rare Plant Rank (CRPR) | Blooming Period/ Fertile | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|---|
| *Cirsium crassicaule*<br>slough thistle | — | — | 1B.1 | May–August | An annual/perennial herb that grows in chenopod scrub, marshes, and swamps (sloughs), and riparian scrub. Elevation: 10–330 feet. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |
| *Clarkia tembloriensis* ssp. *calientensis*<br>Vasek's Clarkia | — | — | 1B.1 | April | An annual herb that grows in valley and foothill grassland. Elevation: 900–1,640 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. |
| *Deinandra mohavensis*<br>Mojave tarplant | — | FSCC | 1B.3 | June–October | An annual herb that grows on mesic soils in chaparral, coastal scrub, and riparian scrub. Elevation: 2,100–5,250 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Dicentra nevadensis*<br>Sierra (Tulare County) bleeding heart | — | FSCC | 4.3 | June–August | A perennial rhizomatous herb that grows in alpine boulder and rock fields, and subalpine coniferous forest (gravelly, sandy, openings). Elevation: 7,220–10,005 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Erigeron aequifolius*<br>Hall's daisy (fleabane) | — | FSCC | 1B.3 | June–August | A perennial rhizomatous herb that grows on granitic and rocky soils in broad-leafed upland forest, lower montane coniferous forest, pinyon and juniper woodland, and upper montane coniferous forest. Elevation: 4,920–8,005 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Erigeron multiceps*<br>Kern River daisy | — | FSCC | 1B.2 | June–September | A perennial herb that grows in meadows and seeps and upper montane coniferous forest (openings). Elevation: 4,920–8,315 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Eriogonum breedlovei* var. *breedlovei*<br>Breedlove's (Piute) buckwheat | — | FSCC | 1B.2 | June–August | A perennial herb that grows on carbonate soils in pinyon and juniper woodland and upper montane coniferous forest. Elevation: 6,200–8,500 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Eriogonum ovalifolium* var. *monarchense*<br>monarch buckwheat | — | FSCC | 1B.1 | June–August | A perennial herb that grows on carbonate, rocky, and sandy soils in Mojavean desert scrub and pinyon and juniper woodland. Elevation: 5,905–5,955 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Gilia yorkii*<br>Boyden Cave gilia | — | FSCC | 1B.1 | May–July | An annual herb that grows on carbonate soils in chaparral and cismontane woodland. Elevation: 4,230–6,005 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Githopsis tenella*<br>tube flower bluecup | — | FSCC | 1B.3 | April–June | An annual herb that grows on mesic and serpentinite soils in chaparral and cismontane woodland. Elevation: 1,065–6,235 feet. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |
| *Helodium blandowii*<br>Blandow's bog moss | — | FSCC | 2B.2 | N/A | A moss that grows on damp soil in meadows and seeps and subalpine coniferous forest. Elevation: 6,110–8,860 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Heterotheca monarchensis*<br>Monarch golden aster | — | FSCC | 1B.1 | May–October | A perennial herb that grows on carbonate soils in cismontane woodland. Elevation: 3,595–6,070 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Horkelia tularensis*<br>Kern Plateau horkelia | — | FSCC | 1B.3 | June–August | A perennial herb that grows on rocky soils in upper montane coniferous forest. Elevation: 7,400–9,435 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Hulsea brevifolia*<br>short-leaved hulsea | — | FSCC | 1B.2 | May–August | A perennial herb that grows on granitic, gravelly, sandy, and volcanic soils in lower montane and upper montane coniferous forest. Elevation: 4,920–10,500 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Ivesia campestris*<br>field ivesia | — | FSCC | 1B.2 | May–August | A perennial herb that grows in meadows and seeps (edges), subalpine coniferous forest, and upper montane coniferous forest. Elevation: 6,480–11,140 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |

| Scientific/Common Name | Federal/ State Status | Sequoia National Forest Status | California Rare Plant Rank (CRPR) | Blooming Period/ Fertile | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|---|
| *Leptosiphon serrulatus [= Linanthus serrulatus]* Madera leptosiphon | — | — | 1B.2 | April–May | An annual herb that grows in cismontane woodland and lower montane coniferous forest. Elevation: 985–4,265 feet. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |
| *Lewisia disepala* Yosemite Lewisia | — | FSCC | 1B.2 | March–June | A perennial herb that grows on granitic and sandy soils in lower montane coniferous forest, pinyon and juniper woodland, and upper montane coniferous forest. Elevation: 3,395–11,485 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Madia radiata* showy madia | — | — | 1B.2 | March–May | An annual herb that grows in cismontane woodland and valley and foothill grassland. Elevation: 80–3,985 feet. | **Unlikely to occur.** The Project is outside of the geographic range for this species. |
| *Meesia uliginosa* Meesia moss | — | FSCC | 2B.2 | July–October | A moss that grows in bogs and fens, meadows and seeps, subalpine coniferous forest, and upper montane coniferous forest. Elevation: 3,970–9,200 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Mielichhoferia shevockii* Shevock's copper moss | — | FSCC | 1B.2 | N/A | A moss that grows in cismontane woodland (mesic, metamorphic, rock). Elevation: 2,460–4,595 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Navarretia peninsularis* Baja navarretia | — | FSCC | 1B.2 | June–August | An annual herb that grows on mesic soils in chaparral (openings), lower montane coniferous forest, meadows and seeps, and pinyon and juniper woodland. Elevation: 4,920–7,545 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Nemacladus calcaratus* Chimney Creek nemacladus | — | FSCC | 1B.2 | May–June | An annual herb that grows on flats and granitic soils in pinyon and juniper woodland. Elevation: 6,235–6,890 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Nemacladus twisselmannii* Twisselmann's nemacladus | — | FSCC | 1B.2 | July | An annual herb that grows on granitic, sandy, or rocky soils in upper montane coniferous forest. Elevation: 7,350–8,040 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Oreonana purpurascens* purple mountain-parsley | — | FSCC | 1B.2 | May–June | A perennial herb that grows on metamorphic soils in broad-leafed upland forest, subalpine coniferous forest, and upper montane coniferous forest. Elevation: 7,860–9,400 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Oreonana vestita* Woolly mountain-parsley | — | FSCC | 1B.3 | March–September | A perennial herb that grows on gravelly and talus soils in lower montane coniferous forest, subalpine coniferous forest, and upper montane coniferous forest. Elevation: 5,300–11,485 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Orthotrichum spjutii* Spjut's bristle moss | — | FSCC | 1B.3 | N/A | A moss that grows on granitic and rocky soils in lower montane coniferous forest, pinyon and juniper woodland, subalpine coniferous forest, and upper montane coniferous forest. Elevation: 6,890–7,875 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Phacelia nashiana* Charlotte's phacelia | — | FSCC | 1B.2 | March–June | An annual herb that grows on granitic and sandy soils in Joshua tree "woodlands", Mojavean desert scrub, and pinyon and juniper woodland. Elevation: 1,970–7,220 feet. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |
| *Phacelia novenmillensis* Nine Mile Canyon phacelia | — | FSCC | 1B.2 | May–June | An annual herb that grows on gravelly and sandy soils in broad-leafed upland forest, cismontane woodland, pinyon and juniper woodland, and upper montane coniferous forest. Elevation: 5,395–8,660 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Ribes menziesii var. ixoderme* aromatic canyon gooseberry | — | — | 1B.2 | April | A perennial deciduous scrub that grows in chaparral and cismontane woodland. Elevation: 2,000–3, 805 feet. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |

| Scientific/Common Name | Federal/ State Status | Sequoia National Forest Status | California Rare Plant Rank (CRPR) | Blooming Period/ Fertile | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|---|
| *Sidalcea multifida*<br>cut-leaf checkerbloom | — | FSCC | 2B.3 | May–September | A perennial herb that grows in Great Basin scrub, lower montane coniferous forest, meadows and seeps, and pinyon and juniper woodland. Elevation: 5,740–9,185 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Streptanthus fenestratus*<br>Tehipite Valley jewel-flower | — | FSCC | 1B.1 | May–July | An annual herb that grows in lower montane coniferous forest and upper montane coniferous forest. Elevation: 3,495–5,740 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Trifolium kingii* ssp. *dedeckerae (T. dedeckerae)*<br>Dedecker's clover | — | FSCC | 1B.3 | May–July | A perennial herb that grows on granitic and rocky soils in lower montane coniferous forest, pinyon and juniper woodland, subalpine coniferous forest, and upper montane coniferous forest. Elevation: 6,890–11,485 feet. | **Unlikely to occur.** The Project does not contain suitable habitat and is out of the elevational range of this species. |
| *Viburnum ellipticum*<br>oval-leaved viburnum | — | FSCC | 2B.3 | May–June | A perennial deciduous shrub that grows in chaparral, cismontane woodland, and lower montane coniferous forest. Elevation: 705–4,595 feet. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |

NOTES:

[1] Vicinity of the Project is defined to include areas within or immediately adjacent to the FERC Project boundary, as well as areas immediately adjacent to the Project-affected reach of the Kern River.

**LEGEND:**

Federal Status
FC = Federal Candidate Species
FE = Federal Endangered
FT = Federal Threatened
FPD = Federal Proposed for Delisting
FPT, FPE = Federal Proposed Threatened/Endangered

Forest Service Status
FSCC = Sequoia National Forest Species of Conservation Concern

State Status
CFP = California Fully Protected
CSC = California Species of Special Concern
CCT, CCE = State Candidate Threatened/Endangered
CE = California Endangered
CT = California Threatened

CRPR = California Native Plant Society Rare Plant Rank
CRPR 1B = rare, threatened or endangered in California and elsewhere
CRPR 2B = rare in California but more common elsewhere
3 = need more information
4 = plants of limited distribution; a watch list

_.1 = Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
_.2 = Moderately threatened in California (20–80% occurrences threatened)
_.3 = Not very threatened in California (<20% of occurrences threatened or no current threats known)

**Table 3.6-3. Non-Native Invasive Plants Potentially Occurring in the Vicinity of the Kern River No. 1 Hydroelectric Project**

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Acacia dealbata*<br>silver wattle | Moderate | X | X | X | |
| *Acacia melanoxylon*<br>blackwood *Acacia* | Limited | X | X | X | X |
| *Aegilops triuncialis*<br>barb goatgrass | High | X | X | X | |
| *Agrostis avenacea*<br>Pacific bentgrass | Limited | X | | | |
| *Agrostis stolonifera*<br>creeping bent | Limited | X | X | | |
| *Ailanthus altissima*<br>tree-of-heaven | Moderate | X | X | | |
| *Alhagi maurorum*<br>camelthorn | Moderate | X | X | X | X |
| *Anthoxanthum odoratum*<br>sweet vernal grass | Limited | X | | | |
| *Arctotheca calendula*<br>fertile capeweed | Moderate | X | | | X |
| *Arctotheca prostrata*<br>capeweed | Moderate | X | | | X |
| *Arundo donax*<br>giant reed | High | X | X | X | |
| *Asparagus asparagoides*<br>bridal creeper | Moderate | | X | | |
| *Asphodelus fistulosus*<br>onion weed | Moderate | X | | | |
| *Atriplex semibaccata*<br>Australian saltbush | Moderate | X | X | X | X |
| *Avena fatua*<br>wild oats | Moderate | X | X | | X |
| *Bassia hyssopifolia*<br>five-hook *Bassia* | Limited | X | X | | X |
| *Bellardia trixago*<br>Bellardia | Limited | X | | | |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Brachypodium distachyon*<br>annual false-brome | Moderate | X | | X | |
| *Brassica nigra*<br>black mustard | Moderate | X | X | | X |
| *Brassica rapa*<br>field mustard | Limited | X | X | | X |
| *Brassica tournefortii*<br>Sahara mustard | High | | | | X |
| *Briza maxima*<br>big quakinggrass | Limited | X | | X | X |
| *Bromus diandrus*<br>ripgut brome | Moderate | X | X | X | X |
| *Bromus hordeaceus*<br>soft brome | Limited | X | | X | X |
| *Bromus japonicus*<br>Japanese brome | Limited | X | | X | |
| *Bromus madritensis* ssp. *rubens*<br>red brome | High | X | X | X | X |
| *Bromus tectorum*<br>cheatgrass | High | X | | X | X |
| *Carduus nutans*<br>musk thistle | Moderate | X | | | X |
| *Carduus pycnocephalus*<br>Italian thistle | Moderate | X | X | X | X |
| *Carduus tenuiflorus*<br>slenderflower thistle | Limited | X | X | X | X |
| *Carthamus lanatus*<br>woolly distaff thistle | High | X | | X | |
| *Centaurea calcitrapa*<br>purple starthistle | Moderate | X | X | | X |
| *Centaurea diffusa*<br>diffuse knapweed | Moderate | X | X | X | X |
| *Centaurea melitensis*<br>tocalote | Moderate | X | X | | X |
| *Centaurea solstitialis*<br>yellow starthistle | High | X | | X | X |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Centaurea stoebe* ssp. *micranthos*<br>spotted knapweed | High | X | X | X | X |
| *Chondrilla juncea*<br>skeleton weed | Moderate | X | | X | X |
| *Cirsium arvense*<br>Canada thistle | Moderate | X | X | X | X |
| *Cirsium vulgare*<br>bull thistle | Moderate | X | X | X | X |
| *Conium maculatum*<br>poison-hemlock | Moderate | X | X | | X |
| *Cortaderia jubata*<br>jubatagrass | High | X | X | | X |
| *Cortaderia selloana*<br>pampasgrass | High | X | X | | X |
| *Cotula coronopifolia*<br>common brassbuttons | Limited | X | | | |
| *Crataegus monogyna*<br>English hawthorn | Limited | | X | X | |
| *Cynara cardunculus*<br>artichoke thistle | Moderate | X | X | | X |
| *Cynodon dactylon*<br>Bermuda grass | Moderate | X | X | | X |
| *Cynosurus echinatus*<br>hedgehog dogtail | Moderate | X | X | X | X |
| *Cytisus scoparius*<br>Scotch broom | High | X | X | X | X |
| *Dactylis glomerata*<br>orchard grass | Limited | X | | X | |
| *Delairea odorata*<br>Cape-ivy | High | X | X | | X |
| *Descurainia sophia*<br>tansy mustard | Limited | X | X | X | X |
| *Digitalis purpurea*<br>foxglove | Limited | X | X | | X |
| *Dipsacus fullonum*<br>common teasel | Moderate | X | X | | |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Dittrichia graveolens*<br>stinkwort | Moderate | X | X | | |
| *Ehrharta calycina*<br>purple veldtgrass | High | X | | X | X |
| *Ehrharta erecta*<br>panic veldtgrass | Moderate | X | X | | X |
| *Elaeagnus angustifolia*<br>Russian olive | Moderate | X | X | | |
| *Elymus caput-medusae*<br>medusahead | High | X | X | X | X |
| *Erodium cicutarium*<br>redstem filaree | Limited | X | | X | X |
| *Eucalyptus camaldulensis*<br>red gum | Limited | X | X | | |
| *Eucalyptus globulus*<br>blue gum | Limited | X | X | | X |
| *Euphorbia oblongata*<br>eggleaf spurge | Limited | X | X | X | |
| *Festuca arundinacea*<br>reed fescue | Moderate | X | X | X | X |
| *Festuca myuros*<br>rat-tail fescue | Moderate | X | X | X | X |
| *Festuca perennis*<br>Italian ryegrass | Moderate | X | X | X | X |
| *Ficus carica*<br>edible fig | Moderate | | X | | X |
| *Foeniculum vulgare*<br>fennel | Moderate | X | X | | X |
| *Genista monosperma*<br>bridal veil broom | Moderate | X | | | X |
| *Genista monspessulana*<br>French broom | High | X | X | X | X |
| *Geranium dissectum*<br>cutleaf *Geranium* | Limited | X | X | X | X |
| *Glyceria declinata*<br>mannagrass | Moderate | X | X | | |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Hedera helix*<br>English ivy | High | | X | X | X |
| *Helichrysum petiolare*<br>licorice plant | Limited | | | | X |
| *Helminthotheca echioides*<br>bristly ox-tongue | Limited | X | X | | X |
| *Hirschfeldia incana*<br>short-pod mustard | Moderate | X | X | | X |
| *Holcus lanatus*<br>common velvet grass | Moderate | X | | | X |
| *Hordeum marinum*<br>Mediterranean barley | Moderate | X | | X | X |
| *Hordeum murinum*<br>hare barley | Moderate | X | | X | X |
| *Hypericum perforatum*<br>St. John's wort | Limited | X | | X | |
| *Hypochaeris glabra*<br>smooth cat's-ear | Limited | X | X | X | X |
| *Hypochaeris radicata*<br>rough cat's-ear | Moderate | X | X | X | X |
| *Ilex aquifolium*<br>English holly | Limited | | X | | |
| *Kochia scoparia*<br>*Kochia* | Limited | X | | | X |
| *Lepidium chalepense*<br>lens-podded hoary cress | Moderate | X | X | | |
| *Lepidium draba*<br>heart-podded hoary cress | Moderate | X | X | | |
| *Lepidium latifolium*<br>perennial pepperweed | High | X | X | | |
| *Leucanthemum vulgare*<br>ox-eye daisy | Moderate | X | | | X |
| *Ligustrum lucidum*<br>glossy privet | Limited | | X | X | |
| *Limonium duriusculum*<br>European sea lavender | Moderate | X | X | | X |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Linaria dalmatica* ssp. *dalmatica*<br>Dalmatian toadflax | Moderate | X | | | X |
| *Linaria vulgaris*<br>yellow toadflax | Moderate | X | X | | X |
| *Lobularia maritima*<br>sweet *Alyssum* | Limited | X | X | | X |
| *Lythrum hyssopifolia*<br>hyssop loosestrife | Moderate | X | | | |
| *Lythrum salicaria*<br>purple loosestrife | High | X | X | | |
| *Marrubium vulgare*<br>horehound | Limited | X | X | X | X |
| *Medicago polymorpha*<br>California burclover | Limited | X | | X | |
| *Mentha pulegium*<br>pennyroyal | Moderate | X | X | | X |
| *Mesembryanthemum nodiflorum*<br>slenderleaf iceplant | Limited | X | | | X |
| *Myoporum laetum*<br>ngaio tree | Moderate | X | X | | X |
| *Myosotis latifolia*<br>common forget-me-not | Limited | | X | | |
| *Nicotiana glauca*<br>tree tobacco | Moderate | X | X | | X |
| *Olea europaea*<br>olive | Limited | X | X | | X |
| *Oncosiphon pilulifer*<br>stinknet | High | X | X | X | X |
| *Onopordum acanthium*<br>Scotch thistle | High | X | | X | |
| *Oxalis pes-caprae*<br>Bermuda buttercup | Moderate | | | | X |
| *Parentucellia viscosa*<br>yellow glandweed | Limited | X | | | |
| *Pennisetum clandestinum*<br>Kikuyu grass | Limited | X | X | | X |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Pennisetum setaceum*<br>crimson fountain grass | Moderate | X | X | | X |
| *Phalaris aquatica*<br>harding grass | Moderate | X | X | X | X |
| *Phoenix canariensis*<br>Canary Island date palm | Limited | | X | | |
| *Phytolacca americana*<br>common pokeweed | Limited | | X | | |
| *Plantago lanceolata*<br>English plantain | Limited | X | X | | X |
| *Poa pratensis*<br>Kentucky bluegrass | Limited | X | X | | |
| *Polypogon monspeliensis*<br>rabbitsfoot grass | Limited | X | X | | |
| *Prunus cerasifera*<br>cherry plum | Limited | | X | X | X |
| *Pyracantha angustifolia*<br>narrowleaf firethorn | Limited | X | X | | X |
| *Pyracantha crenulata*<br>Nepalese firethorn | Limited | X | X | | X |
| *Ranunculus repens*<br>creeping buttercup | Limited | | X | | |
| *Raphanus sativus*<br>wild radish | Limited | X | | X | X |
| *Rhaponticum repens*<br>Russian knapweed | Moderate | X | X | X | X |
| *Ricinus communis*<br>castor bean | Limited | X | X | | X |
| *Robinia pseudoacacia*<br>black locust | Limited | X | X | | |
| *Rubus armeniacus*<br>Himalayan blackberry | High | X | X | X | X |
| *Rumex acetosella*<br>sheep sorrel | Moderate | | X | X | X |
| *Rumex crispus*<br>curly dock | Limited | X | X | | X |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Saccharum ravennae*<br>ravennagrass | Moderate | X | X | | X |
| *Salsola paulsenii*<br>barbwire Russian thistle | Limited | | | | X |
| *Salsola soda*<br>glasswort | Moderate | X | | | |
| *Salsola tragus*<br>Russian thistle | Limited | X | | | X |
| *Saponaria officinalis*<br>bouncing-bet | Limited | | X | | |
| *Schinus molle*<br>Peruvian pepper tree | Limited | X | X | | X |
| *Schinus terebinthifolius*<br>Brazilian pepper tree | Moderate | | X | | |
| *Schismus arabicus*<br>Mediterranean grass | Limited | X | | X | X |
| *Schismus barbatus*<br>common Mediterranean grass | Limited | X | | X | X |
| *Senecio jacobaea*<br>tansy ragwort | Limited | X | X | | |
| *Sesbania punicea*<br>scarlet *Wisteria* | High | | X | | |
| *Silybum marianum*<br>milk thistle | Limited | X | X | X | X |
| *Sinapis arvensis*<br>wild mustard | Limited | X | | | |
| *Sisymbrium irio*<br>London rocket | Limited | X | X | | X |
| *Spartium junceum*<br>Spanish broom | High | X | X | X | X |
| *Stipa miliacea* var. *miliacea*<br>smilo grass | Limited | X | X | | X |
| *Tamarix aphylla*<br>athel | Limited | | X | | |
| *Tamarix chinensis*<br>Chinese tamarisk | High | X | X | | X |

| Scientific Name<br>Common Name(s) | Cal-IPC Rating[1] | Habitat in Which Species Typically Occurs[2] | | | |
|---|---|---|---|---|---|
| | | Grassland | Riparian | Woodland | Scrub |
| *Tamarix gallica*<br>French tamarisk | High | X | X | | X |
| *Tamarix parviflora*<br>smallflower tamarisk | High | X | X | | X |
| *Tamarix ramosissima*<br>saltcedar | High | X | X | | X |
| *Torilis arvensis*<br>hedgeparsley | Moderate | X | X | X | |
| *Triadica sebifera*<br>Chinese tallow tree | Moderate | | X | | |
| *Tribulus terrestris*<br>puncture vine | Limited | X | X | X | X |
| *Trifolium hirtum*<br>rose clover | Limited | X | | X | |
| *Verbascum thapsus*<br>woolly mullein | Limited | X | X | X | |
| *Vinca major*<br>periwinkle | Moderate | | X | X | X |
| *Washingtonia robusta*<br>Mexican fan palm | Moderate | | X | | |
| *Zantedeschia aethiopica*<br>calla lily | Limited | | | | X |

NOTES:

[1] The Cal-IPC Invasive Plant Inventory categorizes plants as High, Moderate, or Limited, according to the degree of ecological impact in California (Cal-IPC 2022).

- **High.** Severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
- **Moderate.** Substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
- **Limited.** Invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

[2] The Cal-IPC Invasive Plant Inventory creates a query based on generalized habitat types. There is no crosswalk available between Cal-IPC habitat types and CALVEG alliances. Therefore, the habitat types that most closely matched CALVEG vegetation alliances in the Project vicinity were selected. These included the following: 1) grassland, vernal pools, meadows, and other herb communities; 2) riparian and bottomland habitat; 3) woodland habitat, and 4) scrub and chaparral.

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## Table 3.6-4. Common Wildlife Species and CWHR Wildlife Habitats

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| **Amphibians and Reptiles** | | | | | | | | | |
| *Anaxyrus boreas*<br>Western toad | X | X | X | X | X | X | X | X | |
| *Pseudacris regilla*<br>Pacific treefrog | X | X | X | X | X | X | X | X | |
| *Lithobates catesbeianus*<br>American bullfrog | X | X | X | X | X | X | X | X | |
| *Coleonyx variegatus*<br>Western banded gecko | | X | | | | | | | |
| *Sceloporus magister*<br>Desert spiny lizard | | | X | | X | | | | X |
| *Sceloporus occidentalis*<br>Western fence lizard | X | X | X | X | X | X | X | | |
| *Sceloporus graciosus*<br>Common sagebrush lizard | | X | | X | | | | | |
| *Uta stansburiana*<br>Common side-blotched lizard | X | X | X | | X | X | X | | X |
| *Plestiodon skiltonianus*<br>Western skink | X | X | X | X | X | X | X | | |
| *Plestiodon gilberti*<br>Gilbert's skink | X | X | X | X | X | X | X | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Aspidoscelis tigris*<br>Tiger whiptail | X | X | X | X | X | X | X | | |
| *Elgaria multicarinata*<br>Southern alligator lizard | X | X | X | X | X | X | X | | |
| *Elgaria coerulea*<br>Northern alligator lizard | X | | | X | | X | X | | |
| *Rena humilis*<br>Western threadsnake | | X | X | | | X | X | | X |
| *Charina bottae*<br>Northern rubber boa | | | X | X | | | | | |
| *Diadophis punctatus*<br>Ring-necked snake | X | X | X | X | X | X | X | | |
| *Contia tenuis*<br>Common sharp-tailed snake | | X | X | X | X | X | X | | |
| *Coluber constrictor*<br>North American racer | X | X | X | X | X | X | X | | |
| *Coluber lateralis*<br>Striped racer | | X | X | X | X | X | X | | |
| *Pituophis catenifer*<br>Gophersnake | X | X | X | X | X | X | X | | |
| *Lampropeltis getula*<br>Eastern kingsnake | X | X | X | X | X | X | X | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Lampropeltis zonata*<br>California mountain kingsnake | X | X | X | X | X | X | X | | |
| *Rhinocheilus lecontei*<br>Long-nosed snake | X | X | | | X | X | X | | |
| *Thamnophis sirtalis*<br>Common gartersnake | X | X | X | X | X | X | X | | |
| *Thamnophis couchii*<br>Sierra gartersnake | X | X | X | X | X | X | X | X | |
| *Hypsiglena chlorophaea*<br>Desert nightsnake | X | X | X | X | X | X | X | | |
| *Crotalus oreganus*<br>Western rattlesnake | X | X | X | X | X | X | X | | X |
| **Birds** | | | | | | | | | |
| *Aechmophorus occidentalis*<br>Western grebe | | | | | | | | X | |
| *Phalacrocorax auritus*<br>Double-crested cormorant | | | X | | | | | X | |
| *Ardea herodias*<br>Great blue heron | X | | X | X | X | X | X | X | |
| *Ardea alba*<br>Great egret | X | | X | | X | X | X | X | |
| *Egretta thula*<br>Snowy egret | | | X | | | | | X | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Bubulcus ibus*<br>Cattle egret | X | | X | | X | X | X | X | |
| *Butorides virescens*<br>Green heron | | | X | X | X | X | X | X | |
| *Nycticorax nycticorax*<br>Black-crowned night heron | | X | X | X | X | X | X | X | |
| *Branta canadensis*<br>Canada goose | X | | | | | | | X | |
| *Aix sponsa*<br>Wood duck | | | X | X | X | X | X | X | |
| *Anas platrhynchos*<br>Mallard | X | | X | | | | | X | |
| *Busephala clangula*<br>Common goldeneye | | | X | | | | | X | |
| *Bucephala albeola*<br>Bufflehead | | | X | | | | | | |
| *Lophodytes cucullatus*<br>Hooded merganser | | | X | | | | | X | |
| *Mergus merganser*<br>Common merganser | | | X | | | | | X | |
| *Cathartes aura*<br>Turkey vulture | X | X | X | X | X | X | X | X | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Pandion haliaetus*<br>Osprey | X | X | X | X | X | X | X | X | X |
| *Accipiter striatus*<br>Sharp-shinned hawk | X | X | X | X | X | X | X | | X |
| *Accipiter cooperii*<br>Cooper's hawk | X | X | X | X | X | X | X | | |
| *Buteo lineatus*<br>Red-shouldered hawk | X | | X | X | X | X | X | | |
| *Buteo jamaicensis*<br>Red-tailed hawk | X | X | X | X | X | X | X | | X |
| *Buteo regalis*<br>Ferruginous hawk | X | | X | | X | X | X | | X |
| *Buteo lagopus*<br>Rough-legged hawk | X | | X | | X | X | X | | X |
| *Falco sparverius*<br>American kestrel | X | X | X | X | X | X | X | | X |
| *Falco columbarius*<br>Merlin | X | X | X | X | X | X | X | X | X |
| *Alectoris chukar*<br>Chukar | X | | X | | | | | | |
| *Phasianus colchicus*<br>Ring-necked pheasant | X | X | X | | X | | | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Meleagris gallopavo*<br>Wild turkey | X | X | X | X | X | X | X | | |
| *Callipepla californica*<br>California quail | X | X | X | X | X | X | X | | |
| *Oreotyx pictus*<br>Mountain quail | X | X | X | X | X | | | | |
| *Gallinula galeata*<br>Common gallinule | | | | | | | | X | |
| *Fulica americana*<br>American coot | X | | | | | | | X | |
| *Charadrius vociferus*<br>Killdeer | X | | X | | X | X | | X | X |
| *Tringa melanoleuca*<br>Greater yellowlegs | | | X | | | | | X | |
| *Actitis macularius*<br>Spotted sandpiper | X | | X | | | | | X | X |
| *Larus delawarensis*<br>Ring-billed gull | X | | | | | | | X | |
| *Larus californicus*<br>California gull | X | | | | | | | X | X |
| *Larus argentatus*<br>Herring gull | | | | | | | | X | X |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Columba livia*<br>Rock pigeon | X | | | | | | | | |
| *Patagioenas fasciata*<br>Band-tailed pigeon | | X | X | X | X | X | X | | |
| *Zenaida macroura*<br>Mourning dove | X | X | X | X | X | X | X | | |
| *Geococcyx californianus*<br>Greater roadrunner | | X | | | X | X | X | | |
| *Tyto alba*<br>Barn owl | X | X | X | X | X | X | X | | X |
| *Megascops kennicottii*<br>Western screech-owl | X | X | X | X | X | X | X | | |
| *Bubo virginianus*<br>Great horned owl | X | X | X | X | X | X | X | | X |
| *Glaucidium gnoma*<br>Northern pygmy-owl | | X | X | X | X | X | X | | |
| *Aegolius acadicus*<br>Northern saw-whet owl | | X | X | X | X | X | X | | |
| *Chordeiles acutipennis*<br>Lesser nighthawk | X | | X | | X | X | X | X | X |
| *Phalaenoptilus nuttallii*<br>Common poorwill | X | X | | X | X | X | X | X | X |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Aeronautes saxatalis*<br>White-throated swift | X | X | | X | X | X | | X | X |
| *Archilochus alexandri*<br>Black-chinned hummingbird | | X | X | | X | X | X | | |
| *Calypte anna*<br>Anna's hummingbird | | X | X | X | X | X | X | | |
| *Selasphorus rufus*<br>Rufous hummingbird | | X | X | X | X | X | | | |
| *Megaceryle alcyon*<br>Belted kingfisher | | | X | | | | | X | X |
| *Melanerpes formicivorus*<br>Acorn woodpecker | | | X | X | X | X | X | | |
| *Sphyrapicus ruber*<br>Red-breasted sapsucker | | X | X | X | X | X | X | | |
| *Picoides nuttallii*<br>Nuttall's woodpecker | | X | X | X | X | X | X | | |
| *Picoides pubescens*<br>Downy woodpecker | X | X | X | X | X | X | X | | |
| *Picoides villosus*<br>Hairy woodpecker | | X | X | X | X | X | X | | |
| *Colaptes auratus*<br>Northern flicker | X | X | X | X | X | X | X | | |

| **Common Wildlife** | **CWHR Wildlife Habitat** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Herb-Dominated Habitats** | | **Shrub-Dominated Habitats** | | **Tree-Dominated Habitats** | | | **Aquatic Areas** | **Other** |
| **Scientific Name**<br>**Common Name** | **Annual Grassland** | **Mixed Chaparral** | **Valley Foothill Riparian** | **Montane Hardwood** | **Blue Oak-Foothill Pine** | **Blue Oak Woodland** | **Valley Oak Woodland** | **Riverine** | **Barren** |
| *Dryocopus pileatus*<br>Pileated woodpecker | | | | X | X | | | | |
| *Contopus sordidulus*<br>Western wood-pewee | | X | X | X | X | X | | | |
| *Empidonax hammondii*<br>Hammond's flycatcher | | | X | X | X | X | X | | |
| *Empidonax oberholseri*<br>Dusky flycatcher | | X | X | | X | X | X | | |
| *Empidonax difficilis*<br>Pacific-slope flycatcher | | X | X | X | X | X | X | | |
| *Sayornis nigricans*<br>Black phoebe | X | X | X | X | X | X | | X | X |
| *Sayornis saya*<br>Say's phoebe | X | X | X | | X | X | X | | |
| *Myiarchus cinerascens*<br>Ash-throated flycatcher | | X | X | X | X | X | X | | |
| *Tyrannus verticalis*<br>Western kingbird | X | X | X | X | X | X | X | | |
| *Eremophila alpestris*<br>Horned lark | X | | X | | X | X | X | | X |
| *Tachycineta bicolor*<br>Tree swallow | X | X | X | X | X | X | X | X | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Tachycineta thalassina*<br>Violet-green swallow | X | X | X | X | X | X | X | X | X |
| *Stelgidopteryx serripennis*<br>Northern rough-winged swallow | X | X | X | X | X | X | X | X | X |
| *Petrochelidon pyrrhonota*<br>Cliff swallow | X | X | X | | X | X | | X | |
| *Hirundo rustica*<br>Barn swallow | X | X | X | X | X | X | X | X | |
| *Cyanocitta stelleri*<br>Steller's jay | | X | X | X | X | X | X | | |
| *Aphelocoma californica*<br>California scrub jay | | X | X | X | X | X | X | | |
| *Pica nuttalli*<br>Yellow-billed magpie | X | | X | | X | X | X | | |
| *Corvus brachryrhynchos*<br>American crow | X | | X | X | X | X | X | X | |
| *Corvus corax*<br>Common raven | X | X | X | X | X | X | X | X | X |
| *Poecile gambeli*<br>Mountain chickadee | | X | X | X | X | X | X | | |
| *Psaltriparus minimus*<br>Bushtit | | X | X | X | X | X | X | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Sitta canadensis*<br>Red-breasted nuthatch | | | X | X | X | X | X | | |
| *Sitta carolinensis*<br>White-breasted nuthatch | | | X | X | X | X | X | | |
| *Certhia americana*<br>Brown creeper | | | X | X | X | X | X | | |
| *Salpinctes obsoletus*<br>Rock wren | | X | X | X | X | X | X | | X |
| *Catherpes mexicanus*<br>Canyon wren | | X | X | | X | | | | X |
| *Thryomanes bewickii*<br>Bewick's wren | | X | X | X | X | X | X | | |
| *Troglodytes aedon*<br>House wren | | X | X | X | X | X | X | | |
| *Troglodytes heimalis*<br>Winter wren | | | X | X | | | | | |
| *Regulus satrapa*<br>Golden-crowned kinglet | | X | X | X | X | X | X | | |
| *Regulus calendula*<br>Ruby-crowned kinglet | | X | X | X | X | X | X | | |
| *Polioptila caerulea*<br>Blue-gray gnatcatcher | | X | X | X | X | X | X | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
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| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Sialia Mexicana*<br>Western bluebird | X | X | X | X | X | X | X | | |
| *Sialia currucoides*<br>Mountain bluebird | X | | X | | X | X | X | | |
| *Myadestes townsendi*<br>Townsend's solitaire | | X | | X | X | | | | |
| *Catharus ustulatus*<br>Swainson's thrush | | X | X | X | X | X | X | | |
| *Catharus guttatus*<br>Hermit thrush | | X | X | X | X | X | X | | |
| *Turdus migratorius*<br>American robin | X | X | X | X | X | X | X | | |
| *Ixoreus naevius*<br>Varied thrush | | X | X | X | X | X | X | | |
| *Mimus polyglottos*<br>Northern mockingbird | X | X | X | | X | X | X | | |
| *Anthus rubrescens*<br>American pipit | X | | X | | | | | X | X |
| *Bombycilla cedrorum*<br>Cedar waxwing | | X | X | X | X | X | X | | |
| *Phainopepla nitens*<br>Phainopepla | | X | X | X | X | X | X | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Sturnus vulgaris*<br>European starling | X | X | X | X | X | X | X | | |
| *Vireo cassinii*<br>Cassin's vireo | | X | X | X | X | X | X | | |
| *Vireo huttoni*<br>Hutton's vireo | | X | X | X | X | X | X | | |
| *Vireo gilvus*<br>Warbling vireo | | X | X | X | X | X | X | | |
| *Oreothlypis celata*<br>Orange-crowned warbler | | X | X | X | X | X | X | | |
| *Oreothlypis ruficapilla*<br>Nashville warbler | | X | X | X | X | X | X | | |
| *Setophaga coronata*<br>Yellow-rumped warbler | X | X | X | X | X | X | X | | |
| *Setophaga townsendi*<br>Townsend's warbler | | X | X | X | X | X | X | | |
| *Geothlypis tolmiei*<br>MacGillivray's warbler | | X | X | X | X | | | | |
| *Geothlypis trichas*<br>Common yellowthroat | X | | X | | | | | | |
| *Cardellina pusilla*<br>Wilson's warbler | | X | X | X | X | X | X | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Piranga ludoviciana*<br>Western tanager | | X | X | X | X | X | X | | |
| *Pheucticus melanocephalus*<br>Black-headed grosbeak | | X | X | X | X | X | X | | |
| *Passerina caerulea*<br>Blue grosbeak | X | | X | | | | | | |
| *Passerina amoena*<br>Lazuli bunting | | X | X | X | X | X | X | | |
| *Pipilo maculatus*<br>Spotted towhee | | X | X | X | X | X | X | | |
| *Melozone crissalis*<br>California towhee | | X | X | X | | | | | |
| *Aimophila ruficeps*<br>Rufous-crowned sparrow | X | X | X | | X | | | | |
| *Spizella passerine*<br>Chipping sparrow | X | X | X | X | X | X | X | | |
| *Pooecetes gramineus*<br>Vesper sparrow | X | X | | | | | | | |
| *Chondestes grammacus*<br>Lark sparrow | X | X | X | X | X | X | X | | |
| *Amphispiza bilineata*<br>Black-throated sparrow | | X | | | | | | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Artemisiospiza belli*<br>Bell's sparrow | | X | | | | | | | |
| *Passerculus sandwichensis*<br>Savannah sparrow | X | X | X | | X | X | X | | |
| *Passerella iliaca*<br>Fox sparrow | | X | X | X | X | X | X | | |
| *Melospiza melodia*<br>Song sparrow | X | X | X | X | X | X | X | X | |
| *Melospiza lincolnii*<br>Lincoln's sparrow | X | | X | X | X | X | X | | |
| *Zonotrichia atricapilla*<br>Golden-crowned sparrow | X | X | X | X | X | X | X | | |
| *Zonotrichia leucophrys*<br>White-crowned sparrow | X | X | X | X | X | X | X | | |
| *Junco hyemalis*<br>Dark-eyed junco | | X | X | X | X | X | X | | |
| *Sturnella neglecta*<br>Western meadowlark | X | X | X | X | X | X | X | | |
| *Euphagus cyanocephalus*<br>Brewer's blackbird | X | | X | X | X | X | X | X | |
| *Quiscalus mexicanus*<br>Great-tailed grackle | | | | | | | | X | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Molothrus ater*<br>Brown-headed cowbird | X | X | X | X | X | X | X | | |
| *Icterus cucullatus*<br>Hooded oriole | | | X | | | | | | |
| *Icterus bullockii*<br>Bullock's oriole | | | X | X | X | X | X | | |
| *Haemorhous purpureus*<br>Purple finch | | X | X | X | X | X | | | |
| *Haemorhous mexicanus*<br>House finch | X | X | X | X | X | X | X | | |
| *Spinus pinus*<br>Pine siskin | X | X | X | X | X | X | X | | |
| *Spinus psaltria*<br>Lesser goldfinch | X | X | X | X | X | X | X | | |
| *Spinus tristis*<br>American goldfinch | X | X | X | X | X | X | X | | |
| *Passer domesticus*<br>House sparrow | | | X | | X | X | X | | |
| **Mammals** | | | | | | | | | |
| *Didelphis virginiana*<br>Virginia opossum | X | X | X | X | X | X | X | | |
| *Sorex ornatus*<br>Ornate shrew | X | X | X | | X | X | X | | |

| **Common Wildlife** | **CWHR Wildlife Habitat** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Herb-Dominated Habitats** | | **Shrub-Dominated Habitats** | | **Tree-Dominated Habitats** | | | **Aquatic Areas** | **Other** |
| **Scientific Name**<br>**Common Name** | **Annual Grassland** | **Mixed Chaparral** | **Valley Foothill Riparian** | **Montane Hardwood** | **Blue Oak-Foothill Pine** | **Blue Oak Woodland** | **Valley Oak Woodland** | **Riverine** | **Barren** |
| *Sorex palustris*<br>Water shrew | | | | | | | | X | |
| *Sorex trowbridgii*<br>Trowbridge's shrew | | X | | | X | X | X | | |
| *Scapanus latimanus*<br>Broad-footed mole | X | | X | X | X | X | X | | |
| *Myotis lucifugus*<br>Little brown bat | X | X | X | X | X | X | X | X | X |
| *Myotis yumanensis*<br>Yuma myotis | X | X | X | X | X | X | X | X | |
| *Myotis evotis*<br>Long-eared myotis | | X | X | X | X | X | X | X | X |
| *Myotis volans*<br>Long-legged myotis | X | X | X | X | X | X | X | X | X |
| *Myotis californicus*<br>California myotis | X | X | X | X | X | X | X | X | X |
| *Myotis ciliolabrum*<br>Small-footed myotis | X | X | X | X | X | X | X | X | X |
| *Lasionycteris noctivagans*<br>Silver-haired bat | X | X | X | X | X | X | X | X | X |
| *Parastrellus hesperus*<br>Canyon bat | X | X | X | X | X | X | X | X | X |

| **Common Wildlife** | **CWHR Wildlife Habitat** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Herb-Dominated Habitats** | | **Shrub-Dominated Habitats** | | **Tree-Dominated Habitats** | | | **Aquatic Areas** | **Other** |
| **Scientific Name**<br>**Common Name** | **Annual Grassland** | **Mixed Chaparral** | **Valley Foothill Riparian** | **Montane Hardwood** | **Blue Oak-Foothill Pine** | **Blue Oak Woodland** | **Valley Oak Woodland** | **Riverine** | **Barren** |
| *Eptesicus fuscus*<br>Big brown bat | X | X | X | X | X | X | X | X | X |
| *Lasiurus cinereus*<br>Hoary bat | X | X | X | X | X | X | X | X | |
| *Tadarida brasiliensis*<br>Brazilian free-tailed bat | X | X | X | X | X | X | X | X | X |
| *Sylvilagus bachmani*<br>Brush rabbit | X | X | X | X | X | X | X | | |
| *Sylvilagus audubonii*<br>Audubon’s cottontail | X | X | X | | X | X | X | | |
| *Lepus californicus*<br>Black-tailed jackrabbit | X | X | X | X | X | X | X | | |
| *Tamias merriami*<br>Merriam’s chipmunk | X | X | X | X | X | X | X | | |
| *Marmota flaviventris*<br>Yellow-bellied marmot | | | | | | | | | X |
| *Ammospermophilus leucurus*<br>White-tailed antelope ground squirrel | X | X | | | | | | | |
| *Urocitellus beldingi*<br>Belding’s ground squirrel | X | X | | | | | | | X |
| *Ostospermophilus beecheyi*<br>California ground squirrel | X | X | X | X | X | X | X | | X |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| **Scientific Name** **Common Name** | **Annual Grassland** | **Mixed Chaparral** | **Valley Foothill Riparian** | **Montane Hardwood** | **Blue Oak-Foothill Pine** | **Blue Oak Woodland** | **Valley Oak Woodland** | **Riverine** | **Barren** |
| *Callospermophilus lateralis* Golden-mantled ground squirrel | X | X | X | X | | | | | |
| *Sciurus griseus* Western gray squirrel | | X | X | X | X | X | X | | |
| *Thomomys bottae* Botta's pocket gopher | X | X | X | X | X | X | X | | X |
| *Perognathus longimembris* Little pocket mouse | | X | | | | | X | | |
| *Perognathus inornatus* San Joaquin pocket mouse | X | X | | | | X | X | | X |
| *Chaetodipus californicus* California pocket mouse | X | X | | X | X | X | X | | |
| *Dipodomys microps* Chisel-toothed kangaroo rat | | X | | | | | | | |
| *Dipodomys agilis* Agile kangaroo rat | X | X | X | X | X | X | X | | X |
| *Dipodomys heermanni* Heermann's kangaroo rat | X | X | | X | X | X | | | |
| *Castor canadensis* American beaver | X | | X | | | X | X | X | |
| *Peromyscus eremicus* Cactus mouse | | X | | | | | | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Reithrodontomys megalotis*<br>Western harvest mouse | X | X | X | X | X | X | X | | |
| *Peromyscus californicus*<br>California mouse | | X | X | X | X | X | X | | |
| *Peromyscus maniculatus*<br>Deer mouse | X | X | X | X | X | X | X | | X |
| *Peromyscus crinitus*<br>Canyon mouse | X | X | | | | | | | |
| *Peromyscus boylii*<br>Brush mouse | X | X | X | X | X | X | X | | |
| *Peromyscus truei*<br>Pinyon mouse | X | X | X | X | | | | | |
| *Neotoma lepida*<br>Desert woodrat | | X | | X | X | | | | |
| *Neotoma fuscipes*<br>Dusky-footed woodrat | | X | X | X | X | X | X | | |
| *Microtus californicus*<br>California vole | X | X | X | X | X | X | X | | |
| *Microtus longicaudus*<br>Long-tailed vole | X | X | | | | | | | |
| *Ondatra zibethicus*<br>Common muskrat | | | X | | | | | X | |

| **Common Wildlife** | **CWHR Wildlife Habitat** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Herb-Dominated Habitats** | | **Shrub-Dominated Habitats** | | **Tree-Dominated Habitats** | | | **Aquatic Areas** | **Other** |
| **Scientific Name Common Name** | **Annual Grassland** | **Mixed Chaparral** | **Valley Foothill Riparian** | **Montane Hardwood** | **Blue Oak-Foothill Pine** | **Blue Oak Woodland** | **Valley Oak Woodland** | **Riverine** | **Barren** |
| *Rattus rattus* Black rat | | | X | | X | X | X | | |
| *Rattus norvegicus* Norway rat | | | X | | X | X | X | | |
| *Mus musculus* House mouse | X | X | X | | X | X | X | | |
| *Zapus princeps* Western jumping mouse | X | | X | | | | | | |
| *Erethizon dorsatum* Common porcupine | | X | X | X | X | X | X | | |
| *Canis latrans* Coyote | X | X | X | X | X | X | X | | X |
| *Urocyon cinereoargenteus* Gray fox | X | X | X | X | X | X | X | | |
| *Ursus americanus* Black bear | X | X | X | X | X | | | X | |
| *Procyon lotor* Raccoon | X | X | X | X | X | X | X | X | |
| *Mustela frenata* Long-tailed weasel | X | X | X | X | X | X | X | | |
| *Spilogale gracilis* Western spotted skunk | X | X | X | X | X | X | X | | |

| Common Wildlife | CWHR Wildlife Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Herb-Dominated Habitats | | Shrub-Dominated Habitats | | Tree-Dominated Habitats | | | Aquatic Areas | Other |
| Scientific Name<br>Common Name | Annual Grassland | Mixed Chaparral | Valley Foothill Riparian | Montane Hardwood | Blue Oak-Foothill Pine | Blue Oak Woodland | Valley Oak Woodland | Riverine | Barren |
| *Mephitis mephitis*<br>Striped skunk | X | X | X | X | X | X | X | | |
| *Puma concolor*<br>Mountain lion | X | X | X | X | X | X | X | | |
| *Lynx rufus*<br>Bobcat | X | X | X | X | X | X | X | | |
| *Equus caballus*<br>Feral horse | X | X | | X | X | X | X | X | |
| *Equus asinus*<br>Feral ass | | | | | | | | X | |
| *Sus scrofa*<br>Wild pig | X | X | X | X | X | X | X | | |
| *Odocoileus hemionus*<br>Mule deer | X | X | X | X | X | X | X | | |

**Table 3.6-5. Special-Status Wildlife Species Known to Occur or Potentially Occurring in the Vicinity of the Kern River No. 1 Hydroelectric Project**

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| **Known to Occur in the Vicinity of the Project** | | | | | |
| **Amphibians** | | | | | |
| *Batrachoseps simatus*<br>Kern Canyon slender salamander | FPT | FSCC | CT | Found in north-facing slopes in narrow canyons shaded by foothill woodland and riparian areas along creeks. Found under rocks, fallen limbs and leaf litter. Endemic to the Kern River Canyon from 1,500 to 4,000 feet in elevation. | **Known to occur.**<br>The CNDDB query yielded seven records for this species within the vicinity of the Project[1] (listed from south/southwest to north/northeast):<br>• A 1979 detection adjacent to Adit 13 & 14 and the Stark Creek Trail;<br>• A 1979 detection in Stark Creek adjacent to Stark Creek Road;<br>• A 1991 detection in Dougherty Creek adjacent to Dougherty Creek Trail and Flume No. 5;<br>• A 1975 detection in Lucas Creek adjacent to the Lucas Creek Trail;<br>• A 1970 detection in Cow Flat Creek adjacent to Cow Flat Creek Trail and Flume No. 2;<br>• A 1991 detection in Democrat Spring adjacent to Conduit No. 3 and the Conduit No. 3 trail; and<br>• A 1978 detection along Tunnel No. 2 just south of Conduit No. 2 and Flume No. 1.<br>Two additional occurrences were recorded within 1 mile of the Project:<br>• A 1970 detection in a tributary to Kern River, approximately 500 feet east of the Willow Spring Creek Road (also referred to as Democrat Dam Road); and<br>• A 2010 detection along SR178 approximately 0.5 mile east of the Willow Spring Creek Road (also referred to as Democrat Dam Road).<br>Proposed Critical Habitat for the Kern Canyon slender salamander is present along west- and northwest-facing slopes along the Kern River upstream of Stark Creek. |
| *Batrachoseps relictus*<br>relictual slender salamander | FPE | FSCC | CSC | Found in seepages and springs in rocky areas with scanty tree cover, in a matrix of foothill woodland or riparian areas in creek bottoms. Rarely found far from surface water. Found at elevations ranging from 1,500 to 6,500 feet. | **Known to occur.**<br>The NRIS query yielded two records within the vicinity of the Project (listed from south/southwest to north/northwest):<br>• A 1960 detection in Lucas Creek adjacent to the Lucas Creek Trail; and<br>• A 1955 detection in Cow Flat Creek, approximately 0.12 mile from the confluence to Kern River.<br>Five additional occurrences were recorded within 1 mile of the Project (listed from south/southwest to north/northwest):<br>• A 1967 detection in a drainage along SR 178 approximately 500 feet downslope of Adit 15 & 17;<br>• A 1960 detection along Stark Creek between Stark Creek Trail and Stark Creek Road;<br>• A 1970 detection along SR 178 in a tributary to Kern River, approximately 500 feet east of the Willow Spring Creek Road (also referred to as Democrat Dam Road); and<br>• A 1964 detection along SR 178, approximately 0.66 mile east of the Willow Spring Creek Road (also referred to as Democrat Dam Road). |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| | | | | | There is also a location-suppressed record of *Batrachoseps relictus* from the Breckenridge Mountain United States Geological Survey (USGS) 7.5-minute quadrangle dated from 2012.<br>Proposed Critical Habitat for the Kern Canyon slender salamander is present along west- and northwest-facing slopes along the Kern River upstream of the Kern River No. 1 Forebay and along Lucas Creek. |
| *Ensatina eschscholtzii croceator*<br>yellow-blotched salamander | — | FSCC | WL | Found in tributaries of lower elevation canyons. Found close to streams and under rocks and logs and become active after precipitation events between January to April. Generally found around seeps and drainages and under the canopy of trees (Germano 2006). | **Known to occur.** Found in Dougherty Canyon, a tributary just above Upper Richbar Day Use Area (SCE 1998). *GIS data not available for this occurrence.* |
| **Reptiles** | | | | | |
| *Phrynosoma blainvillii*<br>coast horned lizard | — | — | CSC | Found in open areas of sandy soil in valleys, foothills, and semi-arid mountains. Prefers areas of low vegetation within grasslands, forests, woodlands, and chaparral. Commonly found along sandy washes and dirt roads. The elevational range extends up to 4,000 feet in the Sierra Nevada foothills and up to 6,000 feet in the mountains of southern California. | **Known to occur.** California horned lizard scat was observed at numerous locations in the vicinity of the Project, indicating that the species is likely present in sizable numbers (SCE 2012). *GIS data not available for these occurrences.* |
| **Birds** | | | | | |
| *Gymnogyps californianus*<br>California condor | FE | — | CE, CFP | Endangered, permanent resident of the semi-arid, rugged mountain ranges surrounding the southern San Joaquin Valley, including the Coast Ranges from Santa Clara County south to Los Angeles County, the Transverse Ranges, Tehachapi Mountains, and southern Sierra Nevada. Forages over wide areas of open rangelands, roosts on cliffs and in large trees and snags. Found mostly below 9,000 feet. Nests in caves, crevices, or sandstone ledges, typically at elevations below 6,500 feet. | **Known to occur.** A nesting pair is known to be present in Sequoia National Forest, in the vicinity of the Kern River No. 1 Forebay (Forest Service 2018). |
| **Mammals** | | | | | |
| *Corynorhinus townsendii*<br>Townsend's big-eared bat | — | FSCC | CSC | Found in all but alpine and subalpine habitats; most abundant in mesic habitats up to 6,000 feet in elevation. Requires caves, mines, tunnels, buildings, or other man-made structures for roosting. Hibernates October through April. Locally migratory only. Extremely sensitive to disturbance and may abandon a roost if disturbed. The Inyo National Forest is known to provide hibernacula, but likely does not support maternity roosts because of its high elevation (Forest Service 2018b). Their maternity season is May – August. | **Known to occur.** A NRIS query yielded detections at three mines including one mine located just east of the Willow Spring Creek Road (also referred to as the Democrat Dam Road). This occurrence is also described by FERC and Forest Service 1998.<br>CNDDB also reports a 1993 detected at this mine. |
| *Eumops perotis californicus*<br>western mastiff bat | — | — | CSC | Found in variety of habitats including desert scrub, chaparral, oak woodland, ponderosa pine, meadows and mixed conifer forests up to 4,600 feet in elevation. Distribution is likely limited by availability of significant rock features offering suitable roosting habitat. | **Known to occur.** A large colony is present near the Project intake (at Democrat Dam) during the summer. The roost site is accessed through SCE's locked gate to the intake (CNDDB 1992 and FERC and USFS 1998).<br>A CNDDB query yielded two additional records for this species within the vicinity of the Project:<br>• A 1963 detection near the confluence of Cow Flat Creek and Kern River;<br>• A 1992 detection approximately 0.5 mile upstream of Democrat Diversion Dam. |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| *Myotis thysanodes*<br>fringed myotis | — | FSCC | CSC | Optimal habitats are pinyon-juniper, valley foothill hardwood, and hardwood-conifer, generally at elevations of 4,000 to 7,000 feet msl. Roosts in caves, mines, buildings, and crevices. Separate day and night roosts may be used. Uses open habitats, early successional stages, streams, lakes, and ponds as foraging areas. Migratory species, making relatively short, local movements to suitable hibernacula. | **Known to occur.** A CNDDB query yielded one record, a 1992 detection, at the mine located just east of the Willow Spring Creek Road (also referred to as the Democrat Dam Road) (see Townsend's big-eared bat, above). |
| **May Potentially Occur in the Vicinity of the Project** | | | | | |
| **Terrestrial Invertebrates** | | | | | |
| *Danaus plexippus*<br>monarch butterfly | FC | — | — | Overwintering population in coastal California. In late-February or March, monarchs will disperse from wintering areas to interior California. Quality habitat includes milkweed (*Asclepias* spp.) which occur in short and tall grass prairies, livestock pastures, agricultural margins, roadsides, wetland and riparian areas, sandy areas, gardens, open forests, and woodlands. | **May potentially occur.** The Project contains suitable habitat and there are records of the host plant (milkweed species) in the vicinity of the Project (CalFlora 2022). The CNDDB query yielded one record for this species within 5 miles of the Project. |
| **Amphibians** | | | | | |
| *Spea hammondii*<br>western spadefoot | — | — | CSC | Prefers open areas with sandy or gravelly soils, in a variety of habitats such as mixed woodlands, grasslands, coastal sage scrub, chaparral, sandy washes, lowlands, river floodplains, alluvial fans, playas, alkali flats, and mountains. Requires ephemeral rainpools without non-native predators for breeding. Up to 4,500 feet in the southern Sierra foothills. | **May potentially occur.** The Project contains suitable habitat for this species. |
| **Reptiles** | | | | | |
| *Aniella* spp.<br>California legless lizard | — | — | CSC | Found in loose soil in sparsely vegetated areas, commonly in sandy washes, oak woodland, mixed conifer forest, and stream terraces. | **May potentially occur.** The Project contains suitable habitat for this species. The CNDDB query yielded one record for this species, a 1992 detection approximately 1.25 miles northeast of Democrat Diversion Dam, upstream of Kern River. |
| *Arizona elegans occidentalis*<br>California glossy snake | — | — | CSC | Found in arid scrubby areas, rocky washes, grasslands, and chaparral in southern Sierra Nevada foothills and coast ranges. Ranges from the eastern San Francisco Bay area south to Baja California. | **May potentially occur.** The Project contains suitable habitat for this species. |
| *Masticophis flagellum ruddocki*<br>San Joaquin coachwhip | — | — | CSC | Found in open, dry, treeless areas with little or no cover, including valley grasslands and saltbush scrub. Hides in rodent burrows, shaded vegetation, and under surface objects. | **May potentially occur.** The Project contains suitable habitat for this species. |
| *Xantusia vigilis*<br>Sierra night lizard | — | — | CSC | Found in the Greenhorn mountains in the southwest Sierra Nevada. It is found in association with yucca, foothill pine, chamise, pinyon pine, and juniper. Can be found under yucca logs and other cover. Occurs at elevations of 990 to 6,800 feet. Activity may begin in early April at low elevations and last until early fall, while emergence may be retarded until late springs at higher elevations. | **May potentially occur.** The CNDDB yielded one record for this species within 5 miles of the Project. |
| **Birds** | | | | | |
| *Accipiter gentilis atricapillus*<br>northern goshawk | — | FSCC | CSC | Middle to high elevation, mature, dense conifer forests for foraging and nesting. Casual in foothills during winter, northern deserts in pinyon-juniper woodland, and low-elevation riparian habitats. | **May potentially occur.** The NRIS query yielded 13 records for this species within 5 miles of the Project. |
| *Agelaius tricolor*<br>tricolored blackbird | BCC | — | CSC | Breeding habitat includes dense riparian vegetation with nearby accessible water and suitable foraging space for insect prey within a few kilometers of the nesting colony. Often forms large breeding colonies. Wintering habitat includes grasslands and agricultural fields with low-growing vegetation. | **May potentially occur.** A CNDDB query yielded one record within 5 miles of the Project; however, suitable emergent wetland nesting habitat is not present in the vicinity of the Project. |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| *Aquila chrysaetos*<br>golden eagle | BCC<br>Eagle Act | — | CFP (nesting and wintering), WL | Grasslands and early successional stages of forest and shrub habitats for foraging at elevations up to 11,500 feet. Secluded cliffs with overhanging ledges or large trees in open areas with unobstructed view for nesting. | **May potentially occur.** Project contains suitable habitat for this species. Golden eagles were observed flying over the Kern Canyon Powerhouse during wildlife reconnaissance surveys conducted in 2001 to support the Kern Canyon Project relicensing (PG&E 2003). A pair of golden eagles were also observed in 2021 near the Kern River No. 1 Powerhouse (JNA-Consulting 2021).<br>A NRIS query yielded one record for this species within 1 mile of the Project, a 1987 detection along Cow Flat Creek, approximately 0.75 miles from Kern River. |
| *Ammodramus savannarum*<br>grasshopper sparrow | — | — | CSC | Grassland habitats with dense escape cover and tall herbaceous plants for perches. | **May potentially occur.** The Project contains suitable habitat for this species. |
| *Chaetura vauxi*<br>Vaux's swift | — | — | CSC | Fairly common in the coast ranges north of Sonoma County, in the Sierra Nevada, and Cascade Range. Nests in redwood and Douglas-fir habitats in large hollow trees and snags. Forages in open areas and over water. | **May potentially occur.** The Project contains suitable foraging habitat for this species. |
| *Circus cyaneus*<br>northern harrier | BCC | — | CSC | A common winter visitor in southern California, but an increasingly rare breeding species in the region. Nests on the ground in marshes or grassy meadows. Feed on ground-dwelling mammals and other prey. They are migratory birds that spend winters in California. | **May potentially occur.** The Project provides suitable foraging habitat for this species |
| *Empidonax traillii extimus*<br>southwestern willow flycatcher | FE | — | CFP | Found only in southern California, this species breeds in dense riparian tree and shrubs associated with rivers, swamps, wetlands, lakes, and other large water bodies at elevations ranging from 2,000 to 8,500 feet. Riparian habitat must be at least 0.25 acre in size and 30 feet wide to support nesting. | **May potentially occur.** The Project contains suitable nesting and foraging habitat for this species. Known to breed at the Audubon Reserve at Lake Isabella (SCE 2012). |
| *Falco mexicanus*<br>prairie falcon | — | — | WL | Nests on high cliff faces and requires open terrain for foraging. Occurs in annual grasslands, alpine meadows, but primarily associated with perennial grasslands, savannahs, rangeland, agricultural fields, and desert scrub. Not found in upper elevations of Sierra Nevada. | **May potentially occur.** The Project contains suitable foraging habitat. A nest site was observed in upper Stark Canyon in 1992 (SCE 1994). |
| *Falco peregrinum anatum*<br>American peregrine falcon | — | — | CFP | Very uncommon breeding resident and uncommon as a migrant. Breeds in woodlands, forests, coastal habitats, and riparian areas near wetlands, lakes, rivers, or other water on high cliffs, banks, dunes, or mounds. Active nesting sites are known along the coast, in the Sierra Nevada, and in the mountains of northern California. Migrants occur along the coast and the western Sierra Nevada in spring and fall. | **May potentially occur**. The Project provides suitable foraging habitat for this species. |
| *Haliaeetus leucocephalus*<br>bald eagle | Eagle Act | FSCC | CE, CFP | Year-round resident in ice-free regions of California. Foraging areas include regulated and unregulated rivers, reservoirs, lakes, estuaries, and coastal marine ecosystems. Majority of bald eagles in California breed near reservoirs and nests are usually located within 1 mile of foraging habitat. Nests are typically placed in the branches of large conifer trees within dense stands of trees (Jackman and Jenkins 2004). | **May potentially occur.** The Project provides suitable foraging habitat for this species.<br>Lake Isabella regularly supports wintering eagles which have been observed flying up the North Fork Kern River and high above Kern River No. 1 Hydroelectric Project (SCE 1998).<br>A NRIS query yielded one record for this species within 1 mile of the Project, a 2002 detection adjacent to Kern River, approximately 4 miles upstream of the Kern River No. 1 Powerhouse. |
| *Icteria virens*<br>yellow-breasted chat | — | — | CSC | An uncommon summer resident and migrant in coastal California and the foothills of the Sierra Nevada. Breeds in valley foothill riparian and desert riparian habitats. Requires riparian thickets of willow and brushy tangles near watercourses for cover. Found at elevations up to 4,800 ft in valley foothill riparian habitats and up to 6,500 ft in the eastern Sierra Nevada. | **May potentially occur.** The Project contains suitable nesting and foraging habitat for this species. |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| *Lanius ludovicianus*<br>loggerhead shrike | — | — | CSC | Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches in the lowlands and foothills throughout California. | **May potentially occur.** The Project contains suitable nesting and foraging habitat for this species. |
| *Progne subis*<br>purple martin | — | — | CSC | An uncommon, local summer resident in wooded low- to mid-elevation habitats. Found in valley foothill, montane hardwood, montane hardwood-conifer, and riparian habitats. Nests in tall, old trees near an open body of water, and occasionally in residential areas. | **May potentially occur.** The Project contains suitable nesting and foraging habitat for this species. |
| *Setophaga petechica*<br>yellow warbler | — | — | CSC | Breeds in riparian woodlands from coastal and desert lowlands at elevations up to 8,000 feet in the Sierra Nevada. Also breeds in montane chaparral, open ponderosa pine, and mixed conifer habitats with substantial amounts of brush. | **May potentially occur.** The Project contains suitable nesting and foraging habitat for this species. |
| *Strix occidentalis occidentalis*<br>California spotted owl | BCC | FSCC | CSC | Dense, old-growth, multi-layered mixed conifer, redwood, Douglas-fir, and oak woodland habitats in the western slope of the Sierra Nevada, from sea level to elevations of approximately 7,600 feet. | **May potentially occur.** Known to occur outside of the vicinity of the Project in forested areas above the flowline and forage in wooded habitats of the Project (SCE 1998, SCE 2012).<br>A NRIS query yielded 11 records for this species within 1 mile of the Project:<br>• Three detections south of the confluence of Dougherty Creek and Kern River, with one occurring in 1990 and two in 1991;<br>• Five detections northwest of the confluence of Dougherty Creek and Kern River, occurring in 1975, 1983, 1985, 1986, and 1987;<br>• A 1991 detection located approximately 0.25 mile east of the confluence of Lucas Creek and Kern River;<br>• A 1990 detection located approximately 0.5 mile southeast of the confluence of Cow Flat Creek and Kern River; and<br>• A Protected Activity Center (PAC) located approximately 0.75 mile north of Democrat Diversion Dam. |
| **Mammals** | | | | | |
| *Antrozous pallidus*<br>pallid bat | — | FSCC | CSC | Grasslands, shrublands, woodlands, and forests from sea level to 10,000 feet in elevation. Typically, day roosts in caves, crevices, or mines. Night roosts are in more open areas. Requires open habitat for foraging. Pallid bat hibernates in winter. The maternity season is April – July. | **May potentially occur.** The Project supports potential roosting and foraging habitat. |
| *Bassariscus astutus*<br>ringtail | — | — | CFP | Found in most forest and shrub habitats in close association with rocky and/or riparian areas, usually not more than 0.6 miles from water. Dens in hollow trees, snags, or other cavities. | **May potentially occur.** The Project supports potential habitat for this species. |
| *Euderma maculatum*<br>spotted bat | — | — | CSC | A widespread, but rare species throughout the western United States. Found in habitats that range from deserts to yellow pine forest. Roosts in caves, rocky crevices and snags and requires open water. | **May potentially occur.** The Project supports potential roosting and foraging habitat. |
| *Lasiurus blossevillii*<br>western red bat | — | — | CSC | Roosts in forests and woodlands from seal level up through mixed mesic conifer forests in coastal ranges and the Sierra Nevada. Forages in a variety of habitats including croplands, grasslands, shrublands, and open woodlands and forests. Prefers solitary roosts in trees and occasionally shrubs. | **May potentially occur.** The Project supports potential roosting and foraging habitat. |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| *Onychomys torridus tularensis*<br>Tulare grasshopper mouse | — | — | CSC | Habitats include compact soils with a sparse growth of perennial grasses; blue oak savannas; desert scrub associations composed of grasses and shrubs; valley sink and saltbush scrub communities on the valley floor; and valley grassland. The historic range of the Tulare grasshopper mouse extended along the foothills and floor of the southern San Joaquin Valley from western Merced and eastern San Benito counties, east to Madera County, and south to the foothills of the Tehachapi and San Emigdio mountains. It also occurs on the Carrizo Plain in eastern San Luis Obispo County, Cuyama Valley, Caliente Creek Wash in southern Kern County, Weldon and Kelso Valley in northeastern Kern County, the Tulare Basin, and the Panoche Valley. Elevation range is between 279 to 2,650 feet. | **May potentially occur.** The Project contains suitable grassland habitat for this species. |
| *Taxidea taxus*<br>American badger | — | — | CSC | This species is considered a furbearing mammal under the California Fish and Wildlife Code.<br>Occurs throughout most of the state in areas with dry, friable soils. It is most abundant in drier open stages of most shrub, forest, and herbaceous habitats up to 12,000 feet in elevation. | **May potentially occur.** The Project contain suitable grassland habitat for this species. The CNDDB query yielded 21 records for this species within 5 miles of the Project. |
| *Vulpes macrotis mutica*<br>San Joaquin kit fox | FE | — | CT | Grasslands and shrubland areas in the San Joaquin Valley with friable soils for building underground dens. Denning begins around September, mating occurs from December to March, and pups are born February through April. No Critical Habitat rules have been published for this species. | **May potentially occur.** The Project contains suitable habitat for this species. The CNDDB query yielded six records for this species within 5 miles of the Project. |
| **Unlikely to Occur in the Vicinity of the Project** | | | | | |
| **Terrestrial Invertebrates** | | | | | |
| *Desmocerus californicus dimorphus*<br>valley elderberry longhorn beetle | FT | — | — | Central valley riparian forests and adjacent upland vegetation along river corridors, in close association with elderberry (*Sambucus* spp.) plants. | **Unlikely to occur.** The Project supports appropriate habitat for the valley elderberry longhorn beetle (VELB) which was previously listed as FT. However, on September 17, 2014, USFWS revised the range for this species to exclude Kings, Kern, and Tulare counties. As a result, this species is no longer considered special-status within Kern County, and will not be considered as special-status in subsequent analyses completed for the Project. |
| *Euproserpinus euterpe*<br>Kern primrose sphinx moth | FT | | | Presently known only from the Walker Basin area (4,500 feet elevation), where it occurs on sandy soils wherever its larval foodplant, *Camissonia contorta epilobiodes* grows. This plant grows in dry, disturbed, or gravelly cismontane areas below 5,000 feet elevation and has been associated with several plant communities and ranges from Baja to central California (SCE 1994). | **Unlikely to occur.** SCE conducted field surveys for the moth's larval foodplant to support the previous license application. No *Camissonia contorta epilobiodes* populations were identified in the Project vicinity (SCE 1994). |
| *Apodemia virgulti davenporti*<br>Behr's metalmark | – | FSCC | – | Known only from the southern Sierra Nevada. Found along the Kern River in Tulare County, Southern Greenhorn Mountains, and Piute Mountains in Kern County between 4,000 to 6,000 feet in elevation. Larvae feed on *Eriogonum fasciculatum* host plants. | **Unlikely to occur.** The Project is outside the elevation range of this species. |
| *Plebejus icarioides evius*<br>Evius blue | – | FSCC | – | Found in forest clearings, meadows, stream margins, and edge habitat with lupine host plants. Generally found in montane areas at intermediate elevations. Known from the Greenhorn Mountains at Shirley Meadows in Kern County. | **Unlikely to occur.** The Project is outside the geographic range of this species and does not contain suitable habitat. |
| *Plebejus saepiolus aehaja*<br>greenish blue | – | FSCC | – | Found in wet meadow habitats on the Kern Plateau and the Greenhorn Mountains. Uses *Trifolium* spp. as host plants. | **Unlikely to occur.** The Project is outside the geographic range of this species and does not contain suitable habitat. |
| *Speyeria egleis tehachapina*<br>Tehachapi fritillary | – | FSCC | – | Found only in Kern County in the Tehachapi and Piute Mountains at elevations between 7,000 and 8,400 feet in elevation. Found in montane meadows, forest openings, and rocky outcrops where host *Viola* spp. occurs. | **Unlikely to occur.** The Project is outside the geographic range of this species. |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| **Aquatic Invertebrates** | | | | | |
| *Branchinecta lynchi*<br>vernal pool fairy shrimp | FT | — | — | Vernal pool ecosystems that hold water for a minimum of 18 days, but not permanently flooded emergent wetlands. | **Unlikely to occur.** Suitable vernal pool habitat is not present within the Project. Project is outside of designated Critical Habitat. |
| **Amphibians** | | | | | |
| *Batrachoseps bramei*<br>fairview slender salamander | – | FSCC | – | Occurs in north-facing talus-covered slopes in narrow canyons where areas are moist and cool in the spring. Endemic to California. | **Unlikely to occur.** The Project is outside the geographic range of this species. |
| *Batrachoseps robustus*<br>Kern Plateau slender salamander | – | FSCC | – | Occurs in moist habitats of pine and fir forests. In drier habitats, occur in pinon pine, sagebrush, and oaks. Found under leaf litter, logs, rocks near springs and streams. | **Unlikely to occur.** The Project is outside the geographic range of this species. |
| **Reptiles** | | | | | |
| *Anniella grinnelli*<br>Bakersfield legless lizard | — | — | CSC | Found in loose soil within sparsely vegetated areas of beach dunes, chaparral, woodlands, desert scrub, sandy washes, and stream terraces. Restricted to the southern San Joaquin Valley and the eastern Carrizo Plain. | **Unlikely to occur**. The Project is outside the geographic range for this species. |
| *Gambelia sila*<br>blunt-nosed leopard lizard | FE | — | CE, CFP | Found in flat, open, sparsely vegetated alkali scrub and desert habitats below 2,400 feet in elevation, within the San Joaquin Valley and adjacent foothills. USFWS has not designated Critical Habitat for this species. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |
| *Thamnophis gigas*<br>giant garter snake | FT | — | CT | Uses a wide variety of habitats within the Californian Central Valley including forests, mixed woodlands, grasslands, chaparral, and agricultural lands. Often occurs near aquatic habitat including ponds, marshes, and streams where it freely retreats to when alarmed. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |
| **Birds** | | | | | |
| *Buteo swainsoni*<br>Swainson's hawk | — | — | CT (nesting) | Uncommon breeding resident and migrant in the Central Valley, Klamath Basin, Northeastern Plateau, Lassen County, and Mojave Desert. Breeding habitat includes riparian woodland and trees adjacent to riparian systems. Riparian woodlands, juniper-sage flats, and oak woodlands for nesting. Open grasslands, pastures agricultural areas for foraging. | **Unlikely to occur.** The Project does not contain suitable habitat required for nesting for this species. |
| *Athene cunicularia*<br>burrowing owl | — | — | CSC | Breeding habitat includes rodent burrows in sparse grassland, desert, and agricultural habitats. They require open, sparsely vegetated areas on mostly level terrain with an abundance of active small mammal burrow. Found in lowlands throughout California. | **Unlikely to occur.** The Project does not contain suitable habitat (level terrain) for this species. |
| *Strix nebulosa*<br>great gray owl | – | FSCC | CE | Nests in old-growth coniferous forests and forages in montane meadows. Distribution includes high elevations of the Sierra Nevada and Cascade ranges, from 4,500 to 7,500 feet in elevation. | **Unlikely to occur**. The Project is outside the elevation range of this species. |
| *Dendragapus fuliginosus howardi*<br>Mount Pinos sooty grouse | – | FSCC | CSC | Found in high-elevation conifer forest in the spring for hooting sites that contain open pine/fir forests at elevations of 6,000 to 10,000 feet. | **Unlikely to occur.** The Project is outside the elevation range of this species. |
| *Contopus cooperi*<br>olive-sided flycatcher | BCC | — | CSC | Uncommon to common, summer resident in a wide variety of forest and woodland habitats. Nesting habitats include mixed conifer, montane hardwood-conifer, Douglas-fir, redwood, red fir, and lodgepole pine forests from 3,000 to 9,000 feet in elevation. | **Unlikely to occur.** The Project does not contain suitable habitat for this species. |
| *Empidonax traillii adastus*<br>willow flycatcher | – | FSCC | CE | Found in the Great Basin and central Rocky Mountains south to Utah and Colorado. Found in a variety of shrubby habitats, but particularly montane riparian habitat with extensive growth of willows. | **Unlikely to occur.** The Project is outside the geographic range of this species. |

| Scientific/Common Name | Federal Status | Forest Service Status | State Status | Habitat | Likelihood for Occurrence |
|---|---|---|---|---|---|
| *Empidonax traillii brewsteri*<br>little willow flycatcher | – | FSCC | CE | Summer resident in wet meadow and montane riparian habitats at 2,000 to 8,000 feet in the Sierra Nevada. Most often occurs in broad, open river valleys or large mountain meadows with lush growth of shrubby willows. Requires meadows at least 1 acre in size for breeding, prefers meadows larger than 10 acres (Green et al. 2003). | **Unlikely to occur.** The Project does not contain suitable wet meadow habitat for this species. |
| *Vireo bellii pusillus*<br>Least Bell's vireo | FE | — | CE | Breeds in riparian habitats (typically in dense willows) in the southwestern United States. Winters in Baja California. Its distribution includes cismontane southern California (most breeding pairs occur in San Diego County) extending north up to the Owens Valley and east into Death Valley National Park. | **Unlikely to occur.** The Project is outside the geographic range and does not contain suitable riparian habitat for this species. |
| *Agelaius phoeniceus aciculatus*<br>Kern red-winged blackbird | – | FSCC | CSC | Known from east central Kern County, in the Walker Basin and on the South Fork of the Kern River in marshes on the east end of Lake Isabella. Prefers marshy meadows, emergent wetlands, and lagoons with large growths of cattails and sedges. | **Unlikely to occur.** The Project does not contain suitable emergent wetland habitat for this species. |
| **Mammals** | | | | | |
| *Dipodomys nitratoides nitratoides*<br>Tipton kangaroo rat | FE | — | CE | Tipton kangaroo rats are limited to arid-land communities occupying the Valley floor of the Tulare Basin in level or nearly level terrain. They are currently found in scattered, isolated areas clustered in low-elevation valleys of Tulare and Kern County. USFWS has not designated Critical Habitat for this species. | **Unlikely to occur.** The Project is outside the geographic range for this species and does not contain suitable habitat. |
| *Dipodomys ingens*<br>giant kangaroo rat | FE | — | CE | Found in dry, sandy grasslands. Found only in isolated areas west of the San Joaquin Valley, including the Carrizo Plain, Elkhorn Plain, and Kettleman Hills. | **Unlikely to occur.** The Project is outside the geographic range for this species. |
| *Ammospermophilus nelson*<br>Nelson's (=San Joaquin) antelope squirrel | — | — | CT | Found in the western San Joaquin Valley from southern Merced County south to Kern County. Historical populations in eastern Kern County foothills are thought to be extirpated. Prefers areas with sandy loam soils, alkali scrub vegetation, and dry washes, at elevations of 200 to 1,200 feet. | **Unlikely to occur.** The Project is outside the geographic range of this species. |
| *Martes caurina sierrae*<br>Sierra marten | – | FSCC | – | Martens are known from the high-elevation forested plant communities. Optimal habitats are various mixed evergreen forests with more than 40% crown closure and large trees and snags for den sites. Most commonly found in red fir and lodgepole pine forests between 4,000 and 10,600 feet elevation. | **Unlikely to occur.** The Project is outside the elevation range of this species. |
| *Pekania pennanti*<br>fisher — Southern Sierra Nevada DPS | FE | FSCC | CT, CSC | Large areas of mature, dense forest red fir, lodgepole pine, ponderosa pine, mixed conifer, and Jeffery pine forests with snags and greater than 50% canopy closure. Known from elevations of 4,000 to 8,000 feet. | **Unlikely to occur.** The Project is outside the elevation range and lacks suitable habitat for this species. |

NOTES:

[1] Vicinity of the Project is defined to include areas within or immediately adjacent to the FERC Project boundary, as well as areas immediately adjacent to the Project-affected reach of the Kern River.

**LEGEND:**

Federal Status
FC = Federal Candidate Species
FE = Federal Endangered
FT = Federal Threatened
FPD = Federal Proposed for Delisting
FPT, FPE = Federal Proposed Threatened/Endangered

Forest Service Status
FSCC = Sequoia National Forest Species of Conservation Concern

State Status
CFP = California Fully Protected
CSC = California Species of Special Concern
CCT, CCE = State Candidate Threatened/Endangered
CE = California Endangered
CT = California Threatened
WL = Watch List

**Table 3.6-6. Game Species Potentially Occurring in the Vicinity of the Kern River No. 1 Hydroelectric Project**

| Species | Status | Habitat | General Season | Bag Limit | Possession Limit | Hunting Restrictions |
|---|---|---|---|---|---|---|
| **Resident Game Birds** | | | | | | |
| *Phasianus colchicus*<br>Ring-necked pheasant | — | Common to uncommon introduced species. Occurs in scattered locations throughout the state, centered in the Central Valley. Dependent on crop lands with adjacent herbaceous and woody cover; also in perennial grasslands with sufficient cover. | November 12 – December 25 | 2 males per day for first two days of the season; 3 males per day after the first two days of the season. | Triple the daily bag limit | Hunting license is required. |
| *Meleagris gallopavo*<br>Wild turkey | — | Found mostly in deciduous riparian, oak, and conifer-oak woodlands. Prefers rugged, hilly terrain with low to intermediate canopy, interspersed with numerous grass/forb openings, near water. | Fall season: November 12 – December 11<br>Spring Season: the last Saturday in March extending for 37 consecutive days | Fall Season: 1 either-sex turkey per day.<br>Spring Season: 1 bearded turkey per day | Fall Season: 2 per season<br>Spring Season: 3 per season | Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use ten-gauge shotgun or smaller, and no shot size larger than No. 2. |
| *Oreotyx pictus*<br>Mountain quail | — | Common to uncommon resident, found typically in most major montane habitats of the state. Found seasonally in open, brushy stands of conifer and deciduous forest, woodland, and chaparral. | Zones Q3: October 15 – January 29 | 10 per day | Triple the daily bag limit | Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use practice dogs on birds outside of season. Must use ten-gauge shotgun or smaller, and no shot size larger than BB. |
| *Callipepla californica*<br>California quail | — | Common, permanent resident of low and middle elevations. Found in shrub, scrub, and brush, open stages of conifer and deciduous habitats, and margins of grasslands and croplands. | Zones Q3: October 15 – January 29 | 10 per day | Triple the daily bag limit | |
| **Migratory Game Birds** | | | | | | |
| *Gallinago gallinago*<br>Common snipe | — | Fairly common winter visitor from October to April on wet meadow and short, emergent wetland habitats throughout much of California. | The third Saturday in October extending for 107 days | 8 per day | Triple the daily bag limit | Hunting license and state duck tag are required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use practice dogs on birds outside of season. Must use ten-gauge shotgun or smaller, and no shot size larger than BB. |
| *Columba fasciata*<br>Band-tailed pigeon | — | Common resident in hardwood and hardwood-conifer habitats. Inhabits lower slopes of major mountain ranges of the state. | The third Saturday in December extending for 9 consecutive days | 2 per day | Triple the daily bag limit | Hunting license and state duck tag are required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use ten-gauge shotgun or smaller, and no shot size larger than BB. |
| *Zenaida macroura*<br>Mourning dove | — | Open woodlands, grasslands, croplands, open hardwood, hardwood-conifer, riparian, low-elevation conifer, and deserts all provide adequate habitat. Requires a nearby water source. | September 1–15 and November 12–December 26 | 15 doves, up to 10 may be white winged | Triple the daily bag limit | Hunting license and state duck tag are required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use ten-gauge shotgun or smaller, and no shot size larger than BB. |

| Species | Status | Habitat | General Season | Bag Limit | Possession Limit | Hunting Restrictions |
|---|---|---|---|---|---|---|
| **Mammals** | | | | | | |
| *Mustela frenata*<br>Long-tailed weasel | — | This species is considered a nongame mammal under the California Fish and Wildlife Code.<br>Common to uncommon, permanent resident of most habitats, except xeric brush, shrub, and scrub in the Mojave and Colorado deserts. Mostly uses intermediate cover stages of conifer and deciduous habitats, interspersed with lower seral stages and open forest, woodland areas and shrubs, from sea level to alpine meadows. | All Year | No limit | No limit | Hunting license is required. May use firearms, bow and arrow, poison under special permit, and approved traps with trapping permit. Dogs permitted. |
| *Sus scrufa*<br>Wild pig | — | This species is considered a big game mammal under the California Fish and Wildlife Code.<br>Wild pigs currently exist in 56 of the state's 58 counties and can be found in a variety of habitats ranging from woodland, chaparral, meadow and grasslands. Wild pigs are omnivorous, consuming both plant and animal matter. In general, wild pigs feed on: grasses and forbs in the spring; mast and fruits in the summer and fall; and roots, tubers and invertebrates throughout the year. | All Year | No limit | No limit | Requires hunting license and hunting tags. |
| *Ursus americanus*<br>Black bear | — | This species is considered a big game mammal under the California Fish and Wildlife Code.<br>Widespread, common to uncommon resident occurring from sea level to high mountain regions. Occurs in fairly dense, mature stands of many forest habitats, and feeds in a variety of habitats including brushy stands of forest, valley foothill riparian, and wet meadow. | Opening day of deer season extends through December 25. General bear season closes on last Sunday in December or earlier, if the Department determines that 1,700 bears have been reported taken. This includes bears harvested during the archery season. | 1 adult/season/tag | 1 adult/season/tag | Requires hunting license and hunting tags. May use approved rifles, bow and arrow, and approved shotguns. Cubs and females accompanied by cubs may not be taken. |
| *Odocoileus hemionus*<br>Mule deer | — | This species is considered a big game mammal under the California Fish and Wildlife Code.<br>Common to abundant, yearlong resident or elevational migrant with a widespread distribution throughout most of California, except in deserts and intensively farmed areas without cover. Prefer a mosaic of vegetation, providing an interspersion of herbaceous openings, dense brush or tree thickets, riparian areas, and abundant edge. | The season in Zone D-8 and Zone D-9 shall open on the fourth Saturday in September and extend for 30 consecutive days. | 1 buck/ tag | 1 buck/ tag | Requires hunting license and hunting tags. May use approved rifles, bow and arrow, approved shotguns, and crossbows. Only bucks with antlers with demonstrable forks (or greater) may be taken. |

| Species | Status | Habitat | General Season | Bag Limit | Possession Limit | Hunting Restrictions |
|---|---|---|---|---|---|---|
| *Urocyon cinereoargenteus*<br>Gray fox | — | This species is considered a furbearing mammal under the California Fish and Wildlife Code.<br>Uncommon to common permanent resident of low to middle elevations throughout most of the state. Frequents most shrublands, valley foothill riparian, montane riparian, and brush stages of many deciduous and conifer forest and woodland habitats. Also found in meadows and cropland areas. Suitable habitat consists of shrublands, brushy and open-canopied forests, interspersed with riparian areas, providing water. | November 24 – the last day of February | No limit | No limit | Hunting license is required. May use firearms, bow and arrow, poison under special permit, and approved traps with trapping permit. Dogs permitted. |
| *Procyon lotor*<br>Raccoon | — | This species is considered a furbearing mammal under the California Fish and Wildlife Code.<br>Widespread, common to uncommon permanent resident throughout most of the state. Occurs in all habitats except alpine, and desert types without water; marginal in Great Basin shrub types. Most abundant in riparian and wetland areas at low to middle elevations. | November 16 – March 31 | No limit | No limit | Hunting license is required. May use firearms, bow and arrow, poison under special permit, and approved traps with trapping permit. Dogs permitted. When taking raccoon after dark, pistols and rifles not larger than.22 caliber rimfire and shotguns using shot no larger than No. BB may be used. |
| *Mustela vison*<br>American mink | — | This species is considered a furbearing mammal under the California Fish and Wildlife Code.<br>Uncommon permanent resident, generally occurring in the northern half of the state. Semiaquatic, inhabiting most aquatic habitats, including some coastal areas. Occurs at elevations up to about 2,700 m (9,000 ft). | November 16 – March 31 | No limit | No limit | Hunting license is required. May use firearms, bow and arrow, poison under special permit, and approved traps with trapping permit. Dogs permitted. |
| *Sciurus griseus*<br>Western gray squirrel | — | This species is considered resident small game under the California Fish and Wildlife Code.<br>Fairly common locally in mature stands of most conifer, hardwood, and mixed hardwood-conifer habitats in the Klamath, Cascade, Transverse, Peninsular, and Sierra Nevada Ranges. Dependent upon mature stands of mixed conifer and oak habitats. Closely associated with oaks. Require large trees, mast, and snags. | The second Saturday in September though the last Sunday in January | 4 per day | 4 in possession | Hunting license is required. Must use ten-gauge shotgun or smaller, and no shot size larger than BB, can use muzzle-loading shotguns, bow and arrow, rifles and pistols, falconry, and crossbows. Dogs permitted. |

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# MAPS

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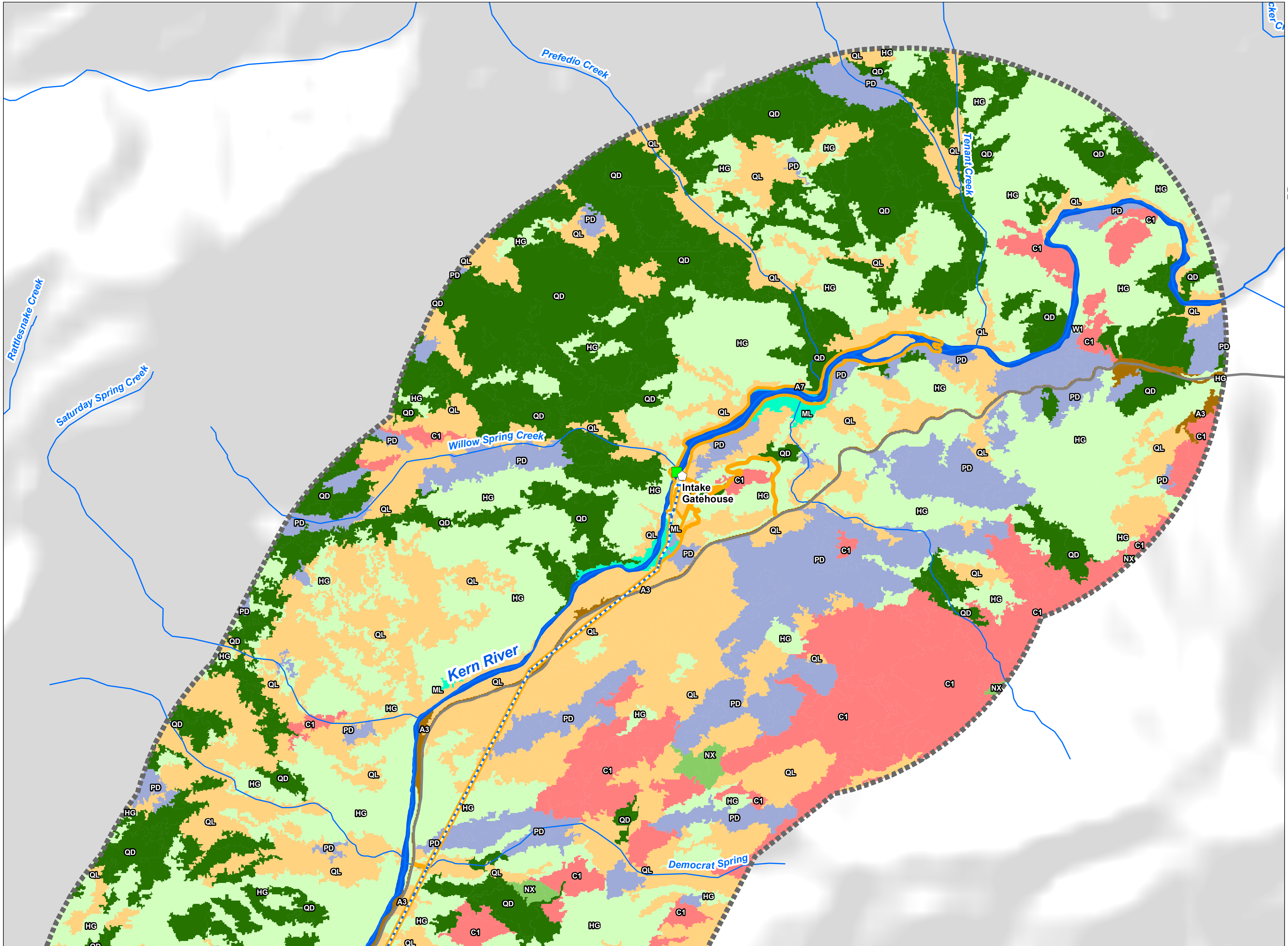



**Facilities**

- Dam
- Powerhouse
- Water Conveyence Feature
- Flowline
- Penstock
- FERC Boundary

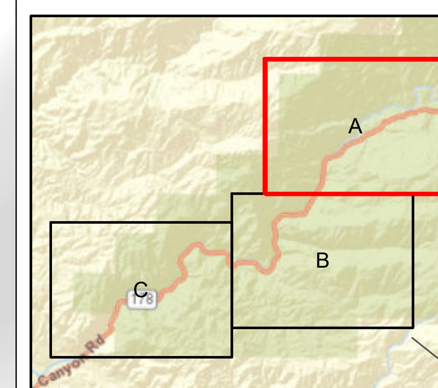
**Other Features**

- Watercourse
- Highway
- 1 Mile Buffer of FERC Boundary

**CALVEG Vegetation Alliances***

- Agriculture Pond or Water Feature (A7)
- Annual Grasses and Forbs Alliance (HG)
- Baccharis (Riparian) Alliance (ML)
- Blue Oak Alliance (QD)
- Gray Pine Alliance (PD)
- Interior Mixed Hardwood Alliance (NX)
- River/Stream/Canal (W1)
- Tilled Earth (A3)
- Ultramafic Mixed Shrub Alliance (C1)
- Valley Oak Alliance (QL)

*SOURCE: Existing Vegetation - CALVEG, USDA - FS, Region 5 - Central Valley, 2019




SOUTHERN CALIFORNIA EDISON

An EDISON INTERNATIONAL® Company

Kern River No. 1 Hydroelectric Project - FERC Project No. 1930

**Map 3.6-1a**

## CALVEG Vegetation Alliances Occurring within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary

N W E S

0 0.125 0.25 Miles

Date: 12/13/2022

**Projection: UTM Zone 11**
**Datum: NAD 83**



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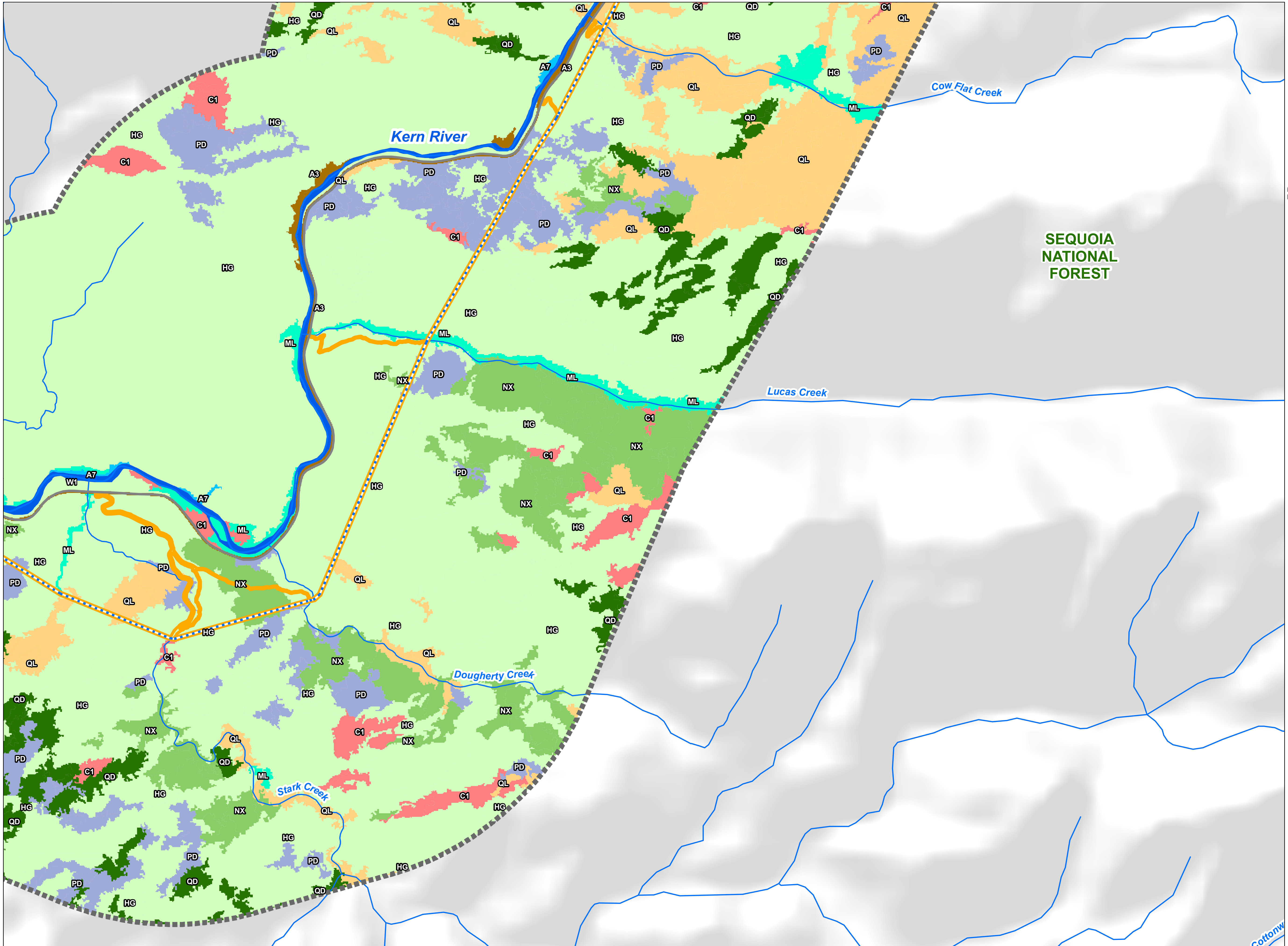



**Facilities**

- Dam
- Powerhouse
- Water Conveyence Feature
- Flowline
- Penstock
- FERC Boundary

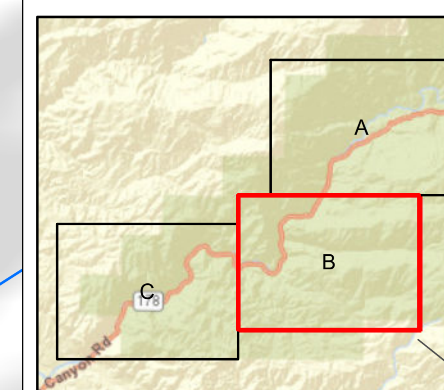
**Other Features**

- Watercourse
- Highway
- 1 Mile Buffer of FERC Boundary

**CALVEG Vegetation Alliances***

- Agriculture Pond or Water Feature (A7)
- Annual Grasses and Forbs Alliance (HG)
- Baccharis (Riparian) Alliance (ML)
- Blue Oak Alliance (QD)
- Gray Pine Alliance (PD)
- Interior Mixed Hardwood Alliance (NX)
- River/Stream/Canal (W1)
- Tilled Earth (A3)
- Ultramafic Mixed Shrub Alliance (C1)
- Valley Oak Alliance (QL)

*SOURCE: Existing Vegetation - CALVEG, USDA - FS, Region 5 - Central Valley, 2019

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Kern River No. 1 Hydroelectric Project - FERC Project No. 1930

**Map 3.6-1b**

**CALVEG Vegetation Alliances Occurring within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary**

N W E S

0 0.125 0.25 Miles

Date: 12/13/2022

Projection: UTM Zone 11
Datum: NAD 83



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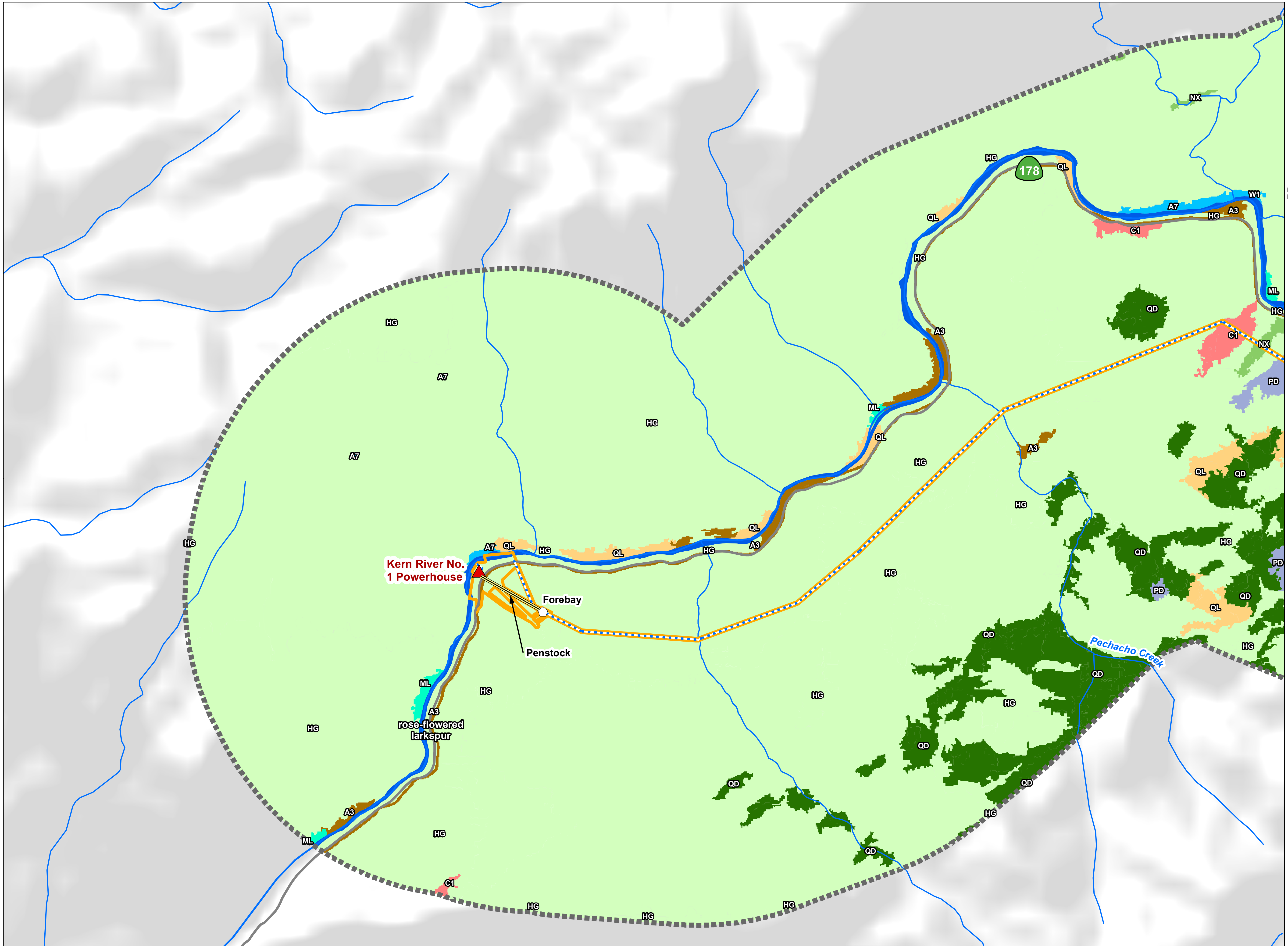



**Facilities**

- Dam
- Powerhouse
- Water Conveyence Feature
- Flowline
- Penstock
- FERC Boundary

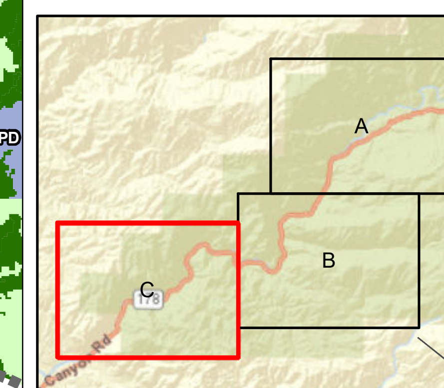
**Other Features**

- Watercourse
- Highway
- 1 Mile Buffer of FERC Boundary

**CALVEG Vegetation Alliances***

- Agriculture Pond or Water Feature (A7)
- Annual Grasses and Forbs Alliance (HG)
- Baccharis (Riparian) Alliance (ML)
- Blue Oak Alliance (QD)
- Gray Pine Alliance (PD)
- Interior Mixed Hardwood Alliance (NX)
- River/Stream/Canal (W1)
- Tilled Earth (A3)
- Ultramafic Mixed Shrub Alliance (C1)
- Valley Oak Alliance (QL)

*SOURCE: Existing Vegetation - CALVEG, USDA - FS, Region 5 - Central Valley, 2019

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Kern River No. 1 Hydroelectric Project - FERC Project No. 1930

**Map 3.6-1c**

## CALVEG Vegetation Alliances Occurring within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary

N W E S

Date: 12/13/2022

0 0.125 0.25 Miles

Projection: UTM Zone 11
Datum: NAD 83



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# CONFIDENTIAL

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**Map 3.6-2a–c Special-Status Plant Species Known to Occur within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary (Confidential)**

Maps 3.6-2a–c will not be distributed to the general public. Documents containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact David Moore, SCE Relicensing Project Manager at (626) 999-6101 or david.moore@sce.com.

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**Map 3.6-3a–c Special-Status Wildlife Species Known to Occur within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary (Confidential)**

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**Map 3.6-4 Known Occurrences and Proposed Critical Habitat for the Kern Canyon Slender Salamander (Confidential)**

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**Map 3.6-5 Known Occurrences and Proposed Critical Habitat for the Relictual Slender Salamander (Confidential)**

Maps 3.6-5 will not be distributed to the general public. Documents containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact David Moore, SCE Relicensing Project Manager at (626) 999-6101 or david.moore@sce.com.

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# APPENDIX 3.6-A

## Vegetation Alliances within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary

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The following vegetation alliance descriptions are excerpted from Vegetation Descriptions, South Sierran Ecological Province, CALVEG Zone 4(U.S. Department of Agriculture – Forest Service, Region 5; April 27, 2009) and Central Valley Ecological Province, CALVEG Zone 5 (U.S. Department of Agriculture – Forest Service, Region 5; March 12, 2009).

## Herb-Dominated Alliances

### Annual Grasses and Forbs Alliance (HG)

Throughout the low elevations of the western slopes of the southern Sierra Nevada, annual grasses such as bromes (*Bromus* spp.), needlegrass (*Achnatherum* spp.) and wild oats (*Avena* spp.) may dominate rolling hills. Dominant forbs in this alliance include owl's clover (*Orthocarpus* spp.), fiddleneck (*Amsinckia intermedia*) and stork's bill (*Erodium* spp.). They may occur in pure stands or contain an overstory of scattered oaks (*Quercus* spp.) or California buckeye (*Aesculus californica*). Associated westside species include hardwoods growing in sheltered areas and conifers such as gray pine (*Pinus sabiniana*) or Ponderosa pine (*Pinus ponderosa*) in the Upper Foothills Metamorphic Belt and Lower Batholith subsections. In some areas, this alliance may dominate a vast array of slopes and aspects due to wildfires, xeric conditions and other factors; on eastside slopes in the Eastern Slopes and Kern Plateau Subsections, recent wildfires have created large grass patches at elevations up to 8,000 feet (ft) (2440 meter [m]) or more. Great Basin species such as big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus* spp.), singleleaf pinyon pine (*Pinus monophylla*) and Jeffrey pine (*Pinus jeffreyi*) are often found adjacent to these patches.

## Shrub-Dominated Alliances

### Ultramafic Mixed Scrub Alliance (C1)

This type is found on ultramafic soils and has been mapped very sparsely in the Ranges and Foothills Sections at elevations generally below about 2,400 ft (732 m) in this zone. The Ultramafic Mixed Shrub Alliance consists of a mixture of shrubs such as wedgeleaf ceanothus (*Ceanothus cuneatus* var. *cuneatus*), leather oak (*Quercus durata*), musk brush (*Ceanothus jepsonii*), California coffeeberry (*Rhamnus california* ssp. *occidentalis*), silk-tassel (*Garrya elliptica*, *Garrya congdonii*), and Siskiyou mat (*Ceanothus pumilus*).

### Baccharis (Riparian) Alliance (ML)

This Alliance identifies one or more species of *Baccharis* that dominate riparian areas and wetlands. It has been mapped in a limited area along Caliente Creek and other sites in the Foothills Section at elevations between 1,000–2,200 ft (305–670 m). Species that may be in this Alliance include mule mat (*Baccharis salicifolia*), marsh Baccharis (*Baccharis douglasii*), and squaw waterweed (*Baccharis sergiloides*). This Alliance is found adjacent to upland species such as interior live oak, gray pine, California buckeye, chaparral yucca (*Yucca whipplei*), and rabbitbrush in this area.

## Tree-Dominated Alliances

### Interior Mixed Hardwoods Alliance (NX)

A mixture of upland hardwoods with no clearly dominant species occurs very commonly in the Lower Batholith and Tehachapi - Piute Mountains Subsections and more rarely in five other subsections. This type has been mapped most often in the elevation range of about 1,000–6,000 ft (305–1830 m). The mixture includes any combination of interior live oak (*Quercus wislizenii*), canyon live oak (*Quercus chrysolepis*), blue oak (*Quercus* *douglasii*), and/or California buckeye (*Aesculus californic*a), with Valley oak (*Quercus lobata*) or black oak (*Quercus kelloggii*) occurring less frequently. The occasional overstory conifers may include gray pine or Ponderosa pine. Lower-elevation shrubs in canopy openings such as wedgeleaf ceanothus and birchleaf mountain mahogany (*Cercocarpus betuloides*) may also be present onsite or in the vicinity.

**Gray Pine Alliance (PD)**

This alliance, dominated by gray pine, grows primarily in the foothills of the Sierra Nevada on steep, dry rocky canyons with south aspects, below about 4,200 ft. In the northern Sierra, it is found mainly in the Upper Foothill Metamorphic Belt and the Granitic and Metamorphic Foothills subsections. These sites are typically diverse in structure, with a mixture of hardwoods such as canyon live oak, interior live oak, and blue oak; and low-elevation chaparral shrubs such as wedgeleaf ceanothus and whiteleaf and common manzanitas. Patches of annual grasses are often found adjacent to gray pine stands.

**Blue Oak Alliance (QD)**

The Blue Oak Alliance occurs on shallow upland soils in foothill savannas adjacent to the western slopes of the Sierra Nevada. It has been mapped in five ecological units, most commonly in the Tehachapi – Piute Mountains, Lower Batholith and Upper Foothills Metamorphic Belt Subsections. Elevations where mapped are often in the 1000–5800 ft (305–1768 m) range, highest towards the south. Blue oak naturally occurs in an oak-grass association on well drained, gentle slopes. Gray pine is the most common tree associate in this hillside type; interior live oak may also be a major hardwood occurring in close proximity to this type. Non-stump sprouting chaparral shrubs such as wedgeleaf ceanothus, manzanitas (Arctostaphylos spp.), coffeeberry, California buckwheat (*Eriogonum fasciculatum*) and poison oak (*Toxicodendron diversilobum*) are scattered throughout this Alliance, and chamise (*Adenostoma fasciculatum*) often occurs adjacent to these sites.

**Valley Oak Alliance (QL)**

This alliance is dominated by Valley oak, a deeply rooting hardwood, which formerly occurred in pure stands of large trees with limited woody understory. These stands occurred on valley bottoms and in rolling slopes, generally below 2,000 ft (610 m) in the north. The present distribution pattern of Valley Oak is along major stream courses and on the deep, rich loamy soils of their alluvial deposits in areas within and along the eastern and western fringes of this zone. It has been mapped occasionally as a dominant hardwood in the three sections up to an elevation of about 5,000 ft (1,524 m) and more rarely as an understory hardwood in Ponderosa pine and gray pine forests and woodlands. A few scattered interior and/or canyon live oaks can be found throughout this Alliance.

## Non-Vegetated Areas

### Tilled Earth (A3)

Agricultural lands may be mapped as barren and lacking vegetation on occasion, such as after harvesting and during seasons prior to crop growth. Some areas may be kept fallow during and after the growing season for various reasons such as conservation of moisture and nutrients in a crop rotation schedule.

## Aquatic Areas

### River/Stream/Canal (W1)

Water is labeled in CALVEG mapping in those cases in which permanent sources of surface water are identified within a landscape unit of sufficient size to be mapped. The category includes lakes, streams and canals of various size, bays and estuaries and similar water bodies. These areas are considered to have a minimum of vegetation components, except along the edges, which may be mapped as types such as wet meadows, tule–cattail freshwater marshes, or pickleweed–cordgrass saline or mixed marshes. Islands within water bodies may be mapped according to their terrestrial dominant vegetation types. In addition, surface water bodies have recently been mapped separately in some parts of this zone under the following categories: W1: Rivers and Streams (natural, flowing surface waters) W2: Perennial Lakes and Ponds (natural lacustrine bodies) W3: Reservoirs (man-made lakes and ponds) W5: Playas (desert basin features) W6: Intermittent Stream Channel (seasonally flowing channeled waters) W8: Intermittent or Seasonal Lake or Pond (occasionally drained surface waters) W9: Exposed non-water features such as gravel, sand bars, etc.

### Agriculture Pond or Water Feature (A7)

Some artificially constructed water features on otherwise agricultural sites on farms, ranches and the like, are large enough to map and document. These sites include stock ponds, small reservoirs, large ditches and other utilitarian or recreational water features.

# APPENDIX 3.6-B

## Life History Information for the Special-status Plant Species Known to Occur or Potentially Occurring in the Vicinity of the Kern River No. 1 Hydroelectric Project

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## Known to Occur in the Vicinity of the Kern River No. 1 Hydroelectric Project

**Rose-flowered larkspur (*Delphinium purpussii*) – Sequoia National Forest Species of Concern (FSCC), California Rare Plant Ranking (CRPR) 1B.3**

Rose-flowered larkspur is a perennial herb endemic to California where it is known only from Kern and Tulare counties in the region where the Sierra Nevada meets the Mojave Desert. This species is found in talus areas and cliffs among chaparral, foothill woodland, and pinyon-juniper woodland from 1,000 to 4,470 feet.

**Calico monkeyflower (*Diplacus pictus* (*Mimulus pictus*)) – FSCC, CRPR 1B.2**

Calico monkeyflower is an annual herb that is endemic to California and found in granitic, disturbed areas in broad-leafed upland forest and cismontane woodland. This species is found at elevations between 330 to 4,770 feet.

**Greenhorn fritillary (*Fritillaria brandegeei*) – FSCC, CRPR 1B.3**

Greenhorn fritillary is a perennial herb (bulbiferous) that is endemic to California and found on granitic areas in lower montane coniferous forests. This species is found at elevations between 4,430 to 7,000 feet.

**Shevock's golden aster (*Heterotheca shevockii*) – FSCC, CRPR 1B.3**

Shevock's golden aster is a perennial herb that is endemic to California and grows in chaparral and cismontane woodland. This species is found at elevations between 760 to 3,000 feet.

**Southern Sierra monardella (*Monardella linoides* ssp. *anemonoides*) – CRPR 1B.3**

Southern Sierra monardella is a perennial herb that is endemic to California and found in chaparral, cismontane woodland, and lower montane coniferous forest. This species is found at elevations between 2,200 to 8,040 feet.

**Bakersfield cactus (*Opuntia treleasei*) – Federal Endangered (FE), California Endangered (CE), CRPR 1B.1**

Bakersfield cactus perennial stem that is endemic to California and grows on sandy or gravelly soils in chenopod scrub, cismontane woodland, and valley and foothill grassland. This species is found at elevations between 400 to 4,830 feet.

USFWS has not designated Critical Habitat for this species. This species is included in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998). The Project is not within the planning area for the recovery plan.

## May Potentially Occur in the Vicinity of the Kern River No. 1 Hydroelectric Project

**Alkali mariposa lily (*Calochortus striatus*) – FSCC, CRPR 1B.2**

Alkali mariposa lily is a perennial bulbiferous herb that grows on alkaline and mesic soils in chaparral, chenopod scrub, Mojavean desert scrub, and meadows and seeps. This species can be found at elevations between 230 to 5,235 feet.

**Kern River evening-primrose (*Camissonia integrifolia*) – FSCC, CRPR 1B.3**

Kern River evening-primrose an annual herb that is native to California and is endemic (limited) to California. This species grows in chaparral and Mojavean desert scrub from 2,295 to 3,935 feet.

**Springville Clarkia (*Clarkia springvillensis*) – FT (Federal Threatened), CE, CRPR 1B.2**

Springville Clarkia is an annual herb that is native to California and endemic (limited) to California. This species grows on granitic soils in chaparral, cismontane woodland, and valley and foothill grassland from 805 to 5,235 feet.

**Piute cypress (*Hesperocyparis nevadensis*) – FSCC, CRPR 1B.2**

Piute cypress is a perennial evergreen tree that is native to California. This species grows in closed-cone coniferous forest, chaparral, cismontane woodland, and pinyon and juniper woodland from 2,360 to 6,005 feet.

**San Joaquin adobe sunburst (*Pseudobahia peirsonii*) – FT, CE, CRPR 1B.1**

San Joaquin adobe sunburst, a dicot, is an annual herb that is native to California and is endemic (limited) to California. This species is found in clay (Cibo, Porterville, or Centerville) soils in grassland and foothill woodland from 200 to 2,700 feet.

**Tracy’s eriastrum (*Eriastrum tracyi*) – FSCC, CRPR 3.2**

Tracy’s eriastrum is an annual herb that is native and endemic to California and grows in chaparral, cismontane woodland, and valley and foothill grassland. This species can be found at elevations between 1,035 to 5,840 feet.

**Tejon poppy (*Eschoscholzia lemmonii*) – CRPR 1B.1**

Tejon poppy is an annual herb that is native to California, and endemic (limited) to California. This species grows in chenopod scrub and valley and foothill grassland from 530 to 3,330 feet.

**Striped adobe lily (*Fritillaria striata*) – California Threatened (CT), FSCC, CRPR 1B.1**

Striped adobe lily is a perennial herb (bulbiferous) that is native to California, and endemic (limited) to California. This species grows on clay soils in cismontane woodland and valley and foothill grassland from 450 to 4,850 feet.

**Piute Mountains navarretia (*Navarretia setiloba*) – CRPR 1B.1**

Piute Mountains navarretia is an annual herb that is native to California and is endemic (limited) to California. This species grows on clay or gravelly loam soils in cismontane woodland, pinyon and juniper woodland, and valley and foothill grassland and between elevations 950 to 7,000 feet.

**Oil neststraw (*Stylocline citroleum*) – CRPR 1B.1**

Oil neststraw is an annual herb that is native to California and is endemic (limited) to California. This species grows on clay soils in chenopod scrub, coastal scrub, and valley and foothill grassland and between elevations 170 to 1,330 feet. Only known extant populations are from the interior coast ranges.

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# APPENDIX 3.6-C

## Wildlife Habitats Occurring within 1 Mile of the Kern River No. 1 Hydroelectric Project FERC Boundary

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The following wildlife habitat descriptions are excerpted from *A Guide to Wildlife Habitats of California* (Kenneth E. Mayer and William F. Laudenslayer, Jr.; State of California, Resources Agency, Department of Fish and Game. 1988).

**California Wildlife Habitat Relationships System**
**California Department of Fish and Game**
**California Interagency Wildlife Task Group**

# Annual Grassland

John G. Kie
Updated by: CWHR Staff, April 2005

## Vegetation

**Structure**. Annual Grassland habitats are open grasslands composed primarily of annual plant species. Many of these species also occur as understory plants in Valley Oak Woodland (VOW) and other habitats. Structure in Annual Grassland depends largely on weather patterns and livestock grazing. Dramatic differences in physiognomy, both between seasons and between years, are characteristic of this habitat. Fall rains cause germination of annual plant seeds. Plants grow slowly during the cool winter months, remaining low in stature until spring, when temperatures increase and stimulate more rapid growth. Large amounts of standing dead plant material can be found during summer in years of abundant rainfall and light to moderate grazing pressure. Heavy spring grazing favors the growth of summer-annual forbs, such as tarweed and turkey mullein, and reduces the amount of standing dead material. On good sites, herbage yield may be as high as 4900 kg/ha (4400 lb/ac) (Garrison et al. 1977).

**Composition**. Introduced annual grasses are the dominant plant species in this habitat. These include wild oats, soft chess, ripgut brome, red brome, wild barley, and foxtail fescue. Common forbs include broadleaf filaree, redstem filaree, turkey mullein, true clovers, bur clover, popcorn flower, and many others. California poppy, the State flower, is found in this habitat. Perennial grasses, found in moist, lightly grazed, or relic prairie areas, include purple needlegrass and Idaho fescue. Vernal pools, found in small depressions with a hardpan soil layer, support downingia, meadowfoam, and other species (Parker and Matyas 1981). Species composition is also related to precipitation (Bartolome et al. 1980). Perennial grasses are more common on northern sites with mean annual rainfall greater than 150 cm (60 in). Soft chess and broadleaf filaree are common in areas with 65-100 cm (25-40 in) of rainfall, and red brome and redstem filaree are common on southern sites with less than 25 cm (10 in) of precipitation (Bartolome et al. 1980).

**Other Classifications**. Annual Grassland habitat has been described as Valley Grassland (Munz and Keck 1959, Heady 1977), Valley and Foothill Grassland (Cheatham and Haller 1975), California Prairie (Küchler 1977), Annual Grasslands Ecosystem (Garrison et al. 1977), Brome grass, Fescue, Needlegrass, and Wild Oats series (Paysen et al. 1980), and Annual Grass-Forb series (Parker and Matyas 1981).

## Habitat Stages

**Vegetation Changes** 1-2:S-D. Annual Grassland habitats occupy what was once a pristine native grassland. The native grassland likely consisted of climax stands of perennial bunchgrasses, such as purple needlegrass, on wetter sites (Bartolome 1981, Bartolome and Gemmill 1981), with annual species existing as climax communities on drier alluvial plains (Webster 1981). Today, plant succession in the classical sense does not occur in Annual Grassland habitats. However, species composition is greatly influenced by seasonal and annual fluctuations in weather patterns. Annual plants germinate with the first fall rains that exceed about 15 mm (0.6 in), growing slowly during winter and more rapidly in spring (Heady 1977). Botanical composition changes throughout the growing season because of differences in plant phenology (Heady 1958). Most annuals mature between April and June (Heady 1977), although some species, such as tarweed and turkey mullein, continue to grow into summer. Fall rains that encourage germination, followed by an extended dry period, favor the growth of deep-rooted forbs (Duncan and Woodmansee 1975), but continuing rainfall favors rapidly growing grasses (Pitt and Heady 1978). Livestock grazing favors the growth of low-stature, spring-maturing forbs, such as filaree (Freckman et al. 1979), and summer annuals, such as turkey mullein (Duncan 1976). Because these are important food plants for many wildlife species, proper levels of livestock grazing are generally beneficial in this habitat. In the absence of livestock, Annual Grassland habitats are often dominated by tall, dense stands of grasses such as ripgut brome (Freckman et al. 1979) and wild oats.

**Duration of Stages**-- Although Annual Grassland habitats consist largely of non-native annuals, these effectively prevent the reestablishment of native perennials over large areas and now comprise climax communities (Heady 1977). Introduced annuals should be considered naturalized plant species and so managed, rather than as invading species characteristic of poor range sites.

## Biological Setting

**Habitat**. Annual Grassland habitat is found just above or surroundingValley Foothill Riparian (VRI), Alkali Desert Scrub (ASC), Fresh Emergent Wetland (FEW), Pasture (PAS) and all agricultural habitat types, and below Valley Oak Woodland (VOW), Blue Oak Woodland (BOW), Blue Oak-Foothill Pine (BOP), Chamise-Redshank (CRC), and Mixed Chaparral (MCH) habitats. Annual Grassland habitat also borders Coast Oak Woodland (COW), Closed Cone-Pine-Cypress (CPC), Coastal Scrub (CSC), and Eucalyptus (EUC) habitats.

**Wildlife Considerations**. Many wildlife species use Annual Grasslands for foraging, but some require special habitat features such as cliffs, caves, ponds, or habitats with woody plants for breeding, resting, and escape cover. Characteristic reptiles that breed in Annual Grassland habitats include the western fence lizard, common garter snake, and western rattlesnake (Basey and Sinclear 1980). Mammals typically found in this habitat include the black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, western harvest mouse, California vole, badger, and coyote (White et al.1980). The endangered San Joaquin kit fox is also found in and adjacent to this habitat (U.S. Fish and Wildlife Service 1983). Common birds known to breed in Annual Grasslands include the burrowing owl, short-eared owl, horned lark, and western meadowlark (Verner et al. 1980). This habitat also provides important foraging habitat for the turkey vulture, northern harrier, American kestrel, black-shouldered kite, and prairie falcon.

## Physical Setting

Annual Grassland habitat occurs mostly on flat plains to gently rolling foothills. Common soil orders include Entisols and Alfisols (Garrison et al.1977). Entisols are often found at lower elevations on flood plains and swales that receive periodic deposits of alluvium (U.S. Soil Conservation Service1975), and are characterized by little or no pedogenic horizon development. Alfisols occur at higher elevations above the valley floor (Garrison et al.1977). Some Annual Grassland habitats can be found in the drier portion of the southern San Joaquin Valley on Aridisols (Garrison et al. 1977). Climatic conditions are typically Mediterranean, with cool, wet winters and dry, hot summers. The length of the frost free season averages 250 to 300 days (18 to 21 fortnights) (Garrison et al. 1977). Annual precipitation is highest in the north (Redding, 960 mm (38 in) ) and north coast (Ukiah, 909 mm (36 in)), decreasing to the south (Sacramento, 430 mm (17 in); Stockton, 339 mm (13 in); Fresno, 259 mm (10 in)), and reaching a minimum in the southern San Joaquin Valley (Bakersfield, 150 mm (6 in) ) (Major 1977).

## Distribution

Annual Grassland habitat occurs in patches of various sizes throughout the state

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# BARREN

Monica D. Parisi

## Vegetation

**Structure and Composition**-- Barren habitat is defined by the absence of vegetation. Any habitat with <2% total vegetation cover by herbaceous, desert, or non-wildland species and <10% cover by tree or shrub species is defined this way. Structure and composition of the substrate is largely determined by the region of the state and surrounding environment. In the marine and estuarine environment, barren habitat includes rocky outcroppings in the intertidal and subtidal zones, open sandy beaches and mudflats. Along rivers, it includes vertical river banks and canyon walls. Desert habitats may be defined as barren when vegetation is widely spaced. Alpine barren habitat includes exposed parent rock, glacial moraines, talus slopes and any surface permanently covered with snow or ice. Urban settings covered in pavement and buildings may classified as barren as long as vegetation, including non-native landscaping, does not reach the % cover thresholds for vegetated habitats.

**Other Classifications**-- Most vegetation classification systems do not include a barren category. Sparsely vegetated substrate is assumed to be a component of the surrounding vegetation type. CALVEG (1981) defines a Barren and a Snow/Ice type. UNESCO (1996) includes a Barren type.

## Habitat Stages

No stages are defined for this type. Many barren types will remain so during the time frame of consideration for management actions. An example is exposed rock in alpine settings, where the combined actions of freezing and thawing, wind and water erosion, and chemical breakdown caused by colonizing lichens eventually creates enough organic material to support higher plants. However, the time period for primary succession to a vegetated habitat type may be thousands of years.

Seasonal changes and management regimes may render some habitats barren for short periods of time. Alpine meadows may be seasonally covered with snow or ice. Disked or plowed agricultural fields will be barren for a few months until resowed. In an urban setting, newly-graded suburban sites converted from other habitat types may be barren for up to two years -- usually until trees, shrubs, lawns or other ground covers have been planted.

## Biological Setting

**Habitat--** Barren habitat may be found in juxtaposition with many different habitats, depending on the region of the state. Along the coast, barren mudflats are found with marine and estuarine habitats and fresh and saline emergent wetlands. Sandy beaches and sand dunes with less than 2% vegetative cover are themselves classified as barren. In the Central Valley, bluffs above river corridors covered with valley oak woodland, valley foothill-riparian or annual grassland habitat may drop sharply into steep barren riverbanks of loose soils. In an alpine setting, exposed parent rock is associated with subalpine conifer, red fir, lodgepole pine, pinyon-juniper, aspen, montane riparian, and montane chaparral habitats and, above timberline, with alpine dwarf shrub and wet meadow habitats. In the desert regions, palm oasis, Joshua tree, desert wash, desert succulent shrub, desert scrub and alkali desert scrub may all give way to a barren classification if conditions become extreme enough.

**Wildlife Considerations**-- Where there is little or no vegetation, structure of the non-vegetated substrate becomes a critical component of the habitat. Cormorants and many hawks and falcons nest on rock ledges. Plovers, stilts, avocets, several gulls and terns, nighthawks and poorwills rely on open ground covered with sand or gravel for constructing small scrape nests. Bank swallows use barren vertical cliffs of friable soils along river corridors to dig holes for nesting and cover. Rocky river canyon walls above open water are preferred foraging habitat for many bats. In the desert, open sandy soil is critical as burrowing and egg-laying substrate for horned lizards and fringe-toed lizards. Among alpine habitats, ground-dwelling mammals such as pika and marmots rely on talus slopes for cover.

## Physical Setting

The physical settings for permanently barren habitat represent extreme environments for vegetation. An extremely hot or cold climate, a near-vertical slope, an impermeable substrate, constant disturbance by either human or natural forces, or a soil either lacking in organic matter or excessively saline can each contribute to a habitat being inhospitable to plants.

## Distribution

Barren habitat occurs throughout the state at every elevation.

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# Blue Oak Woodland

Lyman V. Ritter

## Vegetation

**Structure**-- Generally these woodlands have an overstory of scattered trees, although the canopy can be nearly closed on better quality sites (Pillsbury and De Lasaux 1983). The density of blue oaks on slopes with shallow soils is directly related to water stress (Griffin 1973). The canopy is dominated by broad-leaved trees 5 to 15 m (16 to 50 ft) tall, commonly forming open savanna-like stands on dry ridges and gentle slopes. Blue oaks may reach 25 m (82 ft) in height (McDonald 1985); the tallest tree, found in Alameda County, measured 28.7 m (94 ft) high and had a crown spread of 14.6 m (48 ft) (Pardo 1978). Shrubs are often present but rarely extensive, often occurring on rock outcrops. Typical understory is composed of an extension of Annual Grassland vegetation.

**Composition**-- Blue oak is the dominant species, comprising 85 to 100 percent of the trees present. Common associates in the canopy are coast live oak in the Coast Range, interior live oak in the Sierra Nevada, valley oak where deep soil has formed, and western juniper in the Cascade Range. In the Tehachapi and Paiute Ranges in Kern County, this habitat mixes with species from east of the mountains California juniper and single-leaf pinyon. In interior sections of the southern Coast Range, as in San Luis Obispo County, it mixes with California juniper (V. L. Holland, pers. comm.). Associated shrub species include poison-oak, California coffeeberry, buckbrush, redberry, California buckeye, and manzanita spp. The ground cover is comprised mainly of annuals, such as brome grass, wild oats, foxtail, needlegrass, filaree, fiddeneck, and others. Comprehensive descriptions of different BOW's can be found in White (1966), Griffin (1977), Baker et al. (1981), and Pillsbury and De Lasaux (1983).

**Other Classifications**-- The habitat is referred to as Foothill Woodland by Munz and Keck (1959), Blue Oak Phase of the Foothill Woodlands by Griffin (1977), Blue Oak Series by Paysen et al. (1980), Blue Oak Savanna by Verner and Boss (1980), and Blue Oak Community by Parker and Matyas (1981). BOW's and Blue Oak-Foothill Pine Woodlands are considered a single habitat in Küchler's (1977) Blue Oak-Foothill Pine Forest (25) and in the Blue Oak-Foothill Pine (250) type of the Society of American Foresters (Eyre 1980).

## Habitat Stages

**Vegetation Changes**-- 1;2-5:S-D. Details of successional trends in this habitat type are poorly known. Succession presumably proceeds directly from annual grasslands to tree stages. Most stands of BOW exist as medium or large tree stages with few or no young blue oaks present (White 1966, Holland 1976, Griffin 1977, Baker et al. 1981). Therefore, only structural classes 3-5:S-D are likely to be found. Few areas can be found in California where successful recruitment of blue oaks has occurred since the turn of the century (Holland 1976). This may be due to changes in land use; increased consumption or damage of acorns and seedlings by insects, livestock, and native animals; competition between seedlings and introduced annuals for available soil nutrients and moisture; and the absence of appropriate climatic conditions. Where germination of acorns occurs, survival and growth of the seedlings typically fail. Probably in the drier savanna-like stands, the grassland openings will simply become larger as older trees die. Griffin (1977) suggests that live oaks may replace deciduous oaks in some areas, because their seedlings are more browse resistant. Many authorities question whether conditions will ever again support the recruitment of blue oaks needed to maintain these important woodlands.

**Duration of Stages**-- Valid generalizations about the duration of various successional stages leading to mature stands of BOW are not possible, because adequate quantitative studies have never been done. The successional sequence probably takes at least 50 years, even on good sites. Age studies in the Coast Range (White 1966, Pillsbury and De Lasaux 1983) and the southern Sierra Nevada (Brooks 1969) indicate that most blue oak stands are currently 80 to 120 years in age. Blue oaks are relatively slow-growing, long-lived trees. Large blue oaks range in age from 153 to 390 years (White 1966). Estimation of tree age based on dbh measurements is risky, however, because the dbh relationship varies tremendously depending on site quality. Moreover, height growth is extremely slow or even ceases after trees reach 65 cm (26 in) in dbh (McDonald 1985).

## Biological Setting

**Habitat**-- This type usually intergrades with Annual Grasslands or Valley Oak Woodlands at lower elevations and Blue Oak-Foothill Pine woodlands at higher elevations.

**Wildlife Considerations--** The importance of oak habitats to wildlife in California has recently been reviewed by Barrett (1980) and Verner (1980a.), but they give few details relevant specifically to BOW's. Verner and Boss (1980) give data on wildlife use in blue oak savannahs of the western Sierra Nevada. They indicate that 29 species of amphibians and reptiles, 57 species of birds, and 10 species of mammals find mature stages of this type suitable or optimum for breeding, assuming that other special habitat requirements are met. Griffin (1971) concluded that acorns buried by scrub jays, yellow-billed magpies, western gray squirrels and California ground squirrels are more likely to germinate because they root better and are less likely to be eaten. Although many wildlife species benefit from the use of oaks and even enhance oak germination, additional information is needed on many aspects of oak-wildlife relationships before this habitat can be properly managed.

## Physical Setting

BOW's are usually associated with shallow, rocky, infertile, well-drained soils from a variety of parent materials (McDonald 1985). Blue oaks are well adapted to dry, hilly terrain where the water table is usually unavailable (Griffin 1973). The climate is Mediterranean, with mild wet winters and hot dry summers. Climatic extremes are relatively great in these woodlands, because they have a considerable geographic and elevational range. Average annual precipitation varies from 51 to 102 cm (20 to 40 in) over most of the blue oak's range, although extremes are noted from 25 cm (10 in) in Kern County to 152 cm (60 in) in Shasta County (McDonald 1985). Blue oaks have an unusual tolerance of severe drought, even shedding their leaves during periods of extreme moisture stress. This survival trait contributes to its pattern of distribution, as it competes most successfully with other tree species on drier sites (McDonald 1985). Mean maximum temperatures are from 24 to 36 C (75 to 96 F) in summer, and minima are from 2 to 6 C (29 to 42 F) in winter. The growing season ranges from 6 months in the north to the entire year in the south, with 175 to 365 frost-free days (Burcham 1975).

## Distribution

BOW's occur along the western foothills of the Sierra Nevada-Cascade Ranges, the Tehachapi Mountains, and in the eastern foothills of the Coast Range, forming a nearly continuous ring around the Central Valley. The habitat is discontinuous in the valleys and on lower slopes of the interior and western foothills of the Coast Range from Mendocino County to Ventura County. It is generally found at elevations from 152 to 610 m (500 to 2000 ft) at the northern end of its range and on the western slopes of the Sierra Nevada, from 76 to 915 m (250 to 3000 ft) in the central Coast Range, and from 168 to 1370 m (550 to 4500 ft) in the Transverse and Peninsular Ranges (Sudworth 1908).

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## Blue Oak-Foothill Pine

Jared Verner

## Vegetation

**Structure**-- This habitat is typically diverse in structure both vertically and horizontally, with a mix of hardwoods, conifers, and shrubs. The shrub component is typically composed of several species that tend to be clumped, with interspersed patches of Annual Grassland. Woodlands of this type generally have small accumulations of dead and downed woody material and relatively few snags, compared with other tree habitats in California. Most existing stands of this type are in mature stages, with canopy cover ranging from 10 to 59 percent, and dbh ranging from 2.5 to 30 cm (1 to 12 in). Size class 6 depends on a sparse overstory of foothill pine above a lower canopy of oaks, as canopies of blue oak seldom exceed 15 m (50 ft) in height. Individual trees seldom exceed 125 cm (49 in) dbh, and exceptionally may reach 30 m (100 ft) in height.

**Composition**-- Blue oak and foothill pine typically comprise the overstory of this habitat, with blue oak usually most abundant. Stands dominated by foothill pine tend to lose their blue oak, which is intolerant of shade (P. M. McDonald, pers. comm.). In the foothills of the Sierra Nevada, tree species typically associated with this habitat are interior live oak and California buckeye. In the Coast Range, associated species are the coast live oak, valley oak, and California buckeye (Griffin 1977). Interior live oak sometimes dominates the overstory, especially in rocky areas and on north-facing slopes at higher elevations (Neal 1980).

At lower elevations, where blue oaks make up most of the canopy, the understory tends to be primarily annual grasses and forbs. At higher elevations where foothill pines and even interior live oaks sometimes comprise the canopy, the understory usually includes patches of shrubs in addition to the annual grasses and forbs. Shrub species include Ceanothus spp. Mariposa manzanita, whiteleaf manzanita, Parry manzanita redberry, California coffeeberry, poison-oak, silver lupine, blue elder, California yerba-santa, rock gooseberry, and California redbud.

**Other Classifications**-- This type is referred to as Blue Oak-Foothill Pine by the Society of American Foresters (Eyre 1980) and Parker and Matyas (1981), and as Blue Oak-Foothill Pine Forest by Küchler (1977). Neal (1980) gives an excellent, short description of the type, and a more complete description can be gleaned from Griffin (1977) in his discussion of California's oak woodlands.

## Habitat Stages

**Vegetation Changes**-- 2-5:S-D;6. Succession presumably proceeds from annual grasslands directly to tree stages at lower elevations, where a shrub layer is usually sparse or absent. At higher elevations, shrubs and trees regenerate together.

**Duration of Stages**-- Secondary succession beginning with disturbed soil is rapid during early stages, with annual grasslands giving way to shrubs within 2 to 5 years. However, stands of mature shrubs adequate to provide habitat for those wildlife species requiring them take longer to develop approximately 10 to 15 years. The conifers grow more rapidly than the hardwoods, maturing into relatively large trees even within 30 to 40 years, judging from the photo series taken at the San Joaquin Experimental Range in Madera County (Woolfolk and Reppert 1963). Most of the meager information on growth rates of blue oaks comes from sites in northern and central California. They generally grow slowly at all ages. Blue oaks in Nevada, Shasta, and Placer Counties showed little or no growth in height after they reached 65 cm (26 in) dbh (McDonald 1985)(No McDonald 1985 in Habitat Lit Cite.). The age at which they normally begin producing acorn crops is unknown (M. McClaran, pers. comm.), but it likely takes several decades. Concern has been expressed for the long-term existence of this habitat (Holland 1976), because "little regeneration has occurred since the late 1800s, as livestock, deer, birds, insects, and rodents consume nearly the entire acorn crop each year. Of the few seedlings that become established a large proportion are eaten by deer" (Neal 1980:126). Furthermore, the absence of grazing livestock does not generally result in regeneration (White 1966), because many other animals eat acorns and seedling oaks. Moreover, introduced grasses are subject to burning, may compete directly with seedling oaks for light and nutrients, and may be allelopathic to the oaks. The general absence of secondary successional stages of these woodlands has precluded detailed study of their composition or rates of change.

## Biological Setting

**Habitat**-- As Griffin (1977:386) points out, "oak woodland seldom forms a continuous cover over large areas. It is a major item in a mosaic including valley grassland...and chaparral...with strips of riparian forest." This mosaic is reflected in the character of the understory in stands of BOP woodlands. At lower elevations, these woodlands merge with Annual Grasslands, Blue Oak Woodlands, and Valley Oak Woodlands. The Annual Grasslands actually extend into the woodlands as a ground cover where not shaded by shrubs. The Blue Oak Woodlands differ from the BOP type in lacking a conifer component and usually in lacking a shrub component.

At upper elevations, BOP habitats merge with extensive stands of Mixed Chaparral in most localities, although in some places the Ponderosa Pine type grows at an elevation low enough to form a mixed ecotone with Mixed Chaparral and BOP.

**Wildlife Considerations--** BOP woodlands provide breeding habitats for a large variety of wildlife species, although no species is totally dependent on them for breeding, feeding, or cover. In the western Sierra Nevada, for example, 29 species of amphibians and reptiles, 79 species of birds, and 22 species of mammals find mature stages of this type suitable or optimum for breeding, assuming that other special habitat requirements are met (Verner and Boss 1980).

Most species breed during late winter and early spring a factor to consider when planning management activities. Snags are less common, and hence less critical to wildlife, in this than in other forest types. Most species of cavity-nesting birds, for example, use living oaks. The cavities are often in scars where limbs have broken from the trunk or a main branch and have developed a level of decay that makes them more easily excavated by primary cavity nesters.

According to Olson (1974), blue oaks produce an abundant seed crop every 2 to 3 years and bumper crops every 5 to 8 years; however, McClaran (pers. comm.) questions that such a clear cycle of acorn production has been confirmed. In any case, acorns are an important food resource for many species of birds (Verner 1980a.) and mammals (Barrett 1980).

## Physical Setting

The habitat occurs in a typically Mediterranean climate hot, dry summers and cool, wet winters. Most precipitation falls as rain from November through April, averaging from 51 to 102 cm (20 to 40 in) within the primary range of blue oak (McDonald 1985). The frost-free growing season ranges from 150 to 300 days, with January minima averaging 1 C (30 F) and July maxima averaging 32 C (90 F) (McDonald 1985). Soils are from a variety of generally well-drained parent materials, ranging from gravelly loam through stony clay loam. Soils rich in rock fragments are typical (McDonald 1985).

## Distribution

The range of this habitat (well described by Neal, 1980) generally rings the foothills of the Central Valley, between 150 and 915 m (500 and 3000 ft) in elevation. The Pit River drainage in the Cascade Range and the foothills of the Klamath Mountains mark the approximate northern limit. The habitat is nearly continuous in the western foothills of the Sierra Nevada, except for a gap of 96 km (60 mi) between the Kings and Kern Rivers, where foothill pine is missing. The distribution extends south into the Liebre Mountains of northern Los Angeles County and the drainages of Piru Creek and Santa Clara River in Ventura County. It is discontinuous in the Coast Range west of the Central Valley from Ventura to Mendocino Counties. And it extends westward to within 16 km (10 mi) of the coast in a few places (Griffin 1977, Neal 1980).

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# Lacustrine

William E. Grenfell Jr.

## General Description

**Structure--** Lacustrine habitats are inland depressions or dammed riverine channels containing standing water (Cowardin 1979). They may vary from small ponds less than one hectare to large areas covering several square kilometers. Depth can vary from a few centimeters to hundreds of meters. Typical lacustrine habitats include permanently flooded lakes and reservoirs (e.g., Lake Tahoe and Shasta Lake), intermittent lakes (e.g., playa lakes) and ponds (including vernal pools) so shallow that rooted plants can grow over the bottom. Most permanent lacustrine systems support fish life; intermittent types usually do not.

## Aquatic Environment

Suspended organisms such as plankton are found in the open water of lacustrine habitats. Dominant are the phytoplankton, including diatoms, desmids and filamentous green algae. Because these tiny plants alone carry on photosynthesis in open water, they are the base upon which the rest of limnetic life depends. Suspended with the phytoplankton are animal or zooplankton organisms which graze upon the minute plants. Most characteristic are rotifers, copepods and cladocerans (Smith 1974).

The plants and animals found in the littoral zone vary with water depth, and a distant zonation of life exists from deeper water to shore. A blanket of duckweed may cover the surface of shallow water. Desmids and diatoms, protozoans and minute crustaceans, hyrdras and snails live on the under-surface of the blanket; mosquitoes and collembolans live on top. Submerged plants such as algae and pondweeds serve as supports for smaller algae and as cover for swarms of minute aquatic animals. As sedimentation and accumulation of organic matter increases toward the shore, floating rooted aquatics such as water lillies and smartweeds often appear. Floating plants offer food and support for numerous herbiverous animals that feed both on phytoplankton and the floating plants (Smith 1974).

**Other Classifications--** Other names of lacustrine habitats include Lacustrine (Cowardin et al. 1979), Lakes - 10.41, Manmade Reservoirs - 10.42 and Ponds -10.43 (Cheatham and Haller 1975). The U.S. Fish and Wildlife Service summarizes several lacustrine habitats according to their occurrence in certain terrestrial habitats (Proctor et at. 1980).

## Aquatic Zones and Substrates

The lacustrine habitat may exist in any of the structural classes 1:2 4:O~B. The limnetic or open water zone extends from the deepest part to the depth of effective light penetration. The submerged (littoral) zone is shallow enough to permit light penetration and occurs at the edges of lakes and throughout most ponds. Periodically flooded lacustrine habitats should be evaluated only when water is present. This stage usually cannot support fish populations, and therefore will not attract fish predators. To qualify as shoreline, there must be a water border and less than 2 percent vegetation. Shoreline vegetation exceeding 2 percent would fall into the riparian category.

Lakes and ponds are more or less temporary features of the landscape because of a slow siltation process. The time it takes depends on size, rate of sedimentation and the increase of organic matter.

## Biological Setting

**Habitat--** Lacustrine habitats may occur in association with any terrestrial habitats, Riverine (RIV) and Fresh Emergent Wetlands (FEW).

**Wildlife Considerations--** Lacustrine habitats are used by 18 mammals, 101 birds, 9 reptiles and 22 amphibians for reproduction, food, water and cover. This represents about 23 percent of the species in the Wildlife Habitat Relationships data base. The endangered Santa Cruz long-toed salamander and rare black toad require ponds for breeding. The endangered bald eagle feeds on fish and some birds taken from lakes.

## Physical Setting

The relatively calm waters of lakes and ponds offer environmental conditions that contrast sharply with those of running water. Light penetration is dependent on turbidity. Temperatures vary seasonally and with depth. Because only a small proportion of the water is in direct contact with the air and because decomposition is taking place on the bottom, the oxygen content of lake water is relatively low compared to that of running water. In some lakes, oxygen may decrease with depth, but there are many exceptions. These gradations of oxygen, light and temperature along with the currents and seiches, profoundly influence the vertical distribution of lake organisms (Smith 1974).

## Distribution

Lacustrine habitats are found throughout California at virtually all elevations, but are less abundant in arid regions.

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# Mixed Chaparral

A. Sidney England

# Vegetation

**Structure--** Mixed Chaparral (MCH) is a structurally homogeneous brushland type dominated by shrubs with thick, stiff, heavily cutinized evergreen leaves. Shrub height and crown cover vary considerably with age since last burn, precipitation regime (cismontane vs. transmontane), aspect, and soil type (Hanes 1977). At maturity, cismontane Mixed Chaparral typically is a dense, nearly impenetrable thicket with greater than 80 percent absolute shrub cover. Canopy height ranges from 1 to 4 m (3.3 to 13.1 fl), occasionally to 6 m (19.6 fl) (Horton 1960, Cheatham and Haller 1975, Hanes 1977). On poor sites, serpentine soils or transmontane slopes, shrub cover may be only 30 to 60 percent and shrubs may be shorter, 0.5 to 3.0 m (1.6 to 9.8 fl) (Cheatham and Haller 1975, Hanes 1976, 1977). Considerable leaf litter and standing dead material may accumulate in stands that have not burned for several decades.

**Composition--** Mixed Chaparral is a floristically rich type that supports approximately 240 species of woody plants (Oruduff 1974). Composition changes between northern and southern California and with precipitation regime, aspect, and soil type. Dominant species in cismontane Mixed Chaparral include scrub oak, chaparral oak, and several species of ceanothus and manzanita. Individual sites may support pure stands of these shrubs or diverse mixtures of several species. Commonly associated shrubs include chamise, birchleaf mountain mahogany, silk-tassel, toyon, yerba-santa, California buckeye, poison-oak, sumac, California buckthorn, hollyleaf cherry, Montana chaparral-pea, and California fremontia. Some of these species may be locally dominant. Leather oak and interior silktassel are widely distributed on cismontane serpentine soils, and chamise and toyon may be abundant on these soils. Shrubs such as Jepson, coyote, and dwarf ceanothus and serpentine manzanita are local serpentine endemics (Cheatham and Haller 1975, Thorne 1976, Hanes 1977). Incense-cedar, knobcone pine, Coulter pine, and foothill pine frequently are found in Mixed Chaparral on serpentine soils (Thorne 1976).

Shrub live oak, desert ceanothus, and desert bitterbrush are examples of shrubs found in Mixed Chaparral only on transmontane slopes (Cheatham and Haller 1975, Thorne 1976, Hanes 1977, and Zabriskie 1979). However, many species found in cismontane stands are also common on desert-facing slopes. Examples include bigberry manzanita, chamise, birchleaf mountain mahogany, California fremontia, and several species of ceanothus.

**Other Classifications--** Most authors divide Mixed Chaparral into several types based on the dominant floristic component, soil type or location. Cheatham and Haller (1975) recognize Californian mixed, south coastal, semi-desert, and serpentine chaparrals. Thorne (1976) identifies mixed chaparral but separates serpentine and desert transition chaparral as distinct types. Paysen et al. (1980) subdivide this type into 7 series (ceanothus, mountain mahogany, scrub oak, prunus, sumac, manzanita, and toyon) based on the dominant or codominant shrub components. Hanes (1977) gives a good review and description of 6 Mixed Chaparral types (ceanothus, scrub oak, manzanita, serpentine, desert, and woodland) .

## Habitat Stages

**Vegetation Changes--** 1;24.S-D. Post-fire recovery of Mixed Chaparral begins with a cover of subshrubs, annuals, and perennial herbs. However, shrubs that will be dominant in mature chaparral are present as seedlings and root-crown sprouts. As shrub cover and height increase with age, herbaceous cover declines. Long-lived seeds remaining in the soil produce the herbaceous cover following the next fire (Sweeney 1956). Shrub species composition also may change as the stand ages. Yerba-santa, common deerweed, and many ceanothus are examples of relatively short-lived ( < 40 years) shrubs and subshrubs that disappear from stands that have not been burned for decades (Horton and Kraebel 1955, Hanes 1971, 1977). Long-lived shrubs in very old stands become senescent, accumulating standing dead material, and some individual may die.

Some authors (e.g., Thorne 1976) have suggested that Mixed Chaparral might succeed to an oak woodland if protected from fire for extremely long periods. Others (e.g., Minnich 1976) have failed to find evidence to support this notion. Hanes (1977) suggests that confusion may result from inadequate distinction among vegetation types with different species compositions, soil qualities, slopes, aspects, and precipitation regimes.

**Duration of Stages--** Menke and Villaseñor (1977) and Zedler (1977) give good descriptions of the chaparral post-fire recovery schedule. For the first 1 to 3 years, cover is dominated by short-lived herbs and subshrubs; shrubs are present as seedlings and root-crown sprouts. From 3 to 15 years, herbaceous species disappear as shrubs and subshrubs enlarge, but shrub canopies generally do not touch. From approximately 10 to 30+ years after a burn, shrub cover increases, canopies begin to overlap, relatively short-lived shrubs begin to die, and dead material accumulates. Stands more than 25 to 35 years old eventually can become senescent. The post-fire recovery schedule varies with species composition, slope, aspect, elevation, and soil type. Shrub regeneration is quicker on more mesic sites. In southern California, stands dominated by manzanita, ceanothus, and scrub oak reach 50 to 60 percent cover in 10 years and 80+ percent cover in 25 to 30 years (Horton 1960, Vogl 1976, Pase 1982b). Recovery time usually is shorter in northern California. Stands of Chamise-Redshank Chaparral (CRC) can become extremely senescent in 60 to 90 years; some Mixed Chaparral types may take 2 to 3 times longer (Hanes 1982).

## Biological Setting

**Habitat--** Mixed and Chamise-Redshank Chaparral (CRC) occur as a mosaic on low to middle elevation slopes below several woodland and forest types. Compared to Chamise-Redshank Chaparral, Mixed Chaparral generally occupies more mesic sites at higher elevations or on north-facing slopes. In southern California, Coastal Scrub (CSC) may form the lower chaparral boundary (Hanes 1977). In northern California, Mixed Chaparral merges with Annual Grassland (AGS) and Blue Oak-Foothill Pine (BOP) at lower elevations. Chaparral shrubs form the understory of many Blue Oak-Foothill Pine stands. At upper elevations, Mixed Chaparral grades into Coastal Oak Woodland (COW), Ponderosa Pine (PPN) or mixed conifer types and frequently forms the understory of these habitats. On desert exposures, Desert Scrub (DSC), Desert Succulent Scrub (DSS) or Joshua Tree (JST) may be found below Mixed Chaparral. Jeffrey Pine (JPN), Pinyon-Juniper (PJN) or Juniper (JUN) habitats occur above Mixed Chaparral.

**Wildlife Considerations--** No wildlife species are restricted to Mixed Chaparral. Most species are found in other shrub-dominated types including Chamise-Redshank Chaparral (CRC), Montane Chaparral (MCP), Coastal Scrub (CSC), and Sagebrush (SGB), or the shrubs beneath several woodland and forest types. Wildlife management considerations usually focus on selecting alternative fire management treatments. Potential impacts of management actions in Mixed Chaparral generally are similar to Chamise-Redshank Chaparral.

## Physical Setting

Mixed Chaparral occurs on all aspects, but at lower elevations, it generally is found on north-facing slopes. This pattern is especially true in southern California. Generally, it occurs on steep slopes and ridges with relatively thin, well-drained soils (Oruduff 1974, Cheatham and Haller 1975). Soils can be rocky, sandy, gravelly or heavy (Cheatham and Haller 1975, Thorne 1976). Mixed Chaparral occurs on sites with deeper and more mesic soils than Chamise-Redshank Chaparral (Cheatham and Haller 1975). Serpentine soils are high in several potentially toxic substances, such as iron and magnesium, and low in required nutrients, including calcium (Whittaker 1975). The mediterranean climate is characterized by cool, wet winters and hot, dry summers. Total rainfall is 38 to 63 cm (15 to 25 in) with less than 20 percent falling during the summer (Oruduff 1974).

## Distribution

Mixed Chaparral generally occurs below 1520 m (5000 ft) on mountain ranges throughout California except in the deserts (Cheatham and Haller 1975, Parker and Matyas 1981). Upper and lower elevational limits vary considerably with precipitation regime, aspect, and soil type. Mixed Chaparral occurs throughout the transverse, peninsular, and central coast ranges and the Tehachapi Mountains. In the Sierra Nevada, this type is a broken band along middle and lower elevations of the western slope. It also occupies large areas in the north coast ranges, especially on interior slopes, and is found as large discontinuous patches in the Siskiyou Mountains and Cascade and Klamath Ranges (Cheatham and Haller 1975, Hanes 1977).

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# Montane Hardwood

Philip M. McDonald

## Vegetation

**Structure**-- A typical montane hardwood habitat is composed of a pronounced hardwood tree layer, with an infrequent and poorly developed shrub stratum, and a sparse herbaceous layer. On better sites, individual trees or clumps of trees may be only 3 to 4 m (10 to 13 ft) apart. On poorer sites, spacing increases to 8 to 10 m (26 to 33 ft). Where trees are closely spaced, crowns may close but seldom overlap. Living crowns on mature canyon live oaks occupy about 60 percent of the bole on typical sites and up to 80 percent on poor sites. Tree heights tend to be uniform at most ages in mature stands where hardwoods occur, but subordinate to conifers. Mature oaks on better sites and in canyons range between 17 and 30 m (56 and 98 fl) tall and up to 150 cm (59) in) dbh. On poorer sites, mature trees typically are 10 to 15 m (33 to 49 ft) tall with boles up to 65 cm (26 in) in dbh, with dome-shaped crowns almost as wide as the trees are tall. On rocky summits, canyon live oak is a shrub of small diameter, usually less than 4 m (13 ft) in height. Snags and downed woody material generally are sparse throughout the montane hardwood habitat.

**Composition**-- In the Coast Range and Klamath Mountains, canyon live oak often forms pure stands on steep canyon slopes and rocky ridge tops. It is replaced at higher elevations by huckleberry oak (Parker and Matyas 1980)(No 1980 Lit Cite only 1979 and 1981.). At higher elevations, it is scattered in the overstory among ponderosa pine, Coulter pine, California white fir, and Jeffrey pine, the latter on serpentine and peridotite outcrops. Middle elevation associates are Douglas-fir, tanoak, Pacific madrone, California-laurel, California black oak, and bristlecone fir. Knobcone pine, foothill pine, Oregon white oak, and coast live oak are abundant at lower elevations. Understory vegetation is mostly scattered woody shrubs (manzanita, mountain-mahogany, poison-oak) and a few forbs.

In the Transverse and Peninsular ranges of southern California, overstory associates at middle and higher elevations are Jeffrey pine, ponderosa pine, sugar pine, incense-cedar, California white fir, bigcone Douglas-fir, California black oak, and Coulter pine. At lower elevations, associates are white alder, coast live oak, bigleaf maple, California-laurel, bigcone Douglas-fir, and occasionally valley oak, foothill pine, and blue oak (Cheatham and Haller 1975, McDonald and Littrell 1976). Understory shrub species are manzanita, poison-oak, coffeeberry, currant, and ceanothus.

In the southern Cascade and Sierra Nevada ranges, steep, rocky south slopes of major river canyons often are clothed extensively by canyon live oak and scattered old-growth Douglas-fir. Elsewhere, higher elevation overstory associates are typical mixed conifer and California black oak; lower elevation associates are foothill pine, knobcone pine, tanoak, Pacific madrone, and scrubby California-laurel. Associated understory vegetation includes Oregon-grape, currant, wood rose, snowberry, manzanita, poison-oak, and a few forbs and grasses.

**Other Classifications**-- In southwest Oregon, the species is part of the mixed evergreen (Pseudotsuga-sclerophyll) zone and to a lessor extent the conifer forest zone on drier areas (Franklin and Dryness 1969). These classifications are pertinent to California as well. In California, canyon live oak occurs in 12 of the 17 forest communities described by Munz and Keck (1968)(No Munz and Keck 1968 in Hab Lit Cite.), in 8 dominance types in the Sierra Nevada (Myatt 1980), and in 6 ecological provinces (Parker and Matyas 1980). Cheatham and Haller (1975) place canyon live oak in 8 minor subdivisions of 2 habitat types. Canyon live oak is recognized as a forest cover type by the Society of American Foresters and is an associate species in eight other types (Eyre 1980).

## Habitat Stages

**Vegetation Changes**-- 1;2-5:S-D. Initial establishment of canyon live oak is by acorns, most of which do not move far from beneath tree crowns. Wider dissemination of acorns and seeds of associate species is by birds and mammals. After establishment, canyon live oak sprouts vigorously from the root crown. Most hardwood associates also sprout prolifically. Rapid sprout growth enables the hardwoods to capture most of the favorable micro sites, forcing the conifers to invade harsher sites, or those made harsh by hardwood roots below ground and hardwood shade above. Delayed establishment, slow growth, and sparse or clumpy distribution of conifers often results. In most instances, succession is slow. Seldom is canyon live oak a pioneer species, but occasionally it invades and becomes established on alluvial soils (Heady and Zinke 1978). Canyon live oak has loose, dead, flaky bark that catches fire readily and burns intensely (Plumb 1980). Occasional fire often changes a stand of canyon live oak to live oak chaparral, but without fire for sufficient time, trees again develop. Where fire is frequent, this oak becomes scarce or even drops out of the montane hardwood community.

**Duration of Stages--** A type more stable than Montane Hard wood is difficult to envision. The large number of species in the type, both conifer and hardwood, allow it to occupy and persist in a wide range of environments. Good soils and poor, steep slopes and slight, frequently disturbed and pristine all are at least adequate habitats for one or more species. Longevity (at least 300 years for some species), and large size help to ensure dominance. Seed and sprout reproductive modes assure both wide spread and stationary reproduction, and consequently several age and size classes usually are present in most areas. Growth of most hardwoods, especially canyon live oak, generally is slow and depends on depth and rockiness of soil, slope, and possibly length of time for roots to reach groundwater (Myatt 1980)

## Biological Setting

**Habitat**-- At lower elevations, neighboring habitats are Valley foothill Hardwood-conifer (VHC) and, to a lesser extent, Closed cone Pine Cypress (CPC). At low and middle elevations, Mixed Chaparral (MCH) interfaces with Montane Hardwood. Wildlife habitats at middle elevations, often overlapping above and below, are Montane Hardwood-conifer (MHC), Mixed Conifer (MCN), Douglas-fir (DFR) and, to a lesser degree, Pine-juniper (PJN). At higher elevations, Montane Hardwood is neighbor to Eastside Pine (EPN), Jeffrey Pine (JPN), and Montane Chaparral (MCP).

**Wildlife Considerations**-- Bird and animal species characteristic of the Montane Hardwood habitat include disseminators of acorns (scrub and Steller's jays, acorn woodpecker, and western gray squirrel) plus those that utilize acorns as a major food source wild turkey, mountain quail, band-tailed pigeon, California ground squirrel, dusky-footed woodrat, black bear, and mule deer. Deer also use the foliage of several hardwoods to a moderate extent. Many amphibians and reptiles are found on the forest floor in the Montane Hardwood habitat. Among them are Mount Lyell salamander, ensatina, relictual slender salamander, western fence lizard, and sagebrush lizard. Snakes include rubber boa, ,western rattlesnake, California mountain kingsnake, and sharp tailed snake.

## Physical Setting

Canyon live oak and associates are found on a wide range of slopes, especially those that are moderate to steep. Soils are for the most part rocky, alluvial, coarse textured, poorly developed, and well drained. Soil depth classes range from shallow to deep. L Canyon live oak, incense-cedar, and a few other associates are also found on ultrabasic soils. Mean summer temperatures in the Montane Hardwood habitat vary between 20 and 25 C (68 and 77 F) and mean winter temperatures between 3 and 7 C (37 and 45 F). Frost-free days range from 160 to 230 (Thornburgh 1986)(No Thornburgh 1986 in Habitat Lit Cite.). Annual precipitation varies from 2794 mm (110 in) in the northern Coast Range to 914 mm (36 in) in the mountains of southern California.

## Distribution

The Montane Hardwood habitat ranges throughout California mostly west of the Cascade-Sierra Nevada crest. East of the crest, it is found in localized areas of Placer, El Dorado, Alpine and San Bernardino Counties. Elevations range from 100 m (300 fl) near the Pacific Ocean to 2745 m (9000 ft) in southern California

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# Riverine

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# General Description

**Structure--** Intermittent or continually running water distinguishes rivers and streams. A stream originates at some elevated source, such as a spring or lake, and flows downward at a rate relative to slope or gradient and the volume of surface runoff or discharge. Velocity generally declines at progressively lower altitudes, and the volume of water increases until the enlarged stream finally becomes sluggish. Over this transition from a rapid, surging stream to a slow, sluggish river, water temperature and turbidity will tend to increase, dissolved oxygen will decrease and the bottom will change from rocky to muddy (McNaughton and Wolf 1973).

# Aquatic Environment

**Composition--** The majority of fast stream inhabitants live in riffles, on the underside of rubble and gravel, sheltered from the current. Characteristic of the riffle insects are the nymphs of mayflies, caddisflies, alderflies, stoneflies; and the larva and pupae of true flies. In pools, the dominant insects are burrowing mayfly nymphs, dragonflies, damselflies and water striders. Water moss and heavily branched filamentous algae are held to rocks by strong holdfasts and align with the current. Other algae grow in spheric, or cushionlike colonies with smooth, gelatinous surfaces. Algae growth in streams often exhibits zonation on rocks, which is influenced by depth and current.

With increasing temperatures, decreasing velocities and accumulating bottom sediment, organisms of the fast water are replaced by organisms adapted to slower moving water. Mollusks and crustaceans replace the rubble-dwelling insect larvae. Backswimmers, water boatmen and diving beetles inhabit sluggish stretches and backwaters. Emergent vegetation grows along river banks, and duckweed floats on the surface. Abundant decaying matter on the river bottom promotes the growth of plankton populations that are not usually found in fast water.

**Other Classifications--** Other classification systems of rivers and streams are: Riverine (Cowardin et al. 1979); Streams-10.2, Rivers-10.3 (Cheatham and Haller 1975) and Proctor et al. (1980).

# Aquatic Zones and Substrates

The riverine habitat exists in structural classes 1;24:0-B. Open water (1) is defined as greater than 2 meters in depth and/or beyond the depth of floating rooted plants, and does not involve substrate. Small rivers and streams may not have an open water zone. The submerged zone (2) is between open water and shore. The shore (4) is seldom flooded (except for wave wash or fluctuations in flow) and is less than 10 percent canopy cover. For shorelines with 10 percent canopy cover or more, use a terrestrial habitat designation.

The rate at which a stream erodes its channel is determined by the nature of the substrate, composition of the water, climate and the gradient. The greater the slope, the greater the capacity to transport abrasive materials through increased velocity (Reid 196)

Most natural riverine systems are relatively stable over long periods of time as long as there is no human interference. The building of dams and the dredging and straightening of stream channels are in the most important factors controlling the duration of stream and river types.

## Biological Setting

**Habitat--** Riverine habitats can occur in association with many terrestrial habitats. Riparian habitats are found adjacent to many rivers and streams. Riverine habitats are also found contiguous to lacustrine and fresh emergent wetland habitats.

**Wildlife Considerations--** The open water zones of large rivers provide resting and escape cover for many species of waterfowl. Gulls, terns, osprey and bald eagle hunt in open water. Near-shore waters provide food for waterfowl, herons, shorebirds, belted-kingfisher and American dipper. Many species of insectivorous birds (swallows, swifts, flycatchers) hawk their prey over water. Some of the more common mammals found in riverine habitats include river otter, mink, muskrat and beaver.

## Physical Setting

Streams begin as outlets of ponds or lakes (lacustrine), or rise from spring or seepage areas. All streams at some time experience very low flow and nearly dry up. Some streams, except for occasional pools, dry up seasonally every year.

The temperature of the riverine habitat is not constant. In general, small, shallow streams tend to follow, but lag behind air temperatures, warming and cooling with the seasons. Rivers and streams with large areas exposed to direct sunlight are warmer than those shaded by trees, shrubs and high, steep banks.

The constant swirling and churning of high-velocity water over riffles and falls result in greater contact with the atmosphere-and thus have a high oxygen content. In polluted waters, deep holes or low velocity flows, dissolved oxygen is lower (Smith 1974).

## Distribution

Rivers and streams occur statewide, mostly between sea level and 2438 meters (8000 fl).

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# Valley Foothill Riparian

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## Vegetation

**Structure**-- Canopy height is approximately 30 m (98 ft) in a mature riparian forest, with a canopy cover of 20 to 80 percent. Most trees are winter deciduous. There is a subcanopy tree layer and an understory shrub layer. Lianas (usually wild grape) frequently provide 30 to 50 percent of the ground cover and festoon trees to heights of 20 to 30 m (65 to 98 ft). Herbaceous vegetation constitutes about one percent of the cover, except in openings where tall forbs and shade-tolerant grasses occur (Conard et al. 1977). Generally, the understory is impenetrable and includes fallen limbs and other debris.

**Composition**-- Dominant species in the canopy layer are cottonwood, California sycamore and valley oak. Subcanopy trees are white alder, boxelder and Oregon ash. Typical understory shrub layer plants include wild grape, wild rose, California blackberry, blue elderberry, poison oak, buttonbrush, and willows. The herbaceous layer consists of sedges, rushes, grasses, miner's lettuce, Douglas sagewort, poison-hemlock, and hoary nettle.

**Other Classifications**-- Other classification schemes that describe VRI habitats are Cottonwood and California Sycamore (Parker and Matyas 1981), Central Valley Bottomland Woodland 6.11, Southern Alluvial Woodland - 6.31 (Cheatham and Haller 1975), Wild Rose Alder, Cottonwood, Sycamore, Willow (Paysen et al. 1980), Riparian Forest - 28 (Küchler 1977) and Forested Wetland -61 (Anderson et al. 1976).

## Habitat Stages

**Vegetation Changes--** 1;2-5:S-D. Cottonwoods grow rapidly and can reach WHR size/age class 5 in about 20 to 25 years. One specimen measuring 92 cm (36 in) (inside the bark) showed an age of 29 years (Sudworth 1908). This secondary succession to climax could occur as rapidly as 25 to 30 years in VRI habitats dominated by cottonwood. One valley oak tree 54 cm (21 in) in diameter (WHR size/age class 4) showed an age of 57 years. Valley oak dominated riparian systems would probably take 75+ years to reach climax/maturity. Some VRI types consisting of only a shrub layer (VRI 1;2: S-D) (willows, wild rose, blackberry) may persist indefinitely.

**Duration of Stages--** Shrubby riparian willow thickets may last 15-20 years before being overtopped and shaded out by cottonwoods. Cottonwood or willow tree habitats close to river channels that receive a good silt infusion, without major disruptive flows, tend to be self perpetuating (R. Holland pers. comm.).

## Biological Setting

**Habitat--** Transition to adjacent non-riparian vegetation is usually abrupt, especially near agriculture (Cheatham and Haller 1975). The Valley-Foothill Riparian habitat is found in association with Riverine (RIV), Grassland (AGS, PGS), Oak Woodland (VFH) and Agriculture (PAS, CRP). It may intergrade upstream with Montane Riparian.

**Wildlife Considerations--** Valley-foothill riparian habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 amphibians and reptiles occur in lowland riparian systems. Many are permanent residents, others are transient or temporal visitors (Brode and Bury 1985). In one study conducted on the Sacramento River, 147 bird species were recorded as nesters or winter visitants (Laymon 1985). Additionally, 55 species of mammals are known to use California's Central Valley riparian communities (Trapp et al. 1985).(No 1985 cites for Brode and Bury, Laymon, and Trapp et al. in habitat Lit Cite. I used 1984 cites for all 3 in Lit Cite at end.)

## Physical Setting

Valley-foothill riparian habitats are found in valleys bordered by sloping alluvial fans, slightly dissected terraces, lower foothills, and coastal plains. They are generally associated with low velocity flows, flood plains, and gentle topography. Valleys provide deep alluvial soils and a high water table. The substrate is coarse, gravelly or rocky soils more or less permanently moist, but probably well aerated (Cheatham and Haller 1975). Average precipitation ranges from 15 to 76 cm (6-30 in), with little or no snow. The growing season is 7 to 11 months. Frost and short periods of freezing occur in winter (200 to 350 frost-free days). Mean summer maximum temperatures are 24 to 39 C (75 to 102 F), mean winter minima are 2 to 7 C (29 to 44 F) (Munz and Keck 1973). VRI habitats are characterized by hot, dry summers, mild and wet winters. Coastal areas have a more moderate climate than the interior and receive some summer moisture from fog (Bailey 1980). Potential evaporation during the warmest months is often greater than precipitation. Low rainfall and streamflow result in water scarcity in many parts of the area.

## Distribution

Valley-foothill riparian habitats occur in the Central Valley and the lower foothills of the Cascade, Sierra Nevada and Coast ranges. They are also found in lower slopes at the bases of the Peninsular and Transverse ranges. A few lower elevation locations are on the desert side of the southern California mountains. VRI habitats range from sea level to 1000 m (3000 ft), fingering upward to 1550 m (5000 ft) on south-facing slopes.

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**California Wildlife Habitat Relationships System**
**California Department of Fish and Game**
**California Interagency Wildlife Task Group**

# Valley Oak Woodland

Lyman V. Ritter

## Vegetation

**Structure**-- This habitat varies from savanna-like to forest-like stands with partially closed canopies, comprised mostly of winter-deciduous, broad-leaved species. Denser stands typically grow in valley soils along natural drainages. Tree density decreases with the transition from lowlands to the less fertile soils of drier uplands. Exceptions to this pattern are known, especially in the central coastal counties (N. H. Pillsbury, pers. comm.). Similarly, the shrub layer is best developed along natural drainages, becoming insignificant in the uplands with more open stands of oaks. Valley oak stands with little or no grazing tend to develop a partial shrub layer of bird-disseminated species, such as poison-oak, toyon, and coffeeberry (J. R. Griffin, pers. comm.). Ground cover consists of a well-developed carpet of annual grasses and forbs. Mature valley oaks with weil-developed crowns range in height from 15 to 35 m (49 to 115 ft) (Cheatham and Haller 1975, Conard et al. 1977).

**Composition--** Canopies of these woodlands are dominated almost exclusively by valley oaks (Conard et al. 1977). Tree associates in the Central Valley include California sycamore, Hinds black walnut, interior live oak, boxelder, and blue oak. The shrub understory consists of poison-oak, blue elder, California wild grape, toyon, California coffeeberry, and California blackberry. Various sorts of wild oats, brome, barley, ryegrass, and needlegrass dominate the ground cover. Foothill pine and coast live oak are associated with VOWs along the Coast Range (Parker and Matyas 1979). Griffin (1976) reported that Coulter pine and canyon live oak are found in a montane Savannah of valley oak in the Santa Lucia Range, Monterey County.

**Other Classifications**-- This type is referred to as the Foothill Woodland by Munz and Keck (1959), Valley Oak Savanna (33) by Küchler (1977), the Valley Oak Phase of the Foothill Woodland by Griffin (1977), Valley Oak Series by Paysen et al. (1980), and Valley Oak Community by Parker and Matyas (1979). Conard et al. (1977) and others include VOWs in the Central Valley riparian zone, a vegetative division in the physiographic gradient extending from river edges to higher terraces. Cheatham and Haller (1975) included part of the VOW habitat in their Central Valley Bottomland Woodland (6.11), and Küchler (1977) included parts in his Riparian Forest (28) designation.

## Habitat Stages

**Vegetation Change--** 1;2-5:S-D. In most remaining VOW, little recruitment of young oaks occurs to replace the veteran oaks dying of natural causes or being destroyed by urban and agricultural development (White 1966, Griffin 1973, 1976, 1977). The lack of oak recruitment seems to be related to animal damage of acorns and seedlings (Griffin 1980a, b). The successful combination of circumstances for valley oak establishment is speculative. The future of this habitat in valley locations seems to be fewer valley oaks and more open grassland (Griffin 1976). However, Griffin (1976) found that the current absence of ground fire encourages the invasion of evergreen oaks, Coulter pine, or both, in upland sites in the Santa Lucia Mountains. Presently, most valley oak stands are in mature stages 5:S-D, but structural classes 1-5:S-D are presumably possible. Canopy development and plant density are variable. Only a few localized studies give quantitative data on the structure of VOW (see Griffin 1976, Conard et al. 1977).

**Duration of Stages--** Secondary succession of VOWs under natural conditions has not been studied and little opportunity exists for its study. Most surviving stands appear to be between 100 and 300 years old, and individual valley oaks may live as long as 400 years (Stern 1977). Valley oaks seem to be tolerant of flooding (Harris et al. 1980), and young trees will sprout when fire damaged (Griffin 1976). Given natural perturbations such as fire and flooding, and assuming successful regeneration of valley oaks, VOW would probably remain the climax community.

## Biological Setting

**Habitat--** VOWs in the Great Valley usually merge with Annual Grasslands or border agricultural land. Where these woodlands extend to the foothills surrounding the valley, they intergrade with Blue Oak Woodlands or Blue Oak-Foothill Pine habitats. Near major stream courses this community intergrades with Valley-Foothill Riparian vegetation. West of the Coast Range, VOWs sometimes associate with Coastal Oak Woodlands and, to a limited extent, Montane Hardwood and Coastal Scrub.

**Wildlife Considerations--** These woodlands provide food and cover for many species of wildlife. Oaks have long been considered important to some birds and mammals as a food resource (i.e., acorns and browse). Verner (1980a) reported that 30 bird species known to use oak habitats in California include acorns in their diet. An average of 24 species of breeding birds were recorded on a study plot at Ancil Hoffman Park, near Carmichael, in Sacramento County from 1971 to 1973 (Gaines 1977). The study plot was dominated by valley oaks but included some cottonwood in the canopy. Probably the most significant breeding bird species recorded was red-shouldered hawk. In decreasing order, the most common species were European starling, California quail, plain titmouse, scrub jay, rufous-sided towhee, Bewick's wren, bushtit, and acorn woodpecker. Barrett (1980) indicates that the ranges of about 80 species of mammals in California show substantial overlap with the distribution of valley oaks, and several, such as fox and western gray squirrels and mule deer, have been documented using valley oaks for food and shelter.

## Physical Setting

This habitat occurs in a wide range of physiographic settings but is best developed on deep, well-drained alluvial soils, usually in valley bottoms. Most large, healthy valley oaks are probably rooted down to permanent water supplies (Griffin 1973). Stands of valley oaks are found in deep sills on broad ridge-tops in the southern Coast Range. Where this type occurs near the coast, it is usually found away from the main fog zone (Griffin 1976). The climate is Mediterranean, with mild, wet winters and hot, dry summers.

## Distribution

Remnant patches of this habitat are found in the Sacramento Valley from Redding south, in the San Joaquin Valley to the Sierra Nevada foothills, in the Tehachapi Mountains, and in valleys of the Coast Range from Lake County to western Los Angeles County. Usually it occurs below 610 m (2000 ft), although Griffin (1976) reported a ridge-top stand at 1525 m (5000 ft) in the Santa Lucia Mountains.

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# APPENDIX 3.6-D

## Life History Information for Special-status Wildlife Species Known to Occur or Potentially Occurring in the Vicinity of the Kern River No. 1 Hydroelectric Project

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## Known to Occur in the Vicinity of the Kern River No. 1 Hydroelectric Project

### Kern Canyon slender salamander (*Batrachoseps simatus*) – Federal Proposed Threatened (FPT), Sequoia National Forest Species of Concern (FSCC), California Threatened (CT)

Kern Canyon slender salamander is a lungless, terrestrial salamander that is found in the southern Sierra Nevada, in the lower Kern River Canyon, 1,476 feet (450 meters), and within the Erskine Creek and Bodfish Creek drainages, 3,937 ft (1,200 m). This salamander occupies north-facing riparian zones in narrow canyons shaded with willows and cottonwoods and wooded hillsides supporting oaks and pines, including wet creek margins, seeps, talus, and exposed chaparral. These areas typically do not get sun in winter and remain moist and cool into the spring.

They are active on the surface seasonally when conditions are favorable for performing skin and buccopharyngeal respiration where they can be found under rocks, logs, bark, and leaf litter near seeps, springs, or streams. They have been found to be active on the surface from January to May at lower elevations and March to early November at higher elevations (Jockusch et al. 2012) and only when substrate is adequately moist, and temperatures are suitable (USFWS 2022). Kern River slender salamander will shelter in underground burrows when conditions are not favorable (Cunningham 1960, Lannoo 2005)

Little is known about their diet, but other slender salamanders feed opportunistically above and below ground, and their diet is most likely composed of small invertebrates, earthworms, and slugs. At higher temperatures salamander energy assimilation decreases and salamanders must increase feeding frequency to maintain energy balances (Huey and Kingsolver 2019). Most reproductive activities occur underground (Yanev 1978) and eggs are usually laid in communal sites underground, but near, or under, a flat surface object (Stebbins 1954).

There is little information on specific habitat requirements for breeding or egg laying. Eggs of similar species are laid underground or on moist substrates under or within surface objects, especially pieces of bark (Stebbins 1972).

Kern Canyon slender salamander was recently listed as Federal Proposed Threatened and USFWS has designated Critical Habitat for this species (USFWS 2022). Parts of the Project Area and vicinity are within Critical Habitat Unit 3, encompassing Kern Canyon Tributaries to Kern River starting from approximately 3 miles upstream from the Kern River No. 1 Powerhouse. There are five records for this species within the Project vicinity and three records within the 1-mile buffer of the Project (CNDDB 2022). There are no Recovery Plans currently available for this species.

**Relictual slender salamander (*Batrachoseps relictus*) – Federal Proposed Endangered (FPE), FSCC, California Species of Special Concern (CSC)**

Relictual slender salamander is a lungless, terrestrial salamander that can be found in the southern Sierra Nevada, restricted to a small area of Sequoia National Forest in Kern County, California. They occur in small patches of moist, rocky habitats near seeps, springs, and streams. They can be found under rocks, logs, and even submerged in seeps and streams under cover objects (USFWS 2022). The relictual slender salamander is found in the valley foothill riparian habitat and blue oak woodland in the lower Kern River Canyon. They can also be found in Sierran mixed conifer forest with closed canopies of pine, fir, and oak on Breckenridge Mountain.

Similar to the Kern Canyon slender salamander, they are active on the surface seasonally, usually from January to May at lower elevations and March to early November at higher elevations (Jockusch et al. 2012) and only when substrate is adequately moist, and temperatures are suitable (USFWS 2022).

Little is known about their diet, but other slender salamanders feed opportunistically above and below ground, and their diet is most likely composed of small invertebrates, earthworms, and slugs. At higher temperatures salamander energy assimilation decreases and salamanders must increase feeding frequency to maintain energy balances (Huey and Kingsolver 2019). Most reproductive activities occur underground (Yanev 1978), and eggs are usually laid in communal sites underground, but near, or under, a flat surface object (Stebbins 1954).

Most reproductive activities occur underground (Yanev 1978) and eggs are usually laid in communal sites underground, but near, or under, a flat surface object (Stebbins 1954).

Relictual slender salamander was recently listed as Federal Proposed Endangered and USFWS has designated Critical Habitat for this species (USFWS 2022). Parts of the Project Area and vicinity are within Critical Habitat Unit 1 and Unit 2, encompassing Kern Canyon Tributaries to Kern River starting from approximately 0.25 mile upstream from the Kern River No. 1 Powerhouse, and Lucas Creek. There is one record for this species within the Project vicinity and five records within a 1-mile buffer of the Project (NRIS 2022). There are no Recovery Plans currently available for this species.

**Yellow-blotched salamander (*Ensatina eschscholtzii croceator*) – FSCC, Watch List (WL)**

This species is found from the north of Tehachapi Mountains to the base of the Greenhorn Mountains of the southern Sierra Nevada chain (Stebbins 2003). The yellow-blotched salamander is an endemic resident of California that occurs in tributaries of lower elevation canyons, including the Kern River Canyon. This species is typically found under leaf litter, rocks, and logs in evergreen and deciduous forests and at elevations ranging from sea level to 11,000 ft (3,350 m).

Yellow-blotched salamanders live in relatively cool moist places and become most active on rainy or wet nights when temperatures are moderate. They stay underground during hot and dry periods where they are able to tolerate considerable dehydration. They may also continue to feed underground during the summer months. High-altitude populations are inactive during severe winter cold.

Adults have been observed marking and defending territories outside of the breeding season. Reproduction is terrestrial. Mating takes place in fall and spring but may also occur throughout the winter (CaliforniaHerps 2022).

**Coast horned lizard (*Phrynosoma blainvilii*) – CSC**

The coast horned lizard occurs in valley foothill hardwood, conifer and riparian habitats, as well as in pine-cypress, juniper and annual grassland habitats. It is found in the Sierra Nevada foothills from Butte County to Kern County and throughout the central and southern California coast. Coast horned lizards forage on the ground in an open area, usually between shrubs and often near ant nests. The species relies on camouflage for protection. Predators and extreme heat are avoided by burrowing into loose soil. Periods of inactivity and winter hibernation are spent burrowed in the soil under surface objects such as logs or rocks, in mammal burrows, or in crevices (Zeiner et al 2000).

The coast horned lizard inhabits mostly open country, especially sandy areas, washes, flood plains and wind-blown deposits in a wide variety of habitats and can be found at elevations up to 8,000 ft (2,438 m) (CaliforniaHerps 2022).

**California condor (*Gymnogyps californianus*) – Federal Endangered (FE), California Endangered (CE), CFP**

California condor are an endangered, permanent resident of the semi-arid, rugged mountain ranges surrounding the southern San Joaquin Valley, including the Coast Ranges from Santa Clara County south to Los Angeles County, the Transverse Ranges, Tehachapi Mountains, and southern Sierra Nevada. California condors occur mostly between sea level and 9,000 ft (0 to 2700 m), and nests from 2,000 to 6,500 ft (610 to 1372 m).

This species forages over wide areas of open rangelands, roosts on cliffs and in large trees and snags. Nonbreeding individuals move north to Kern and Tulare counties in April, often returning south in September to winter in Tehachapi Mountains, Mount Pinos, and Ventura and Santa Barbara counties. The total population in the early 1980s was estimated to be fewer than 20, and declining (Ogden 1982). Their occurrence in the wild now is uncertain. Two Forest Service sanctuaries set aside within the Los Padres National Forest are primarily for nesting and roosting protection.

California condors are strictly scavengers, eating carrion such as cattle, sheep, deer, and ground squirrel carcasses. Dead cattle have provided the most important food source in recent decades. This species requires approximately 2.2 pounds (lb) (1 kilogram [kg])) of food per day and can convert food to fat rapidly after gorging; thus, can remain for several days without feeding (Wilbur 1978). California condors search for food while soaring and gliding. Food must be in open areas to enable landing and take-off (Koford 1953). They often forage over areas 2.8 to 11.6 square miles ($mi^2$) (7.3 to 30 square kilometers [$km^2$]), or larger and maybe 35 miles (56 km) or more from roost to feeding sites (Koford 1953). Traditional roosting sites are ledges or cavities on cliffs.

This species breeds in caves, crevices, behind rock slabs, or on large ledges on high sandstone cliffs. The egg is laid on a bare surface. Nesting occurs within the Coast and Transverse Ranges of Ventura and Santa Barbara counties. California condors require vast expanses of open savannah, grasslands, and foothill chaparral, with cliffs, large trees, and snags for roosting and nesting.

USFWS has designated Critical Habitat for the California condor. However, the Project does not intersect with any designated Critical Habitat. The closest Critical Habitat is located approximately 6 miles northeast of the Project area.

This species is covered under the Recovery Plan for the California Condor (USFWS 1996), however recent findings concluded that the development of measurable, objective criteria that describes recovery for the California condor is not practicable (USFWS 2019).

**Townsend's big-eared bat (*Corynorhinus townsendii*) – FSCC, CSC**

Townsend's big-eared bat is found throughout California, but the details of its distribution are not well known. This species prefers mesic habitats and is found in all but subalpine and alpine habitats and may be found at any season throughout its range. Once considered common, Townsend's big-eared bat now is considered uncommon in California. It is most abundant in mesic habitats. Small moths are the principal food of this species. Beetles and a variety of soft-bodied insects also are taken. Townsend's big-eared bat captures their prey in flight using echolocation, or by gleaning from foliage. Their flight is slow and maneuverable. This species is capable of hovering and requires caves, mines, tunnels, buildings, or other human-made structures for roosting. This species may use separate sites for night, day, hibernation, or maternity roosts. Hibernation sites are cold, but not below freezing. Individuals may move within the hibernaculum to find suitable temperatures. Maternity roosts are warm and found in caves, tunnels, mines, and buildings. Roosting sites are the most important limiting resource. Small clusters or groups (usually fewer than 100 individuals) of females and young form the maternity colony (CDFW 2022).

**Western mastiff bat (*Eumops perotis californicus*) – CSC**

The western mastiff bat occurs in many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, annual and perennial grasslands, palm oases, chaparral, desert scrub, and urban. This species catches and feeds on insects in flight. Ross (1961) found that it fed primarily (58%) on night-flying hymenopterous insects. The insects consumed were relatively small, low-flying and weak-flying forms, and he concluded that the bats were feeding from ground to tree-level. However, over rugged terrain these bats typically forage at much greater heights (195 ft, 60 m) above the ground (Krutzsch 1955, Vaughan 1959, Cockrum 1960). Crevices in cliff faces, high buildings, trees, and tunnels are required for roosting (Howell 1920, Dalquest 1946, Barbour and Davis 1969). When roosting in rock crevices, this species needs vertical faces to drop off to take flight. Nursery roosts are described as tight rock crevices at least 35 in (90 cm) deep and 2 in (5 cm) wide, or crevices in buildings (Howell and Little 1924). Suitable habitat consists of extensive open areas with abundant roost locations provided by crevices in rock outcrops and buildings.

**Fringed myotis (*Myotis thysanodes*) – FSCC, CSC**

The fringed myotis is widespread in California, occurring in all but the Central Valley and Colorado and Mojave deserts. Its abundance appears to be irregular and may be common locally. It occurs in a wide variety of habitats; records range in elevation from sea level to 9,350 ft (2,850 m) in New Mexico (Barbour and Davis 1969). Optimal habitats are pinyon-juniper, valley foothill hardwood and hardwood-conifer, generally at 4,000 to 7,000 ft (1,300 to 2,200 m). This species feeds mostly on beetles, and also on moths, arachnids, and orthopterans (Black 1974). Foraging flight is slow and maneuverable, and capture may utilize wing and tail membranes. This species is capable of hovering, and occasionally may land on the ground. Fringed myotis feed over water, over open habitats, and by gleaning from foliage. The fringed myotis roosts in caves, mines, buildings, and crevices. Separate day and night roosts may be used. Adults and subadults generally form separate groups in the roost. Maternity colonies of up to 200 individuals are located in caves, mines, buildings, or crevices. Adult males are absent from maternity colonies, which are occupied from late April through September. Maternity group members may remain together during hibernation. This species uses open habitats, early successional stages, streams, lakes, and ponds as foraging areas.

## May Potentially Occur in the Vicinity of the Kern River No. 1 Hydroelectric Project

**Monarch Butterfly (*Danaus plexippus*) – Federal Candidate (FC)**

The monarch butterfly has a western and eastern population in the United States and is a long-distance migrator in its North American range. The western population of monarch butterflies occupy breeding habitats during spring and summer months. At the end of the summer, monarchs migrate to overwintering sites located in coastal California and Mexico. In the Sierra Nevada, the western migration begins as early as late July or August, but some breeding can occur in autumn (UC Davis 2022).

Monarch butterflies lay their eggs on obligate milkweed (*Asclepias* spp.) host plants, and larvae emerge after two to five days. Larvae develop over a period of nine to 18 days, feeding on the milkweed and sequestering toxic cardenolides, which they use as a defense against predators. After reaching an appropriate size, the larvae pupate into a chrysalis before emerging six to 14 days later as an adult butterfly. Multiple generations of monarchs are produced during the breeding season and adults live approximately 2 to 5 weeks.

In the arid western North America, milkweeds are often associated with riparian corridors that have higher abundances of floral resources.

**Western spadefoot (*Spea hammondii*) – CSC**

The western spadefoot ranges throughout the Central Valley and adjacent foothills and is usually quite common where it occurs. Elevations of occurrence extend from near sea level to 4,460 ft (1,363 m) in the southern Sierra foothills (Jennings and Hayes 1994). This species occurs primarily in grasslands, but occasional populations also occur in valley foothill hardwood woodlands. Some populations persist for a few years in orchard or vineyard habitats. Grasslands with shallow temporary pools are optimal habitats for the western spadefoot.

They are mostly found in underground burrows up to 36 in (0.9 m) deep (Stebbins 1972). They can also find cover in drying mud cracks, under boards and other surface objects including decomposing cow dung (Weintraub 1980).

Adult western spadefoot feed on worms and other invertebrates (Stebbins 1972). Tadpoles consume planktonic organisms and algae but are also carnivorous (Bragg 1964) and consume dead aquatic larvae of amphibians, including their own species.

Breeding and egg laying occur almost exclusively in shallow, temporary pools formed by heavy winter rains. Egg masses are attached to plant material, or the upper surfaces of small, submerged rocks (Stebbins 1951).

**California legless lizard (*Aniella* spp.) – CSC**

The California legless lizard is common in suitable habitats in the Coast Ranges from the vicinity of Antioch, Contra Costa Co. south to the Mexican border (Jennings and Hayes 1994). Legless lizards occur infrequently throughout the rest of their range, which includes the floor of the San Joaquin Valley from San Joaquin County south, the west slope of the southern Sierra, the Tehachapi Mountains west of the desert, and the mountains of southern California. They can be found below 6,000 ft (1,800 m) in the Sierra. California legless lizards typically occupy coastal dune, valley foothill, chaparral, and coastal scrub habitats.

The California legless lizard usually forages at the base of shrubs or other vegetation either on the surface or just below it in leaf litter or sandy soil. Legless lizards eat insect larvae, small adult insects, and spiders (Stebbins 1954). Legless lizards sometimes seek cover under surface objects such as flat boards and rocks where they lie barely covered in loose soil. They are often encountered buried in leaf litter and commonly burrow near the surface through loose soil.

Legless lizards have a relatively low thermal preference (Bury and Balgooyen 1976), which allows them to be active on cool days as well as early in the morning and even at night during warmer periods, at which time mid-day activity is reduced. Individuals from coastal and southern localities are probably active all year with only brief periods of winter inactivity. Lizards from more inland sites, especially in the Sierra foothills, undergo winter hibernation.

The reproductive season begins with mating activities in late spring or early summer. The gestation period is about 4 months (Jennings and Hayes 1994). Live young are born in September, October, or even November. Litter size ranges from one to four but two is common (Stebbins 1954).

**California glossy snake (*Arizona elegans occidentalis*) – CSC**

California glossy snake is common throughout southern California especially in desert regions. Less common to the north, glossy snakes occur in the interior Coast Ranges as far as Mount Diablo in Contra Costa Co. Glossy snakes are most common in desert habitats but also occur in chaparral, sagebrush, valley foothill hardwood, pine-juniper, and annual grass. This species occurs at elevations from below sea level to 6,000 ft (1,830 m; CDFW 2022). They are primarily nocturnal and spend periods of inactivity during the day and during winter in mammal burrows and rock outcrops, and to a lesser extent under surface objects such as flat rocks and vegetation residue. Individuals occasionally burrow in loose soil (CDFW 2022).

Their diet consists of lizards, small snakes, terrestrial birds, and nocturnally active mammals.

Mating occurs in the spring soon after the end of the period of winter inactivity. Eggs are laid in early July with clutch sizes that range from 3 to 23 (average of 8 or 9). Hatching occurs from late August to mid-September (Stebbins 1954, Aldridge 1979).

**San Joaquin coachwhip (*Masticophis flagellum ruddocki*) – CSC**

San Joaquin Coachwhip is endemic to California, ranging from Arbuckle in the Sacramento Valley in Colusa County southward to the Grapevine in the Kern County portion of the San Joaquin Valley and westward into the inner South Coast Ranges (CaliforniaHerps 2022).

Coachwhips are common to uncommon in arid regions below 7,700 ft (2,350 m) in California (Stebbins 1985). Coachwhips are mainly terrestrial, but occasionally climb trees and bushes to bask, seek prey and cover (CDFW 2022). Their diet consists of rodents, lizards, birds, turtles, insects, eggs, and carrion (Cowles 1946, Stebbins 1954, Wright and Wright 1957, Carpenter 1958, Cunningham 1959, Miller and Stebbins 1964).

Mating occurs in April and May, eggs are laid June and July, and the first young appear in late August or early September (Stebbins 1954, Wright and Wright 1957, Fitch 1970).

**Sierra night lizard (*Xantusia vigilis*) – CSC**

The Sierra night lizard is restricted to the Greenhorn mountains in the southwest Sierra Nevada. It is found in association with yucca, foothill pine, chamise, pinyon pine and juniper. This is a secretive lizard, spending most of its time in and under yucca logs and other cover. This species is found at elevations of 990 to 6,800 ft (300 to 2,070 m) (Macey and Papenfuss 1991). Activity may begin in early April at low elevations and last until early fall, while emergence may be retarded until late spring at higher elevations.

This lizard eats termites, orthopterans, small beetles, homopterans, hemipterans, collembolans, moths, caterpillars, flies, ants, ticks, and spiders. It waits for prey items that wander into the cover area and seldom searches actively (Brattstrom 1952, Stebbins 1954)

Most commonly this species is found under and in logs of the several species of yucca, and much less frequently under logs and debris of foothill pine, root channels of creosote, and other natural or unnatural cover objects (Brattstrom 1952, Stebbins 1954).

Copulation occurs in late spring and egg development takes about three months. The young are born in September and October with an average of two young in a brood. The mother attends the young for a short time after birth (Cowles 1944, Miller 1948, 1951, Stebbins 1954).

**Northern goshawk (*Accipiter gentilis atricapillus*) – FSCC, CSC**

The northern goshawk breeds in North Coast Ranges through Sierra Nevada, Klamath, Cascade, and Warner Mountains, in Mount Pinos and San Jacinto, San Bernardino, and White Mountains. They remain yearlong in breeding areas as an uncommon resident. This species prefers middle and higher elevations, and mature, dense conifer forests. They are casual in winter along the north coast, throughout foothills, and in northern deserts, where they may be found in pinyon-juniper and low-elevation riparian habitats.

The northern goshawk hunts in wooded areas and uses snags and dead-topped trees for observation and prey-plucking perches. The species feeds mostly on birds, from robin to grouse in size. Small mammals, of squirrel and rabbit size, are often taken. They rarely eat carrion and insects. Prey is caught in air, on ground, or in vegetation, using fast, searching flight, or rapid dash from a perch. Northern goshawks use mature and old-growth stands of conifer and deciduous habitats.

This species usually nests on north slopes, near water, in densest parts of stands, but close to openings (Jackman and Scott 1975). Young have been reported bathing (Bond 1942, Brown and Amadon 1968). Dense, mature conifer and deciduous forest, interspersed with meadows, other openings, and riparian areas required for this species. Northern goshawks begin breeding in April in southern California, and by mid-June in the north. Females lays eggs in three-day intervals for average clutch of three. Females incubate 36 to 41 days while male provides food. After hatching, female feeds brood 8 to 10 days, then male helps feed them. Young may leave nest to perch at about 40 days and usually fledge by 45 days. Young begin to hunt by 50 days, and are often independent by 70 days.

**Tricolored blackbird (*Agelaius tricolor*) – BCC, CSC**

The tricolored blackbird is a resident in California. This species is common locally throughout Central Valley and in coastal districts from Sonoma County south. Tricolored blackbirds breed near fresh water, preferably in emergent wetland with tall, dense cattails or tules, but also in thickets of willow, blackberry, wild rose, tall herbs. This species feeds in grassland and cropland habitats and breeds locally in northeastern California. In winter, tricolored blackbirds become more widespread along central coast and San Francisco Bay area (Grinnell and Miller 1944, McCaskie et al. 1979, Garrett and Dunn 1981) and is found in portions of the Colorado Desert. Their numbers appear to be declining in California (DeHaven et al. 1975).

Their diet consists of insects and spiders, and seeds and cultivated grains, such as rice and oats. This species forages on ground in croplands, grassy fields, flooded land, and along edges of ponds. They seek cover in emergent wetland vegetation, especially cattails and tules; also in trees and shrubs. Tricolored blackbirds roosts in large flocks in emergent wetland or in trees (Terres 1980).

Their nests are in dense cattails or tules, as well as thickets of willow, blackberry, wild rose, tall herbs. Nests are usually located a few feet over, or near, fresh water and may be hidden on ground among low vegetation. Tricolored blackbirds build nests of mud and plant materials. This species is highly colonial. The nesting area must be large enough to support a minimum colony of about 50 pairs (Grinnell and Miller 1944). Their breeding season mid-April into late July.

**Golden eagle (*Aquila chrysaetos*) – Eagle Act, Birds of Conservation Concern (BCC), California Fully Protected (CFP) (nesting and wintering)**

The golden eagle is an uncommon permanent resident and migrant throughout California, except in the center of Central Valley. This species is more common in southern California than in the north. The golden eagle ranges from sea level up to 11,500 ft (3833 m) (Grinnell and Miller 1944). Their habitat typically includes rolling foothills, mountain areas, sage-juniper flats, and deserts.

This species eats mostly lagomorphs and rodents, but will also take other mammals, birds, reptiles, and some carrion. The diet is most varied in nonbreeding season. This species requires open terrain for hunting, such as grasslands, deserts, savannahs, and early successional stages of forest and shrub habitats. This species soars 98 to 297 ft (30 to 90 m) above ground in search of prey, or makes low, quartering flights, often 23 to 26 ft (7 to 8 m) above ground. They occasionally search from a perch and fly directly to prey (Carnie 1954) and sometimes pirates food from other predators. It is common for golden eagles to hunt in pairs.

Golden eagles use secluded cliffs with overhanging ledges and large trees for cover. This species nests on cliffs of all heights and in large trees in open areas. Alternative nest sites are maintained, and old nests are reused. Golden eagles build large platform nests, often 10 ft (3 m) across and 3 ft (1 m) high, of sticks, twigs, and greenery. Rugged, open habitats with canyons and escarpments used most frequently for nesting. Golden eagles use rolling foothills and mountain terrain, wide arid plateaus deeply cut by streams and canyons, open mountain slopes, and cliffs and rock outcrops. This species breeds from late January through August; peak in March through July. Clutch size two to three. Eggs are laid in early February to mid-May. Incubation is 43-45 days (Beebe 1974), and nestling period is usually 65-70 days.

**Grasshopper sparrow (*Ammodramus savannarum*) – CSC**

The grasshopper sparrow is an uncommon and local summer resident and breeder along the western edge of the Sierra Nevada and most coastal counties south to Baja California. This species occurs in dry, dense grasslands with tall forbs and scattered scrubs for singing perches. In southern California, grasshopper sparrows occur mainly on hillsides and mesas in coastal districts, but has bred up to 5,000 ft (1500 m) in San Jacinto Mts. They have also has been found in Shasta Valley, Siskiyou County.

Grasshopper sparrows feed on insects and other invertebrates, as well as grass and forb seeds. They forage on the ground within relatively dense grasslands. Dense grasslands are also essential for concealment for this species, as well as nesting habitat. Grasshopper sparrows breed from early April to mid-July, with peak in May and June. A pair nests solitarily and clutch size is about 4 to 5 eggs.

**Vaux's swift (*Chaetura vauxi*) –CSC**

The Vaux's swift is a summer resident of California. This species breeds in the Coast Ranges from northern Sonoma County, and south to Santa Cruz County; in the Sierra Nevada; and the Cascade Range. Vaux's swift prefers redwood and Douglas-fir habitats with nest sites in large hollow trees and snags. Vaux's swift breed from early May to mid-August with a clutch size of about 3-7 eggs.

Vaux's swift feeds on flying insects that are taken in long, continuous foraging flights. They feed high in the air over most terrains and habitats. The most important habitat requirement is an appropriate nest site in a large, hollow tree. Vaux's swift have shown to have a preference for foraging over rivers and lakes. This species is a fairly common migrant throughout most of the state in April and May, and August and September.

**Northern harrier (*Circus cyaneus*) – BCC, CSC**

The northern harrier occurs from annual grassland up to lodgepole pine and alpine meadow habitats, as high as 10,000 ft (3,000 m). This species breeds from sea level to 5,700 ft (1,700 m) in the Central Valley and Sierra Nevada, and up to 3,600 ft (800 m) in northeastern California (CDFW 2022). The northern harrier frequents meadows, grasslands, open rangelands, desert sinks, fresh and saltwater emergent wetlands and are seldom found in wooded areas.

This species is a permanent resident of the northeastern plateau and coastal areas and a less common resident of the Central Valley. The California population has decreased in recent decades (Grinnell and Miller 1944, Remsen 1978), but can be locally abundant where suitable habitat remains free of disturbance, especially from intensive agriculture. The breeding population has shown a decline, especially in the southern coastal district. Destruction of wetland habitat, native grassland, and moist meadows, and burning and plowing of nesting areas during early stages of breeding cycle, are major reasons for the decline (Remsen 1978). Northern harriers feed on small mammals, birds, frogs, small reptiles, insects, and crustaceans. Makes low, quartering flights 3 to 30 ft (1 to 9 m) above open ground. This species dives from flight or hover and rarely perches and pounces on prey.

Nests are located on the ground in shrubby vegetation, usually at marsh edge (Brown and Amadon 1968). The nest is built of a large mound of sticks on wet areas, and a smaller cup of grasses on dry sites. Northern harriers mostly nest in emergent wetland or along rivers or lakes, but may nest in grasslands, grain fields, or on sagebrush flats several miles from water. They breed from April to September, with peak activity June through July.

**Southwestern willow flycatcher (*Empidonax traillii extimus*) – FE, CFP**

The southwestern willow flycatcher are present in California from late April to September (Biosystems Analysis 1989). Their elevational range extends from near sea level to over 8,530 ft (0-2,600 m) with the majority of territories below 5,250 ft (1,600 m) (Durst et al. 2008). Spring migration peaks in mid-May and fall migration extends from mid-August to early September (Biosystems Analysis 1989). Habitat for southwestern willow flycatcher includes riparian and wetland thickets, generally of willow, tamarisk, or both, sometimes boxelder or Russian olive (USFWS 2013).

Habitat patches comprising mostly native vegetation account for fewer than half (44 percent) of the known flycatcher territories (Durst et al. 2008). Habitat patches as small as 0.5 ha can support one or two nesting pairs (USFWS 1993). Nests are typically placed in trees where the plant growth is most dense, where trees and shrubs have vegetation near ground level, and where there is a low-density canopy (USFWS 2013).

Many migrants occur in riparian habitats or patches (small areas of riparian vegetation) that would be unsuitable for nest placement (the vegetation structure is too short or sparse, or the patch of vegetation is too small). In these drainages, migrating flycatchers may use a variety of riparian habitats, including ones dominated by native or exotic plant species, or mixtures of both (USFWS 2013).

This species' diet consists of mainly insects caught in flight, sometimes gleans insects from foliage, and occasionally eats berries. In breeding range, this species forages within and occasionally above dense riparian vegetation. Southwestern willow flycatchers arrive on breeding grounds in late April to early May. Nesting begins in late May and early June, with fledging from late June to mid-August. They typically lay three to four eggs per clutch, laid at one day intervals and are incubated by the female for about 12 days. Young birds fledge 12 to 13 days after hatching. Southwestern willow flycatchers only raise one brood per year; however, some pairs will raise a second brood, or re-nest after a nest failure.

USFWS Critical Habitat has been designated for the southwestern willow flycatcher, however, there is no Critical Habitat in the Project vicinity. Critical Habitat for the southwestern willow flycatcher is located along the South Fork Kern River, upstream of Lake Isabella. In California, the Critical Habitat is located on a combination of Federal, State, tribal, and private lands in Inyo, Kern, Los Angeles, Riverside, Santa Barbara, San Bernardino, San Diego, and Ventura Counties (USFWS 2013).

Recovery efforts for this species are described in the Final Recovery Plan for Southwestern Willow Flycatcher (USFWS 2002). The Project area is within the Basin and Mojave Recovery Unit and the Kern Management Unit.

**Prairie falcon (*Falco mexicanus*) – WL (nesting)**

Prairie falcon is an uncommon permanent resident that ranges from southeastern deserts northwest throughout the Central Valley and along the inner Coast Ranges and Sierra Nevada. This species is distributed from annual grasslands to alpine meadows, but associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. They are mostly absent from northern coastal fog belt and are not found in the upper elevations of Sierra Nevada. This species eats mostly small mammals, some small birds, and reptiles. Prairie falcon catches their prey in the air and on the ground in open areas.

This species dives from a perch with rapid pursuit, or dives from searching flight 50 to 300 ft (15 to 90 m) above ground. They require sheltered cliff ledges for cover. Prairie falcon usually nest in a scrape on a sheltered ledge of a cliff overlooking a large, open area and sometimes nest on old raven or eagle stick nest on cliff, bluff, or rock outcrop. Aerial courtship display occurs near nest site. Nest sites are usually facing southeast. This species uses open terrain for foraging; nests in open terrain with canyons, cliffs, escarpments, and rock outcrops. Prairie falcon breed from mid-February through mid-September, with peak April to early August. The clutch size is 3 to 6 eggs, with an average of 5. Young falcons begin to disperse in June and July and may live as long as 13 to 20 years (Enderson 1969, Denton 1975).

**American peregrine falcon (*Falco peregrinus anatum*) – FD, BCC, State Delisted (SD), CFP**

The habitat of the peregrine falcon includes many terrestrial biomes in North America. Most often, breeding peregrine falcons utilize habitats containing cliffs and almost always nest near water (Wheeler 2003, White et al. 2002). Peregrine falcons generally utilize open habitats for foraging. Non-breeding peregrine falcons may also occur in open areas without cliffs. Many artificial habitats like towers, bridges and buildings are also utilized by peregrine falcons (White et al. 2002).

Peregrine falcons prey on a select group of species in regional and local areas, and their selections may vary seasonally. Their prey mainly consists of birds ranging from small passerines to mid-sized waterfowl. They may also feed on bats. Juveniles primarily feed on large flying insects (Wheeler 2003). Peregrine falcons are active throughout the day from dawn to dusk and can even be nocturnal. They usually hunt in the morning and late evening (Wheeler 2003). Peregrine falcons are aerial and perching hunters that rarely scavenge. From perches, peregrines dive quickly to capture prey. In an aerial attack, peregrine falcons will dive at high speed while gliding, soaring or kiting at a low altitude. Prey is often eaten while soaring, gliding or kiting (Wheeler 2003).

The breeding range of the peregrine falcon is significantly diminished from its original range due to the impacts of dichloro-diphenyl-trichloroethane (DDT) and other chemical poisons; and is local and spotty throughout most of North America. Areas where the range is particularly diminished are the mid-western and eastern United States, where most of the distribution is urban, but reportedly growing quickly. Areas of Alaska and the western United States including Utah, Arizona, western Colorado and northern California are where the peregrine falcon is most widely found (White et al. 2002).

The peregrine falcon is a long-distance migrant that travels one of the longest distances of any raptor and may undertake long water crossings. The peregrine has clear migration routes which either occur along leading lines or coastal areas with ideal habitat on the Eastern and Gulf Coasts and Eastern Mexico such as Chincoteague and Assateague Island in Maryland and Virginia and Padre Island, Texas and Veracruz, Mexico. Peregrines also migrate in lesser concentrations along shores of the Great Lakes, the West Coast of the United States, western Mexico, and the eastern front of the Rocky Mountains (Goodrich and Smith 2008). It is a leap-frog migrant that commonly follows leading and diversion lines and that travels alone or in small groups of 10 to 20 individuals. Peregrine falcons hunt during migration and may stay as long as eight days at stopovers for this purpose. Satellite tracked individuals have been shown to migrate distances of between 87 to 124 miles per day. Migration for peregrine falcons occurs mostly from morning through late afternoon. Migration movements can be broad front or narrow front in form.

The peregrine falcon is known to migrate at heights at or below 2,953 ft (900 m). Peregrine falcons build their nests in substrates on ledges of cliffs ranging from 26 to 1,312 ft (8 to 400 m) in height. The male creates a depression in the substrate by scraping it with his feet. Most peregrine falcons will use ledges used by other peregrines in previous years. Peregrines arrive at nest sites around April or May and egg laying may begin from two weeks to two months later depending on the latitude. Designated Critical Habitat was removed for the American peregrine falcon when the species was delisted on August 25, 1999 (USFWS 2003).

**Bald eagle (Haliaeetus leucocephalus) – Federal Delisted (FD), Eagle Act, FSCC, BCC, CE, CFP**

The bald eagle is a permanent resident, and uncommon winter migrant, now restricted to breeding mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties. About half of the wintering population is in the Klamath Basin. This species is more common at lower elevations and not found in the high Sierra Nevada. Bald eagles are fairly common as a local winter migrant at a few favored inland waters in southern California. Largest numbers of bald eagles occur at Big Bear Lake, Cachuma Lake, Lake Mathews, Nacimiento Reservoir, San Antonio Reservoir, and along the Colorado River.

This species requires large bodies of water, or free flowing rivers with abundant fish, and adjacent snags or other perches. Bald eagles swoop from hunting perches, or soaring flight, to pluck fish from water. They will wade into shallow water to pursue fish. In flooded fields, bald eagles occasionally pounce on displaced voles, or other small mammals. Groups may feed gregariously, especially on spawning fish. This species scavenges dead fish, water birds, and mammals.

Bald eagles perch high in large, stoutly limbed trees, on snags or broken-topped trees, or on rocks near water. They roost communally in winter in dense, sheltered, remote conifer stands. In Klamath National Forest, winter roosts were 16-19 km (10-12 mi) from feeding areas (Spencer 1976b). This species nests in large, old-growth, or dominant live tree with open branch work, especially ponderosa pine. Their nests most frequently occur in stands with less than 40% canopy, but there is usually some foliage shading the nest (Call 1978).

The nests are usually located in the largest tree in a stand on which to build stick platform nest and located 50 to 200 ft (16 to 61 m) above ground, usually below tree crown and near a permanent water source. The species of the tree is not so important as height and size. Bald eagles require large, old-growth trees or snags in remote, mixed stands near water.

No Critical Habitat has been established for the bald eagle in the lower 48 States.

**Yellow-breasted chat (*Icteria virens*) – CSC**

The yellow-breasted chat is the largest warbler, with an approximate length of 6.25 inches. This species requires dense, brushy thickets and tangles near water, and thick understory in riparian woodland. The nest is usually 2 to 8 feet above ground in dense shrubs along a stream or river. Breeding occurs from early May into early August with peak activity in June. The species is monogamous and lays 3 to 6 eggs. Incubation lasts 11 to 15 days, and chicks apparently fledge in 8 to 11 days. Altricial young are tended by both parents until fledging.

The yellow-breasted chat is an uncommon summer resident and migrant in coastal California and in the foothills of the Sierra Nevada up to 4,800 feet in valley foothill riparian and up to 6,500 feet east of the Sierra Nevada in desert riparian habitats. It is uncommon along the coast of northern California and occurs only locally south of Mendocino County. In southern California, it breeds locally on the coast and very locally inland. During migration, it may be found in lower elevations of mountains in riparian habitat.

Within the Central Sierra west slope mountains and foothills, the yellow-breasted chat occurs in valley foothill riparian habitats of the Sierra Nevada up to 4,800 feet.

**Loggerhead shrike (*Lanius ludovicianus*) –CSC**

The loggerhead shrike is widespread throughout the United States, Mexico, and portions of Canada (Humple 2008). They are a yearlong resident species in most of the United States, including from California east to Virginia and south to Florida, and in Mexico. They also summer and breed in portions of southern Alberta, Saskatchewan, in Canada (Humple 2008). The largest populations are concentrated in Texas and Louisiana (Humple 2008). Northerly breeding populations migrate to warmer locations during winter, including to the Atlantic and south Pacific coasts in Mexico (Small 1994; Yosef 1996). In California, while shrikes are widespread at the lower elevations in the State, the largest breeding populations are located in portions of the Central Valley, the Coast Ranges, and the southeastern deserts (Humple 2008).

Preferred habitats for the loggerhead shrike are open areas that include scattered shrubs, trees, posts, fences, utility lines, or other structures that provide hunting perches with views of open ground, as well as nearby spiny vegetation or manmade structures (such as the top of chainlink fences or barbed wire) that provide a location to impale prey items for storage or manipulation (Humple 2008). Loggerhead shrikes occur most frequently in riparian areas along the woodland edge, grasslands with sufficient perch and butcher sites, scrublands, and open canopied woodlands, although they can be quite common in agricultural and grazing areas, and can sometimes be found in mowed roadsides, cemeteries, and golf courses. Loggerhead shrikes occur only rarely in heavily urbanized areas. For nesting, the height of shrubs and presence of canopy cover are most important (Yosef 1996).

Loggerhead shrikes prey mainly on arthropods (primarily grasshoppers, crickets, beetles, and caterpillars), but also take reptiles, amphibians, fish, small birds, and rodents (Humple 2008). In the west, their diet consists mostly of insects (Yosef 1996). They are opportunistic feeders and adjust their diet based on prey availability.

The loggerhead shrike's breeding territory is usually the same as its winter territory and it may defend territories year-round (Yosef 1996). In Contra Costa and Kern counties in California, territories averaged 18.7 acres (Yosef 1996). Loggerhead shrikes are monogamous, and individuals may remain paired during the winter in sedentary populations. In California, they lay four to eight eggs from March into May (Yosef 1996). Eggs hatch in 14 to 15 days and young are fledged after 18 to 19 days (Yosef 1996). Nest sites are chosen based more on the cover than the particular vegetation species. They are usually constructed in a dense shrub or tree well below the crown and are well concealed (Yosef 1996). The heights of nests vary depending on the shrub or tree used for nesting, but the heights of nests increase as the breeding season progresses, probably due to weather conditions (Yosef 1996).

**Purple martin (*Progne subis*) – CSC**

The purple martin is the largest swallow, with an approximate length of 7 inches, and inhabits open forests, woodlands, and riparian areas in the breeding season. It is found in a variety of open habitats during migration, including grassland, wet meadow, and fresh emergent wetland, usually near water. It usually nests in an old woodpecker cavity, sometimes in a human-made structure (e.g., nesting box, bridge, or culvert). Nests are often located in a tall, old, isolated tree or snag in open forest or woodland. Nesting occurs from April to August, with peak activity in June. The pair nests colonially or singly and lays three to eight eggs. It may raise two broods per year. Altricial young are tended by both parents and leave the nest at 24 to 31 days.

The purple martin is an uncommon to rare, local summer resident in a variety of wooded, low-elevation habitats throughout the state, a rare migrant in spring and fall, and absent in winter. The breeding range extends east to Modoc and Lassen counties.

The purple martin uses valley foothill and montane hardwood, valley foothill and montane hardwood-conifer, and riparian habitats, and also occurs in coniferous habitats, including ponderosa pine and Douglas-fir. It is absent from higher slopes of the Sierra Nevada.

**Yellow warbler (*Setophaga petechica*) – CSC**

Yellow warbler breeding distribution includes from the coast range in Del Norte County, east to Modoc plateau, south along coast range to Santa Barbara and Ventura counties and along western slope of Sierra Nevada south to Kern County. This species also breeds along eastern side of California from the Lake Tahoe area south through Inyo County, as well as several southern California mountain ranges and throughout most of San Diego County. The yellow warbler winters in Imperial and Colorado River valleys and breeds in riparian woodlands from coastal and desert lowlands up to 8,000 ft (2,500 m) in the Sierra Nevada. Yellow warbler also breed in montane chaparral, and in open ponderosa pine and mixed conifer habitats with substantial amounts of brush. The numbers of breeding pairs have declined dramatically in recent decades in many lowland areas (southern coast, Colorado River, San Joaquin and Sacramento valleys). They are now rare to uncommon in many lowland areas where formerly common (McCaskie et al. 1979, Garrett and Dunn 1981). This species is a common migrant on Channel and Farallon Islands in spring and fall (DeSante and Ainley 1980, Garrett and Dunn 1981). Yellow warblers mostly eat insects and spiders. They glean and hover in the upper canopy of deciduous trees and shrubs. Occasionally hawks insects from air, or eats berries (Bent 1953, Ehrlich et al. 1988). Yellow warblers are usually found in riparian deciduous habitats in summer: cottonwoods, willows, alders, and other small trees and shrubs typical of low, open-canopy riparian woodland. This species also breeds in montane shrubbery in open conifer forests; perhaps a recent phenomenon (Gaines 1977). In migration, this species visits woodland, forest, and shrub habitats. The yellow warbler's nest is an open cup placed 2 to 16 ft (0.6 to 5 m) above ground in a deciduous sapling or shrub. Their territory often includes tall trees for singing and foraging and a heavy brush understory for nesting (Ficken and Ficken 1966). Yellow warblers frequent open to medium-density woodlands and forests with a heavy brush understory in breeding season. In migration, they can be found in a variety of sparse to dense woodland and forest habitats. This species breeds from mid-April into early August with peak activity in June. A pair breeds solitarily. The yellow warbler lays 3 to 6 eggs (usually 4 or 5); incubated by female for 11 days. Altricial young are tended by both parents until fledging at 9 to 12 days (Harrison 1978). The young breed the following year.

**California spotted owl (*Strix occidentalis occidentalis*) – BCC, FSCC, CSC**

California spotted owl is an uncommon, permanent resident in suitable habitat. In northern California, resides in dense, old-growth, multi-layered mixed conifer, redwood, and Douglas-fir habitats, from sea level up to approximately 7,600 ft (0 to 2300 m). In southern California, California spotted owls are nearly always associated with oak and oak-conifer habitats (Garrett and Dunn 1981). Their breeding range extends west of the Cascade Range through the North Coast Ranges, the Sierra Nevada, and in more localized areas of the Transverse and Peninsular Ranges. This species may move downslope in winter along the eastern and western slopes of the Sierra Nevada, and in other areas.

California spotted owls feed in forest habitats upon a variety of small mammals, including flying squirrels, woodrats, mice and voles, and a few rabbits, as well as small birds, bats, and large arthropods. This species usually searches from a perch and swoops or pounces on prey in vegetation or on the ground and may cache excess food. California spotted owls use dense, multi-layered canopy cover for roost seclusion. Roost selection appears to be related closely to thermoregulatory needs since they are intolerant of high temperatures. They roost in dense overhead canopy on north-facing slopes in the summer. In the winter, their roosts are in oak habitats. In northern regions of the state, daytime roosts averaged 549 ft (165 m) from water. In southern regions, daytime roosts averaged only 173 ft (51 m) from water (Barrows and Barrows 1978). This species usually nests in tree or snag cavity, or in the broken top of large tree. Nests are jess frequently in large mistletoe clump, abandoned raptor or raven nest, in cave or crevice, on cliff or ground (Call 1978). Mature, multi-layered forest stands are required for breeding (Remsen 1978). Their nests are usually placed 30 to 180 ft (9 to 55 m) above the ground. California spotted owls may reduce heat stress by bathing (Barrows and Barrows 1978, Barrows 1981). This species requires blocks of 100-600 acres of mature forest with permanent water and suitable nesting trees and snags (Forsman 1976). In northern California, spotted owls prefers narrow, steep-sided canyons with north-facing slopes.

**Pallid bat (*Antrozous pallidus*) – FSCC, CSC**

The pallid bat is a locally common species of low elevations in California. It occurs throughout California except for the high Sierra Nevada from Shasta to Kern counties, and the northwestern corner of the state from Del Norte and western Siskiyou counties to northern Mendocino County. The pallid bat occupies a wide variety of habitats, including grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. The species is most common in open, dry habitats with rocky areas for roosting. This species is a yearlong resident in most of the range. The pallid bat takes a wide variety of insects and arachnids, including beetles, orthopterans, homopterans, moths, spiders, scorpions, solpugids, and Jerusalem crickets. The stout skull and dentition of this species allows it to take large, hard-shelled prey.

The pallid bat forages over open ground, usually 1.6 to 8 ft (0.5 to 2.5 m) above ground level. Foraging flight is slow and maneuverable with frequent dips, swoops, and short glides. Many prey of the pallid bat are taken on the ground. Gleaning is frequently used, and a few prey are taken aerially. This species can maneuver well on the ground and may carry large prey to a perch or night roost for consumption. The pallid bat uses echolocation for obstacle avoidance, and possibly utilizes prey-produced sounds while foraging.

Their day roosts are in caves, crevices, mines, and occasionally in hollow trees and buildings. Their roost must protect them from high temperatures. Bats move deeper into cover if temperatures rise. Night roosts may be in more open sites, such as porches and open buildings. There are few hibernation sites that are known, but possibly uses rock crevices. Maternity colonies form in early April and may have a dozen to 100 individuals. Males may roost separately or in the nursery colony. This species prefers rocky outcrops, cliffs, and crevices with access to open habitats for foraging.

**Ringtail (Bassariscus astutus) – CFP**

Widely distributed, common to uncommon permanent resident. Occurs in various riparian habitats, and in brush stands of most forest and shrub habitats, at low to middle elevations. Little information is available on distribution and relative abundance among habitats (Grinnell et al. 1937, Schempf and White 1977). Primarily carnivorous, eating mainly rodents (woodrats and mice) and rabbits. Also takes substantial amounts of birds and eggs, reptiles, invertebrates, fruits, nuts, and some carrion (Taylor 1954, Trapp 1978). Forages on ground, among rocks, in trees; usually near water. Hollow trees, logs, snags, cavities in talus and other rocky areas, and other recesses are used for cover. Nests in rock recesses, hollow trees, logs, snags, abandoned burrows, or woodrat nests. Usually not found more than 1 km (0.6 mi) from permanent water. Suitable habitat for ringtails consists of a mixture of forest and shrubland in close association with rocky areas or riparian habitats.

**Spotted bat (*Euderma maculatum*) – CSC**

The spotted bat is found mostly in foothills, mountains, and desert regions of southern California (Watkins 1977). Other habitats include arid deserts, grasslands, and mixed conifer forests. Elevational range extends from below sea level in California to above 10,000 ft (3,000 m) in New Mexico (Black and Cosgriff 1999).

This species mainly feeds on moths and occasionally beetles. The spotted bat feeds in flight, over water, and near the ground, using echolocation to find prey. Spotted bats prefer to roost in rock crevices and are occasionally found in caves and buildings. Cliffs provide optimal roosting habitat for spotted bats.

This species mates in autumn. Most births occur before mid-June. Females lactate from June to August, with one young produced per year.

**Western red bat (*Lasiurus blossevillii*) – CSC**

The western red bat occurs in California from Shasta County and Mendocino County in the north, and through the central coastal region and the Central Valley west of the Sierra Nevada/Cascade ranges to coastal southern California (Cryan 2003; Zeiner et al. 1990), east into Arizona and New Mexico, and south into Baja California and mainland Mexico to South America (Cryan 2003). The species does not occur in desert regions. The western red bat had been considered a subspecies of the red bat (*L. borealis teliotis*) (Shump and Shump 1982), but more recent genetic studies separated the red bat into two species: the western red bat and the eastern red bat (*L. borealis*) (Baker et al. 1988; Morales and Bickham 1995). Morales and Bickham (1995) used mitochondrial DNA (mtDNA) to support the separation of the two species. The western red bat is considered locally common. The species inhabits California year-round but makes seasonal movements within the state and, possibly, to Arizona and New Mexico (Cryan 2003).

There is little ecological information specifically for the western red bat; most studies are based on the red bat before it was separated into the western and eastern species. This species account is, therefore, based primarily on information for the red bat before it was separated into the two species.

Red bats (*Lasiurus* spp.) typically roost in trees, occasionally in shrubs, and even on the ground (Shump and Shump 1982). They are usually solitary, but different bats may use different roosts on different days, and they occasionally form nursery colonies. Day roosts are commonly located in edge habitats adjacent to streams, open fields, and urban areas (Shump and Shump 1982).

Red bats take a variety of prey, including moths, crickets, flies, true bugs, beetles, and cicadas (Shump and Shump 1982). They generally forage in grasslands, shrublands, open woodlands, and croplands, but they also take advantage of congregations of insects attracted to streetlights and building floodlights.

Births occur in about mid-June and young develop rapidly, with flight occurring by 21 to 42 days of age (Shump and Shump 1982).

**Tulare grasshopper mouse (*Onychomys torridus tularensis*) – CSC**

Tulare grasshopper mice are common in arid desert habitats of the Mojave Desert and southern Central Valley of California. Alkali desert scrub and desert scrub habitats are preferred, with somewhat lower densities expected in other desert habitats, including succulent shrub, wash, and riparian areas. This species also occurs in coastal scrub, mixed chaparral, sagebrush, low sage, and bitterbrush habitats. They are uncommon in valley foothill and montane riparian, and in a variety of other habitats (CDFW 2022).

The Tulare grasshopper mouse feeds almost exclusively on arthropods, especially scorpions and orthopteran insects (Horner et al. 1964). Sperry (1929) found the diet composed of 56% grasshoppers, crickets, caterpillars, and moths, and 21% ground and darkling beetles and less than 5% was seeds. Vertebrate prey includes salamanders, lizards, frogs, and small mammals (McCarty 1975). Both vertebrates and seeds are minor components of the diet (Bailey and Sperry 1929, Horner et al. 1964).

Nests are constructed in burrows abandoned by other rodents (Bailey and Sperry 1929) or may be excavated. Peak breeding is from May to July but may start in January under ideal conditions (Pinter 1970) and may continue year round. Gestation is 27 to 30 days. The Tulare grasshopper mouse has a litter size that averages four young. As many as six litters per year an occur in wild. Both males and females care for the young (Horner 1961). Weaning in the laboratory for this species may occur in 20 days (Horner and Taylor 1968). Young females apparently have significantly greater reproductive potential than old females (McCarty 1975). Males store sperm at 40 days of age. Females can become receptive at six weeks of age.

**American badger (*Taxidea taxus*) – CSC**

The American badger is an uncommon, permanent resident found throughout most of the state, except in the northern North Coast area (Grinnell et al. 1937). They are most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Badgers are carnivorous. They eat fossorial rodents: rats, mice, chipmunks, and especially ground squirrels and pocket gophers. This species also eats some reptiles, insects, earthworms, eggs, birds, and carrion. Their diet shifts seasonally and yearly in response to availability of prey.

Badgers dig burrows in friable soil for cover. American badgers frequently reuse old burrows, although some may dig a new den each night, especially in summer (Messick and Hornocker 1981). Their young are born in burrows dug in relatively dry, often sandy, soil, usually in areas with sparse overstory cover. Suitable habitat for badgers is characterized by herbaceous, shrub, and open stages of most habitats with dry, friable soils.

**San Joaquin kit fox (*Vulpes macrotis mutica)* – FE, ST**

The San Joaquin kit fox is an uncommon to rare, permanent resident of arid regions of the southern half of the state (Grinnell et al. 1937). This species lives in annual grasslands or grassy open stages of vegetation dominated by scattered brush, shrubs, and scrub.

Kit foxes primarily are carnivorous. The principal foods are black-tailed jackrabbits and desert cottontails, rodents (especially kangaroo rats and ground squirrels), insects, reptiles, and some birds, bird eggs, and vegetation (Egoscue 1962, Laughrin 1970, Morrell 1971, 1972, Orloff et al. 1986). They hunt by searching, meandering, circling clumps of brush, and wandering back and forth between clumps of vegetation. They dig their dens, which provides cover in open, level areas with loose-textured, sandy, and loamy soils (Laughrin 1970, Morrell 1972).

Kit foxes usually are monogamous, but polygamy apparently is also common (McGrew 1979). Most pups are born February through April, following a gestation period of 49 to 55 days (Egoscue 1962). One litter per year of about four pups (McGrew 1979). Pups are weaned at about four to 5 months of age. Males and females sexually mature in their second year. In Utah, Egoscue (1975) found a known-age individual of seven years at last capture.

Kit foxes play important roles in their respective ecosystems as "architects of subterranean burrows", which in turn provide cover for many other species (Thacker and Flinders 1999). Kit foxes use dens throughout the year. Nocturnal activity and regular use of dens are important adaptations for thermal regulation and water conservation (Golightly 1981). Potential predators are coyotes, large hawks and owls, eagles, and bobcats. Cultivation has eliminated much habitat. Kit foxes are vulnerable to many human activities, such as hunting, use of rodenticides and other poisons, off-road vehicles, and trapping.

There is no designated habitat for the San Joaquin kit fox, however this species is covered under the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998), where three geographically-distinct core populations are protected and managed: 1) Carrizo Plain Natural Area in San Luis Obispo County, 2) natural lands of western Kern County, and 3) the Ciervo-Panoche Natural Area of western Fresno and eastern San Benito Counties. The Project does not overlap with these areas.

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## LIST OF MAPS

## LIST OF ACRONYMS

| | |
|---|---|
| CDC | California Department of Conservation |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| Commission | Federal Energy Regulatory Commission |
| FERC | Federal Energy Regulatory Commission |
| msl | mean sea level |
| Mw | Moment magnitude |
| Project | Kern River No. 1 Hydroelectric Project |
| SCE | Southern California Edison Company |
| USACE | United States Army Corps of Engineers |
| USGS | United States Geological Survey |
| Watershed | Kern River Watershed |

## 3.7 GEOLOGY AND SOILS

This section describes the geology and soils in the vicinity of the Kern River No. 1 Hydroelectric Project (Project) and surrounding area. The Federal Energy Regulatory Commission's (FERC or Commission) content requirements for this report are specified in Title 18 of the Code of Federal Regulations (CFR) Chapter I § 5.6(d)(3)(ii).

As required, this section provides: (1) a description of the geologic setting in the vicinity of the Project, including a description of the bedrock lithology, structural features, unconsolidated deposits, and mineral resources; (2) a description of faulting and seismicity; 3) a description of the soils, including factors pertaining to soil movement and erodibility; and (4) a description of the shorelines and streambanks associated with the Project. In addition, this section identifies Project facilities or operations that are known to or may cause erosion and instability. The information presented in this section focuses on those aspects of the geologic environment that are pertinent to hydropower facilities and/or may affect stream conditions. In addition, Section 3.8 Geomorphology summarizes existing information regarding channel geomorphology and associated fluvial processes in the bypass reach[1].

### 3.7.1 Information Sources

This section was developed using existing information available in the following primary sources. Additional references are cited in the text, as appropriate.

- FERC's Final Environmental Assessment for Hydropower License, Kern River No. 1 Hydroelectric Project (FERC 1998)
- USACE (U.S. Army Corps of Engineers, Sacramento District), Isabella Lake dam Safety Modification Project Environmental Impact Statement (2012)
- California Department of Conservation, Alquist-Priolo earthquake mapping (2015)
- United States Geological Survey (USGS) data bases

### 3.7.2 Geologic Setting

The Project is situated along the western slope of the Sierra Nevada within the Kern River Valley, at elevations ranging from approximately 1,950 feet above mean sea level (msl) in the vicinity of Democrat Diversion Dam, to 950 msl at the Kern River No. 1 Powerhouse. The Kern River Watershed in the vicinity of the Project is characterized by steep canyons with narrow "V-shaped" valley bottoms and steep, deeply-incised channels. Topography in the Project vicinity is shown on Map 3.7-1.

[1] A bypass reach is a segment of a river downstream of a diversion facility where Project operations result in the diversion of a portion of the water from the river.

#### 3.7.2.1 Bedrock Lithology

The Project vicinity is primarily underlain with Precambrian to Cenozoic plutonic rocks consisting of granodiorite of the Sierra Nevada batholith as shown on Map 3.7-2. A small body of mafic intrusive igneous rocks, primarily gabbro, is also present and associated with a pre-Quaternary fault that transects the Project in a northwest-southeast direction. A basic geologic time scale is provided in Table 3.7-1 for reference.

#### 3.7.2.2 Structural Features

There are multiple plutons that make up the entire batholith that were uplifted and exposed at different times throughout the entire range of the Sierra Nevada. The Kern River at its northern reaches is made up of intrusive (granite) and extrusive (lava) material near the Golden Trout Volcanic field. Although intrusive material makes up the bulk of the rock throughout the entire reach of the river, there are also noticeable areas of metasedimentary rock outcrops and limestone dikes in the lower reaches south of the Project. Metasedimentary rock outcrops and limestone dikes are not found within the Project.

#### 3.7.2.3 Unconsolidated Sediments

Unconsolidated sediments in the Project vicinity are generally limited to surface soils, and recent alluvium deposited in the stream and river courses and associated terraces.

#### 3.7.2.4 Mineral Resources

Historic and current mining activity in the Kern River Watershed including the Project vicinity are shown on Map 3.7-3. Historically, there has been some mining for gold and uranium and to a lesser extent copper and silver in the watershed and Project vicinity (USACE 2022). Gold occurs in quartz veins and in placer deposits. As shown on the Map 3.7-3, in the vicinity of the Project there are several gold mining sites, that status of which are unknown or known as a past producer.

### 3.7.3 Faulting and Seismicity

Map 3.7-4 displays fault age and seismicity date within a 100-mile radius of the Project. The nearest known active fault is the Kern Canyon Fault located approximately 8.5 to 10 miles east-northeast of the Project. It is a northeast-southwest trending fault that extends from the mouth of the Kern River Canyon, through Lake Isabella, towards the northeast for approximately 69 miles. Recent USACE field studies (2012) determined that the Kern Canyon Fault is active and capable of producing a 7.5-magnitude earthquake. The last known movement on the Kern Canyon Fault appears to have occurred during the past 2,500 to 4,000 years, with an average interval between large earthquakes of about 3,200 years (USACE 2012). A moderate to large earthquake on this fault would likely produce severe ground shaking in the Project vicinity.

As discussed in Section 3.7.2.1, an unnamed pre-Quaternary fault has been mapped and transects the Project in a northwest-southeast direction (Map 3.7.2). The fault location is approximated as it transects the Project. Due to the age faulting (pre-Quaternary), the fault is not considered active (e.g., last 11,000 years).

There are no Alquist-Priolo Earthquake Fault Zones identified in the Project vicinity (CDC 2015). The closest known Alquist-Priolo Earthquake Fault Zone occurred as ground breaks and are located approximately 6.3 miles southwest of the Kern River No. 1 Powerhouse (Map 3.7-2). These ground breaks occurred during the 1952 earthquake event that measured 7.2 on the moment magnitude (Mw) scale and occurred near Wheeler Ridge (Map 3.7-4). The 1952 event damaged the Isabella Dam while it was under construction (USACE 2012).

Map 3.7-4 also shows the known earthquakes that have occurred within 100 miles of the Project. The known occurrence or frequency of earthquakes (seismicity) ranges in date from 1800 to the present (USACE 2023). Earthquakes ranging from 4.0 Mw to 5.0 Mw have occurred within the vicinity of the Project, with larger but infrequent, earthquakes having occurred within 100 miles of the Project.

### 3.7.4 Soils

Soils found within 0.5 mile of Project are shown on Map 3.7-5. Descriptions of each soil shown on the map, including taxonomy, parent rock, vegetation, and erodibility (K-Factor) are summarized in Table 3.7-2 and organized by the soil codes identified on Map 3.7-5. The majority of the soils within 0.5 mile of the Project are shallow materials that have formed from weathered granitic rock. The K-Factor of the majority of the soils ranges from 0.24 to 0.28 which indicates that they are medium-textured soils and have properties in between those of sand and clay (loamy). They are moderately susceptible to detachment and produce moderate runoff. The K-Factor of soils in the southern area of the Project is 0.17 and are coarse-textured soils, such as sandy soils. The soils will produce low runoff even though these soils and easily detached. The soils within the limits of Kern River banks are river wash.

### 3.7.5 Shorelines and Streambanks

Very little shoreline along the Democrat Impoundment or stream banks exist within Project due to the “V-shaped” and steep, deeply incised channels. A description of the channel conditions in the river reaches downstream of the Project diversion dams is provided in Section 3.8 Geomorphology.

### 3.7.6 Erosion Associated with Project Facilities

#### 3.7.6.1 Hillslope Erosion

Hillslope erosion within the bypass reach occurs through mass wasting processes and road maintenance but is generally low. Mass wasting events, for example rock and mudslides can cause large amounts of debris to enter the channel. Sediments, coarse rubble, and finer grained sediments have historically contributed to the bypass reach from road maintenance and slope erosion (SCE 1998).

On September 10, 2013, SCE filed an incident report with FERC of a landslide initiated by a forebay spill. The report stated that due to a storm event, the Project forebay spilled and the pipe spillway was plugged, causing erosion below the forebay and along the pipe spillway. Rock and debris crossed State Route 178 and entered the Kern River. The State Regional Water Quality Control Board, California Department of Fish and Wildlife, and the United States Forest Service (Forest Service) were notified. SCE coordinated with the Forest Service to repair the damaged facilities.

#### 3.7.6.2 Streambank Erosion

The potential for bank erosion within the bypass reach is low due to the presence of bedrock and coarse boulder substrates that stabilize the streambed and banks. In addition, riparian vegetation generally acts to stabilize bars within the bypass reach, limiting streambank erosion.

### 3.7.7 Current Erosion Management

SCE prepared a Sediment Management Plan in association with the previous relicensing effort. The Sediment Management Plan includes a schedule for implementation of any additional monitoring; implementation of any changes in operation to manage sediment releases in the bypass reach; consultation with the appropriate federal and state agencies; and filing with FERC the results of monitoring and management, agency comments, and SCE's response to agency comments. The plan identifies any necessary adjustments to sediment releasing operations based on ongoing monitoring results. FERC approved the plan on April 6, 1999.

In addition, SCE is required to file project-specific resource plans in compliance with Forest Service 4(e) conditions. These require SCE to develop 1) a site-specific erosion and sediment control plan, 2) solid waste and waste water plan, and 3) a spoil disposal plan for each project. The plan for each project is approved by the Forest Service prior to construction.

### 3.7.8 References

CDC (California Department of Conservation). 2015. The Alquist-Priolo Earthquake Zoning Act. Available at: http://www.consrv.ca.gov/cgs/rghm/ap/Pages/main.aspx.

FERC (Federal Energy Regulatory Commission). 1998. Final Environmental Assessment for Hydropower License, Kern River No. 1 Hydroelectric Project, FERC Project No. 1930-014. California. June 17.

USACE (U.S. Army Corps of Engineers). Sacramento District. 2012. Isabella Lake Dam Safety Modification Project Environmental Impact Statement, Draft. March 2012. Available at: http://www.spk.usace.army.mil/Portals/12/documents/ usace_project_public_notices/ISABELLA_DSM_DEIS_Volume_I_13MAR12.pdf.

———. 2022. Mineral Resources Data System (MRDS). Available at: http://mrdata.usgs.gov/mrds/.

———. 2023. Earthquake Catalog, February 2023.

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# TABLES

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## Table 3.7-1. Simplified Geologic Time Scale*

| Eon | Era | Period | Years Before Present |
|---|---|---|---|
| Phanerozoic (542.0 mya to present) | Cenozoic (65.5 mya to present) | Quaternary | 2.6 mya to present |
| | | Holocene | 11,700 yrs to present |
| | | Pleistocene | 2.588 mya to 11,700 yrs |
| | | Tertiary | 65.5 to 2.6 mya |
| | Mesozoic (251.0 to 65.5 mya) | Cretaceous | 145.5 to 65.5 mya |
| | | Jurassic | 199.6 to 145.5 mya |
| | | Triassic | 251.0 to 199.6 mya |
| | Paleozoic (542.0 to 251.0 mya) | Permian | 299.0 to 251.0 mya |
| | | Carboniferous | 359.2 to 299.0 mya |
| | | Devonian | 416.0 to 359.2 mya |
| | | Silurian | 443.7 to 416.0 mya |
| | | Ordovician | 488.3 to 443.7 mya |
| | | Cambrian | 542.0 to 488.3 mya |
| Precambrian | | | |

* Adapted from Geologic Time Scale, University of California Museum of Paleontology (http://www.ucmp.berkeley.edu/help/timeform.php)

Notes:
mya = million years ago
yrs = years

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## Table 3.7-2. Description of Soils Within 0.5 Mile of the Project

| Code (Corresponds to Map 3.7-5) | Association | Soil Description | Slope | Taxonomy | Parent Rock | Erosion K Factor[1] | Vegetation |
|---|---|---|---|---|---|---|---|
| 139 | Riverwash | - | - | - | - | - | - |
| 201 | Cieneba-Rock Outcrop Complex | very shallow and shallow, somewhat excessively drained soils that formed in material weathered from granitic rock | 15 to 50 | Loamy, mixed, superactive, nonacid, thermic, shallow Typic Xerorthents | granite and other rocks of similar texture and composition | 0.24 | chaparral and chemise with widely spread foothill pine or oak tree, small area of thin annual grasses and weeds |
| 202 | Cieneba-Rock Outcrop Complex | very shallow and shallow, somewhat excessively drained soils that formed in material weathered from granitic rock | 50 to 75 | Loamy, mixed, superactive, nonacid, thermic, shallow Typic Xerorthents | granite and other rocks of similar texture and composition | 0.24 | chaparral and chemise with widely spread foothill pine or oak tree, small area of thin annual grasses and weeds |
| 212 | Auberry-Cieneba-Rock Outcrop Complex | very shallow and shallow, somewhat excessively drained soils that formed in material weathered from granitic rock. | 10 to 30 | Loamy, mixed, superactive, nonacid, thermic, shallow Typic Xerorthents | granite and other rocks of similar texture and composition | 0.28 | chaparral and chemise with widely spread foothill pine or oak tree, small area of thin annual grasses and weeds |

| Code (Corresponds to Map 3.7-5) | Association | Soil Description | Slope | Taxonomy | Parent Rock | Erosion K Factor[1] | Vegetation |
|---|---|---|---|---|---|---|---|
| 213 | Auberry-Cieneba-Rock Outcrop Complex | very shallow and shallow, somewhat excessively drained soils that formed in material weathered from granitic rock. | 30 to 50 | Loamy, mixed, superactive, nonacid, thermic, shallow Typic Xerorthents | granite and other rocks of similar texture and composition | 0.28 | chaparral and chemise with widely spread foothill pine or oak tree, small area of thin annual grasses and weeds |
| 267 | Cieneba-Vista-Rock Outcrop Complex | very shallow and shallow, somewhat excessively drained soils that formed in material weathered from granitic rock | 30 to 60 | Loamy, mixed, superactive, nonacid, thermic, shallow Typic Xerorthents | granite and other rocks of similar texture and composition | 0.17 | chaparral and chemise with widely spread foothill pine or oak tree, small area of thin annual grasses and weeds |
| 400 | Rock Outcrop | - | - | - | - | - | - |

Source:
UC Davis California Soil Resource Lab https://casoilresource.lawr.ucdavis.edu/; https://soilseries.sc.egov.usda.gov/; and https://websoilsurvey.sc.egov.usda.gov/

[1] The K factor assesses the susceptibility of soil to sheet and rill erosion and is dependent upon the percentages of clay, silt, sand, and organic matter in the soil. In general, soils with low K factors are less susceptible to erosion and soils with high K factors are more susceptible to erosion.

# MAPS

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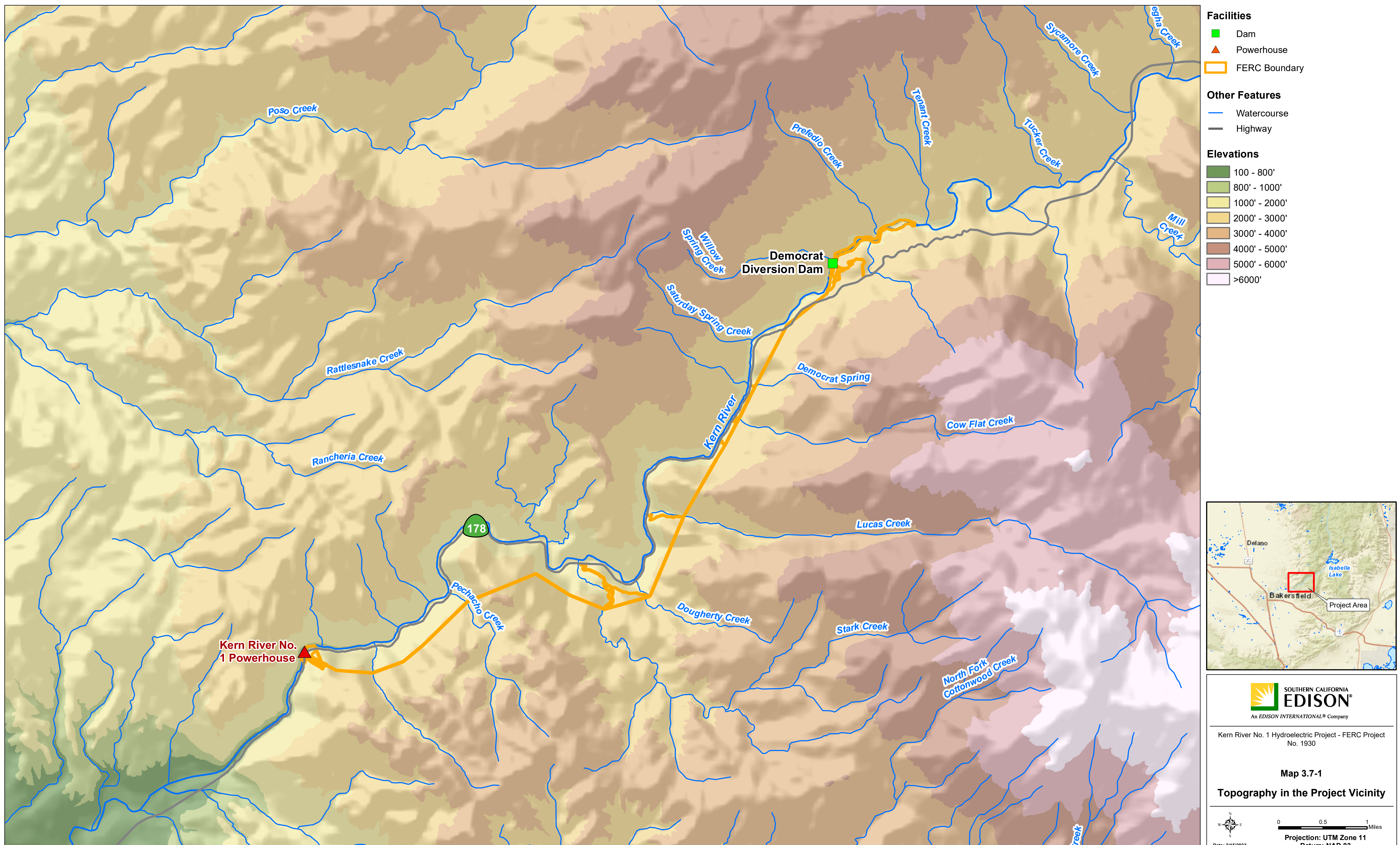




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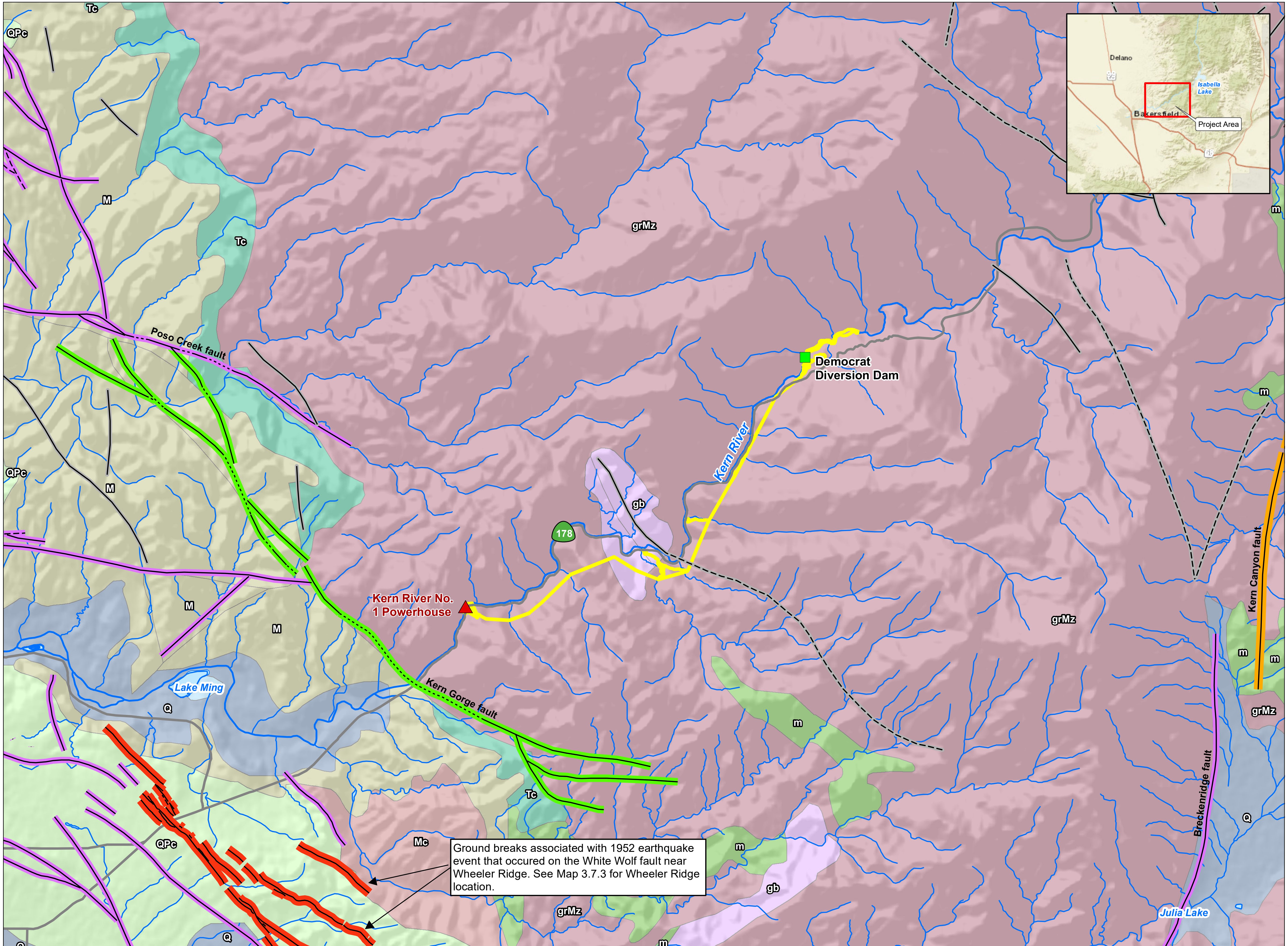


**Facilities**

- Dam
- Powerhouse
- FERC Boundary

**Other Features**

- Watercourse
- Highway
- Lake

**Fault Zone Data***

**Fault Age:**

- Historic Displacement (last 200 years)
- Holocene Displacement (last 11,000 years)
- Late Quaternary Displacement (last 750,000 years)
- Undivided Quaternary Displacement (last 1.6 million years)
- Pre-Quaternary Period (more than two million years ago)

**Fault Type**

- fault, certain
- fault, approx. located
- fault, concealed

*SOURCES: -- USGS, Earthquake Hazards Program, 2018 https://earthquake.usgs.gov/hazards/qfaults
-- California Geological Survey, 2010 https://maps.conservation.ca.gov/cgs/

**Geologic Rock Types****

**Cenozoic - Precambrian**

- gb gabbro
- grMz granodiorite
- M sandstone

**Cenozoic**

- Q alluvium
- Tc conglomerate
- Mc sandstone
- QPc sandstone
- m schist

**Source: Department of Conservation, California Geological Survey, 2010

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Kern River No. 1 Hydroelectric Project - FERC Project No. 1930

**Map 3.7-2**

**Lithology in the Project Vicinity**

0 1 2 Miles

Date: 3/1/2023

**Projection: UTM Zone 11**
**Datum: NAD 83**



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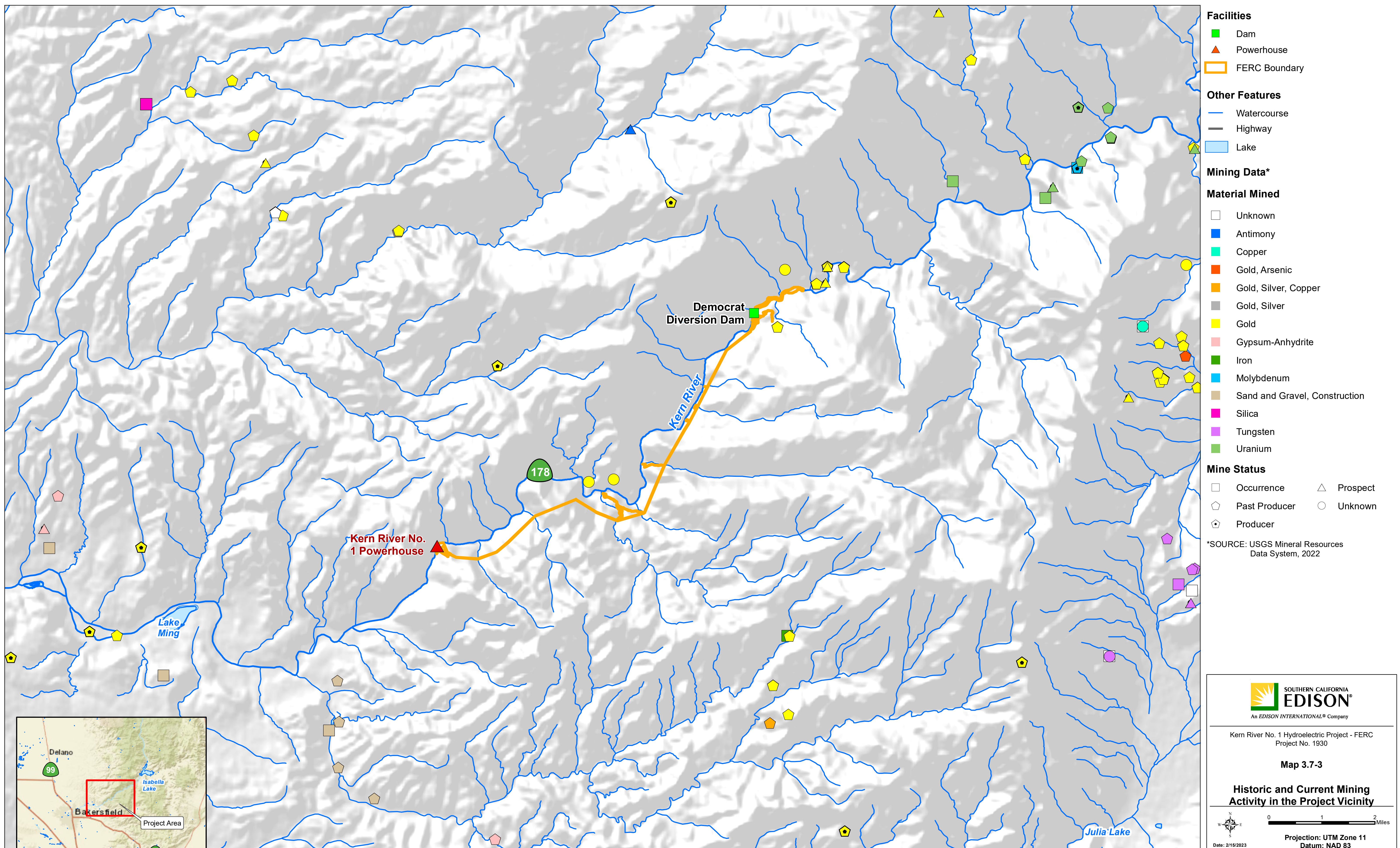


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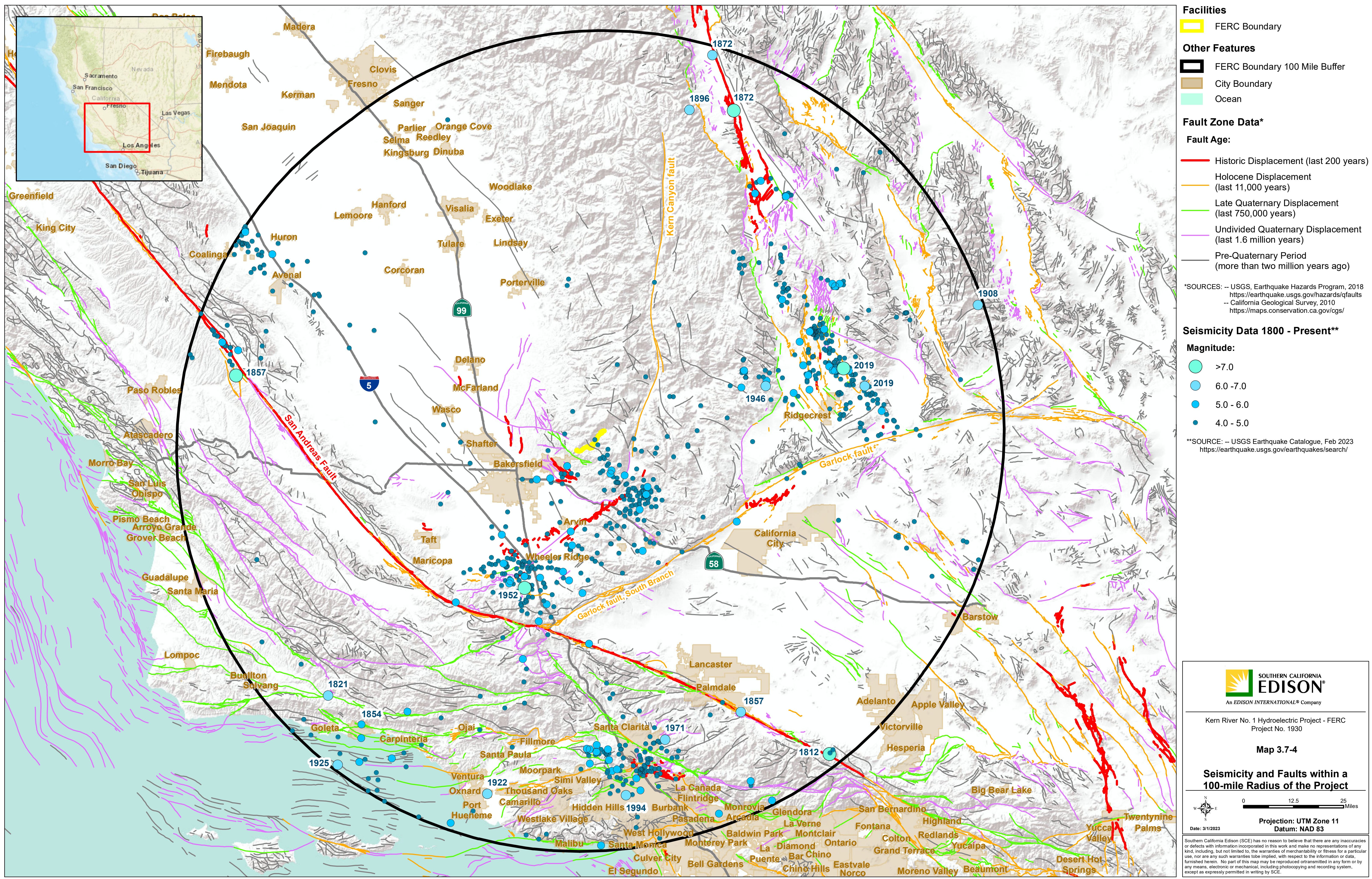


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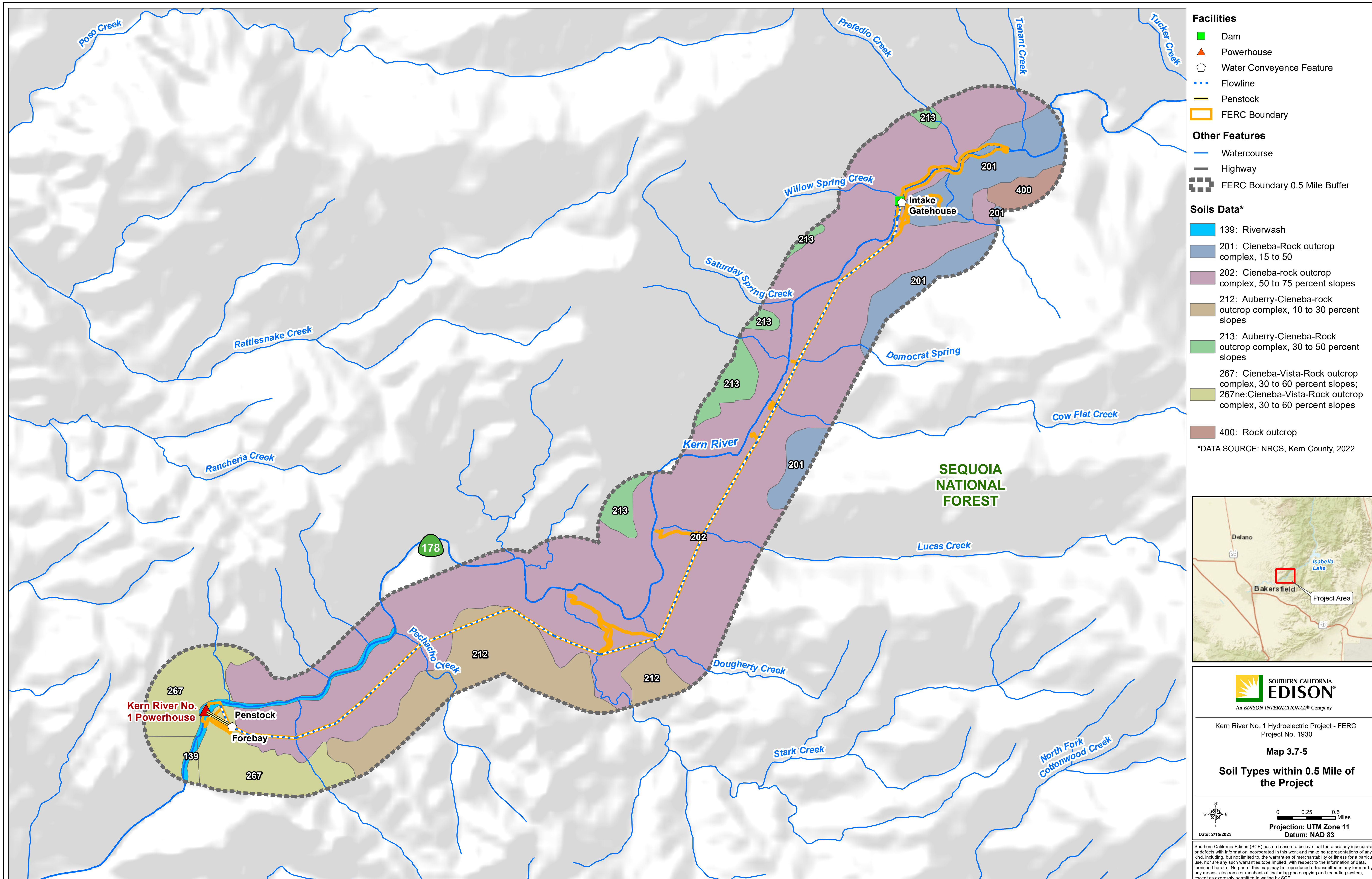


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## LIST OF ACRONYMS

| | |
|---|---|
| FERC or Commission | Federal Energy Regulatory Commission |
| Forest Service | United States Forest Service |
| Project | Kern River No. 1 Hydroelectric Project |
| RM | River Mile |
| SCE | Southern California Edison Company |

## 3.8 GEOMORPHOLOGY

This section summarizes existing information regarding channel geomorphology and associated fluvial processes in the bypass reach[1] associated with Southern California Edison Company's (SCE) Kern River No. 1 Hydroelectric Project (Project). The Federal Energy Regulatory Commission's (FERC) content requirements for this section are specified in Title 18 of the Code of Federal Regulations Chapter I § 5.6(d)(3)(ii), which includes a requirement to provide a description of streambanks, including steepness, composition, and vegetative cover; and existing erosion, mass soil movement, slumping or other forms of instability.

Channel geomorphology is a description of the channel form (morphology) including dimensions, gradient, planform, and pattern. Fluvial processes refer to the flow, sediment supply, and sediment transport characteristics that create and maintain the channel morphology. Information directly related to channel morphology and sediment transport are not specifically required by the FERC regulations; however, this information is important to understanding channel maintenance processes and the aquatic and riparian habitat in the bypass reach.

Descriptions and maps showing the existing geology, topography, and soils in the vicinity of the Project and potential erosion at Project facilities are included in Section 3.7, Geology and Soils. Section 3.9, Wetland, Riparian, and Littoral Habitats includes a description of the vegetative cover along the streambanks and shorelines.

### 3.8.1 Information Sources

This section was developed using existing information available in the following primary sources. Additional references are cited in the text, as appropriate.

- FERC's Final Environmental Assessment for Hydropower License, Kern River No. 1 Hydroelectric Project (FERC 1998)
- SCE's Application for New License for the Kern River No. 1 Hydroelectric Project (SCE 1994)
- SCE's Sediment Monitoring Results and Sediment Management Plan (SCE 1999)
- SCE's Kern River No. 3 Pre-Application Document, FERC Project No. 2290 (SCE 2021)

[1] A bypass reach is a segment of a river downstream of a diversion facility where Project operations result in the diversion of a portion of the water from the river.

### 3.8.2 Channel Reach Morphology

The longitudinal profile for the lower Kern River, from Lake Isabella to the Mouth of the Kern Canyon is shown in Section 3.2, Figure 3.2-1. The longitudinal profile is divided into seven river segments that are based upon similar gradients, starting at the Mouth of Kern Canyon and ending approximately 10 miles upstream of Democrat Dam (Figure 3.2-1 and Figure 3.8.1, Table 3.8-1). The overall gradients from Lake Isabella to the Mouth of Kern Canyon and from Democrat Dam Impoundment to Kern River No. 1 Powerhouse are 1.1% and 1.8%, respectively (Figure 3.2-1, Table 3.8-1). The largest tributaries in the vicinity of the Project are Lucas and Stark Creeks, containing upstream drainages of approximately nine square miles.

The steep and narrow canyon topography limits the valley bottom width and controls the coarse (primarily cobble and boulders) material substrate size that comprise the riverbed and banks. The valley bottom width ranges from 100 to 500 feet and averages 220 feet between Democrat Dam and the mouth of Kern Canyon. The width of the active channel ranges between 75 and 200 feet with an average width of 100 feet. The widest sections of the Kern River are found along significant bends in the channel.

#### 3.8.2.1 Channel Morphology in the Bypass Reach

The bypass reach associated with the Project starts at Democrat Dam (River Mile [RM] 54.4) and ends at the Kern River No. 1 Powerhouse tailrace (RM 43.9). The bypass reach is approximately 10.5 miles in length and extends only partly into Segment 1 at the downstream end and Segment 7 at the upstream end of the bypass reach (Figure 3.8-1). The overall channel gradient of the bypass reach from Democrat Dam to Kern River No. 1 Powerhouse is 1.8%. Gradients within the bypass reach range from 1.2 to 3.5% (Table 3.8-1; Figure 3.8-1).

The river bed is comprised of bedrock and large boulders and cobbles, which make up 29% and 36% of the length of the bypass reach, respectively (Map 3.8-1). Channel morphology is characterized by bedrock and boulder cascades that form forced pools and rapid sequences (Figure 3.8-2). Depositional features are also present in lower gradient segments including transient sand bars that are deposited in eddies along the channel and are colonized by riparian vegetation (Figure 3.8-2, Photo C).***

The channel bed and banks within the bypass reach are generally stable because of the stable bedrock and boulder channel bed and banks that limit lateral and vertical channel erosion or deposition. Aerial imagery of the bypass reach planform during the term of the current license (1998 to present) shows:

- Limited unstable banks or channel segments.
- Minimal change to the location and extent of sediment bars (e.g., Figure 3.8-3A).
- Minimal change to the location and length of morphological sequences (e.g., Figure 3.8-3, Photo B).

#### 3.8.2.2 Upstream and Downstream of the Bypass Reach

Upstream of the bypass reach and diversion (Segment 7, Democrat Dam to Isabella Dam), the channel gradient flattens to 0.5%. The Democrat Dam Impoundment extends approximately one mile upstream of Democrat Dam. At the upstream end of the impoundment, there is a large, stable island. There is no evidence of channel instability behind the dam.

The channel gradient from just upstream of the Kern River No. 1 Powerhouse to the mouth of Kern Canyon (Segment 1) is steep at approximately 2.3%. Downstream of the mouth of Kern Canyon, the valley width increases (approximately 750 feet at its widest point compared to a 200 feet maximum active channel width within the bypass reach) and the channel morphology is characterized by braided channels or boulder and cobble fields that are adjacent to the main channel.

### 3.8.3 Sediment Supply and Transport

This section describes potential sediment contribution to the bypass reach from hillslope and streambank erosion, and the relative capacity of the reach to transport and store sediments.

The lower Kern River is characterized as a bedrock-controlled stream with minimal horizontal or vertical channel adjustment and low fine-sediment loads (SCE 1999). Across the seven river segments, some areas are periodically supplied with sediment through mass wasting processes (e.g., debris flow sediment from floods and post-fire storm events in the area) (SCE 2021). Sediment supplied from colluvial fan deposits on moderate to very steep slopes (e.g., headward erosion of small gullies) contains poorly sorted grain sizes from clay to cobbles.

#### 3.8.3.1 Sediment Supply in the Bypass Reach

**<u>Hillslope Erosion</u>**

Hillslope erosion within the bypass reach occurs through mass wasting processes and road maintenance but is generally low. Mass wasting events, for example rock and mudslides (e.g., August 2013), can cause large amounts of debris to enter the channel. Sediments, coarse rubble, and finer grained sediments have historically contributed to the bypass reach from road maintenance and slope erosion (SCE 1999).

On September 10, 2013, SCE filed an incident report with FERC of a landslide. The report stated that due to a storm event, the Project forebay spilled and the pipe spillway was plugged, causing erosion below the forebay and along the pipe spillway. Rock and debris crossed State Route 178 and entered the Kern River. The State Regional Water Quality Control Board, California Department of Fish and Wildlife, and the United States Forest Service (Forest Service) were notified. SCE coordinated with the Forest Service to repair the damaged facilities.

## Streambank Erosion

The potential for bank erosion within the bypass reach is low due to the presence of bedrock and coarse boulder substrates that stabilize the streambed and banks. In addition, riparian vegetation generally acts to stabilize bars within the bypass reach, limiting streambank erosion.

### 3.8.3.2 Sediment Transport / Management

Boulder- and bedrock-dominated channel morphologies that contain high stream gradients cause the river to have high sediment transport capacity, resulting in a supply-limited sediment regime. Consequently, the limited fine sediment that is supplied to the bypass reach river from upstream is transported through the system with only limited, temporary storage at points of locally reduced flow velocity (e.g., eddies; SCE 1999). Fine sands to gravel sized sediment present in the bypass reach is rapidly transported downstream during high-flow events and deposited along channel margins. Large boulders and cobbles that armor the channel bed are infrequently mobilized during large, infrequent flood events.

Fine sediment, mostly sand and smaller particles, accumulate and are temporarily stored behind Democrat Dam (within Democrat Dam Impoundment). Accumulated sediment is managed in accordance with SCE's Revised Sediment Management Plan (SCE 2005) and resource agency permits. Sediment management in the Democrat Dam Impoundment does not include physical removal (e.g., dredging), but focuses on flushing. Sediment that accumulates behind Democrat Dam is managed by flushing using the low-level outlet (or lower drain gate) located below the intake, at the bottom of the impoundment, near the base of the dam. Flushing emulates the natural sediment regime of the lower Kern River by allowing naturally occurring sediment that is temporarily deposited in the impoundment to continue downstream, past Democrat Dam, and through the lower Kern River system.

In accordance with License Article 402, SCE conducted sediment monitoring to better understand sediment movement within the bypass reach. Surveys were conducted in the late fall of 1995, 1996, and 1997, during or following periods of when SCE conducted sediment management activities. A summary of the sediment monitoring data, including pool substrate composition, pool channel change and sediment transport analysis within five studied pools downstream of Democrat Dam is shown in Tables 3.8-2 to 3.8-6. Pools that were sampled are shown in Map 3.8-2. Overall, the absolute and net changes in cross-sectional area for the years monitored indicated that the pool channels experienced either a balancing of deposition and aggradation, or moderate scour (SCE 1999). The bed surface area of pools was dominated by 56 to 84% sand cover. Therefore, sediment management activities implemented at Democrat Dam did not cause significant deposition within the pools, indicating a supply-limited system.

### 3.8.4 References

FERC (Federal Energy Regulatory Commission). 1998. Final Environmental Assessment for Hydropower License, Kern River No. 1 Hydroelectric Project, FERC Project No. 1930-014. California. June 17.

SCE (Southern California Edison Company). 1994. Application for New License, Kern River No. 1 Hydroelectric Project, FERC Project No. 1930. April 28.

____. 1999. Sediment Monitoring Results and Sediment Management Plan for the Kern River No. 1 Hydroelectric Project. February 26.

____. 2005. Revised Sediment Management Plan for the Kern River No. 1 Hydroelectric Project. February 28.

____. 2021. Kern River No. 3 Hydroelectric Project Pre-Application Document, FERC Project No. 2290. September.

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# TABLES

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## Table 3.8-1. Kern River Segments

| Location | Segment | River Mile | | | Channel Gradient |
|---|---|---|---|---|---|
| | | To | From | Total Segment Length | |
| S1 to Mouth of Kern Canyon | 1[1] | 42.1 | 44.6 | 2.5 | 2.3 |
| Peachacho Creek to S1 | 2 | 44.6 | 45.9 | 1.3 | 3.5 |
| S3 to Peachacho Creek | 3 | 45.9 | 47 | 1.1 | 1.7 |
| Lucas Creek to S3 | 4 | 47 | 50.4 | 3.4 | 1.2 |
| Saturday Spring Creek to Lucas Creek | 5 | 50.4 | 52.9 | 2.5 | 1.8 |
| Democrat Dam to Saturday Spring Creek | 6 | 52.9 | 54.5 | 1.6 | 1.4 |
| S7 to Democrat Dam | 7[2] | 54.5 | 64.8 | 10.3 | 0.5 |
| **Overview** | | | | | |
| Isabella Dam to Mouth of Kern Canyon[3] | N/A | 42.1 | 75 | 32.9 | 1.1 |
| Democrat Dam to Kern River No. 1 Powerhouse | N/A | 43.9 | 54.4 | 10.5 | 1.8 |

[1] Segment 1 starts just upstream of Kern River No. 1 Powerhouse and extends to the Mouth of Kern Canyon.

[2] Segment 7 is located 10 miles upstream of Democrat Dam.

[3] Mouth of Kern Canyon is located 1.8 miles downstream of Kern River No. 1 Powerhouse.

## Table 3.8-2. Summary of Estimated Substrate Composition for Pools in the Bypass Reach

| Station Number | Substrate Composition (%) | | | |
|---|---|---|---|---|
| | **Fines** | **Gravel** | **Cobble** | **Boulder/Bedrock** |
| **Pool No. 1** | | | | |
| 1995 | 76.20 | 2.40 | 2.40 | 19.00 |
| 1996 | 75.50 | 11.10 | 6.70 | 6.70 |
| 1997 | 68.40 | 13.20 | 0.00 | 18.40 |
| **Pool No. 3** | | | | |
| 1995 | 21.40 | 17.90 | 0.00 | 60.70 |
| 1996 | 36.40 | 3.00 | 6.10 | 54.50 |
| 1997 | 14.70 | 0.00 | 11.80 | 73.50 |
| **Pool No. 4** | | | | |
| 1995 | 84.40 | 0.00 | 0.00 | 15.60 |
| 1996 | 81.80 | 0.00 | 3.00 | 15.20 |
| 1997 | 67.60 | 5.90 | 8.80 | 17.70 |
| **Pool No. 5*** | | | | |
| 1996 | 56.10 | 0.00 | 0.00 | 43.90 |
| 1997 | 63.40 | 0.00 | 22.00 | 14.60 |
| **Pool No. 6*** | | | | |
| 1996 | 43.90 | 0.00 | 0.00 | 56.10 |
| 1997 | 42.90 | 0.00 | 0.00 | 57.10 |

Source: SCE 1999

NOTES:
*Data was not reported from pool in 1995.
Pool No. 2 does not exist. The naming convention of the pools skips Pool No. 2.

## Table 3.8-3. Summary of Median Grain Size for Pools in the Bypass Reach

| Sample ID | Median Grain Size | |
|---|---|---|
| | 1996 | 1997 |
| Pool 1L | 0.108 | 0.1 |
| Pool 1M | 1.218 | 1.05 |
| Pool 1R | 0.685 | -- |
| Pool 3L | 0.138 | -- |
| Pool 3M | ** | -- |
| Pool 3R | 0.25 | 0.4 |
| Pool 4L | -- | 0.95 |
| Pool 4M | 1.501 | 0.87 |
| Pool 4R | 0.215 | 1.29 |
| Pool 5L | 0.904 | -- |
| Pool 5M | 3.307 | > 3.0 |
| Pool 5R | 1.348 | 0.13 |
| Pool 6L | -- | -- |
| Pool 6M | 1.099 | > 3.0 |
| Pool 6R | 0.873 | 1.34 |

Source: SCE 1999

NOTES:
"--" indicates sediment sample not collected.
"**" indicates sample collected is too granular and out of range for machine to calculate median grain size.
“L, M, and R” indicates where the sample was taken in the channel (left, middle or right).
Pool No. 2 does not exist. The naming convention of the pools skips Pool No. 2.

## Table 3.8-4. Summary of Channel Form Indices in the Bypass Reach

| Station Number | 1995 | 1996 | 1997 |
|---|---|---|---|
| **Cross-Sectional Depth (mean in feet)** | | | |
| Pool No. 1 | 8.23 | 8.4 | 8.53 |
| Pool No. 3 | 8.72 | 8.64 | 9.04 |
| Pool No. 4 | 11.11 | 10.75 | 11.08 |
| Pool No. 5 | -- | 8.47 | 9.02 |
| Pool No. 6 | -- | 10.73 | 10.81 |
| **Width: Depth Ratio** | | | |
| Pool No. 1 | 22.61 | 22.14 | 22.8 |
| Pool No. 3 | 9.98 | 10.07 | 9.63 |
| Pool No. 4 | 10.74 | 11.10 | 10.77 |
| Pool No. 5 | -- | 11.44 | 10.75 |
| Pool No. 6 | -- | 11.66 | 11.57 |

| Station Number | Absolute Percent Change in Area | | Net Percent Change in Area | |
|---|---|---|---|---|
| | 1995–1996 | 1996–1997 | 1995–1996 | 1996–1997 |
| **Percent Change in Cross-Sectional Area** | | | | |
| Pool No. 1 | 7.73 | 7.98 | 2.13 | 1.56 |
| Pool No. 3 | 2.92 | 5.14 | -0.92 | 4.62 |
| Pool No. 4 | 4.48 | 4.36 | -3.21 | 3.07 |
| Pool No. 5 | -- | 8.76 | -- | 6.46 |
| Pool No. 6 | -- | 3.68 | -- | 0.78 |

Source: SCE 1999

NOTES:
"--" indicates sediment sample not collected.
Pool No. 2 does not exist. The naming convention of the pools skips Pool No. 2.

## Table 3.8-5. Calculated Maximum Grain-Size Transported (Shield's Criterion) in the Bypass Reach

| Pool ID* | Slope | Area BF ($ft^2$) | Half-BF ($ft^2$) | Hydraulic Radius BF (ft) | Half-BF (ft) | Shear Velocity BF (cm/sec) | Half-BF (cm/sec) | Maximum Size - Onset Motion | | Average Grain Size (D50) of Fines (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | BF (mm) | Half-BF (mm) | |
| Pool No. 3 (1995) | 0.0017 | 986 | 230 | 2 | 2.45 | 10.08 | 11.16 | > 10 | > 10 | - |
| Pool No. 3 (1996) | 0.000051 | 986 | 230 | 2 | 2.45 | 1.75 | 1.93 | 0.7 | 0.7 | 0.25 |
| Pool No. 3 (1997) | 0.000103 | 986 | 230 | 2 | 2.45 | 2.48 | 2.75 | 1.1 | 1.2 | 0.4 |
| Pool No. 4 (1995) | 0.0001 | 1160 | 395 | 4.85 | 2.46 | 3.81 | 2.71 | 2 | 1.2 | - |
| Pool No. 4 (1996) | 0.00005 | 1160 | 395 | 4.85 | 2.46 | 2.69 | 1.92 | 1.2 | 0.7 | 1.5 |
| Pool No. 4 (1997) | 0.0000 | 1160 | 395 | 4.85 | 2.46 | - | - | - | - | 1.29 |
| Pool No. 5 (1996) | 0.0003 | 877 | 385 | 5.48 | 2.85 | 7.01 | 5.06 | 7 | 3.5 | 3 |
| Pool No. 5 (1997) | 0.00001 | 877 | 385 | 5.48 | 2.85 | 1.28 | 0.92 | 0.3 | 0.2 | 3 |
| Pool No. 6 (1996) | 0.0002 | 1296 | 456 | 4.98 | 3.37 | 5.46 | 4.49 | 3.6 | 2.5 | 1 |
| Pool No. 6 (1997) | 0.0003 | 1296 | 456 | 4.98 | 3.37 | 6.68 | 5.5 | 6.8 | 3.6 | 3 |

Source: SCE 1999

NOTES:

"--" indicates data not collected.
BF: Bankfull
*Data was not collected for Pool No. 1.
Pool No. 2 does not exist. The naming convention of the pools skips Pool No. 2.

**Table 3.8-6. Calculated Sediment Transport Capacity During Monitored Conditions in the Bypass Reach**

| Pool I.D. | Avg. Depth (ft) | Width (ft) | Discharge (cfs) | Velocity (ft/sec) | Transport Capacity (tons/day) |
|---|---|---|---|---|---|
| Pool No. 3 (1995) | 8.31 | 69.2 | 611 | 1.06 | 9.7 |
| Pool No. 3 (1996) | 8.39 | 45.3 | 20 | 0.05 | -- |
| Pool No. 3 (1997) | 9.8 | 49.2 | 64 | 0.13 | -- |
| Pool No. 3 - BF | 12 | 86 | 4000 | 4.05 | 200 |
| Pool No. 4 (1995) | 8.5 | 100.8 | 611 | 0.71 | 10 |
| Pool No. 4 (1996) | 7.3 | 88.8 | 20 | 0.03 | -- |
| Pool No. 4 (1997) | 8.3 | 92.1 | 64 | 0.08 | -- |
| Pool No. 4 - BF | 10 | 115 | 4000 | 3.45 | 150 |
| Pool No. 5 (1996) | 4.6 | 88.7 | 20 | 0.046 | -- |
| Pool No. 5 (1997) | 5.4 | 89.9 | 64 | 0.13 | -- |
| Pool No. 5 - BF | 9 | 99 | 4000 | 4.56 | 340 |
| Pool No. 6 (1996) | 6.5 | 72.5 | 20 | 0.04 | -- |
| Pool No. 6 (1997) | 6.7 | 73.5 | 64 | 0.13 | -- |
| Pool No. 6 - BF | 10.4 | 125 | 4000 | 3.08 | 110 |

NOTES:
"--" indicates data not collected.
BF: Bankfull
*Data was not collected for Pool No. 1.Pool No. 2 does not exist. The naming convention of the pools skips Pool No. 2. (SCE 1999)

# FIGURES

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**Figure 3.8-1. Longitudinal Profile of the Bypass Reach**

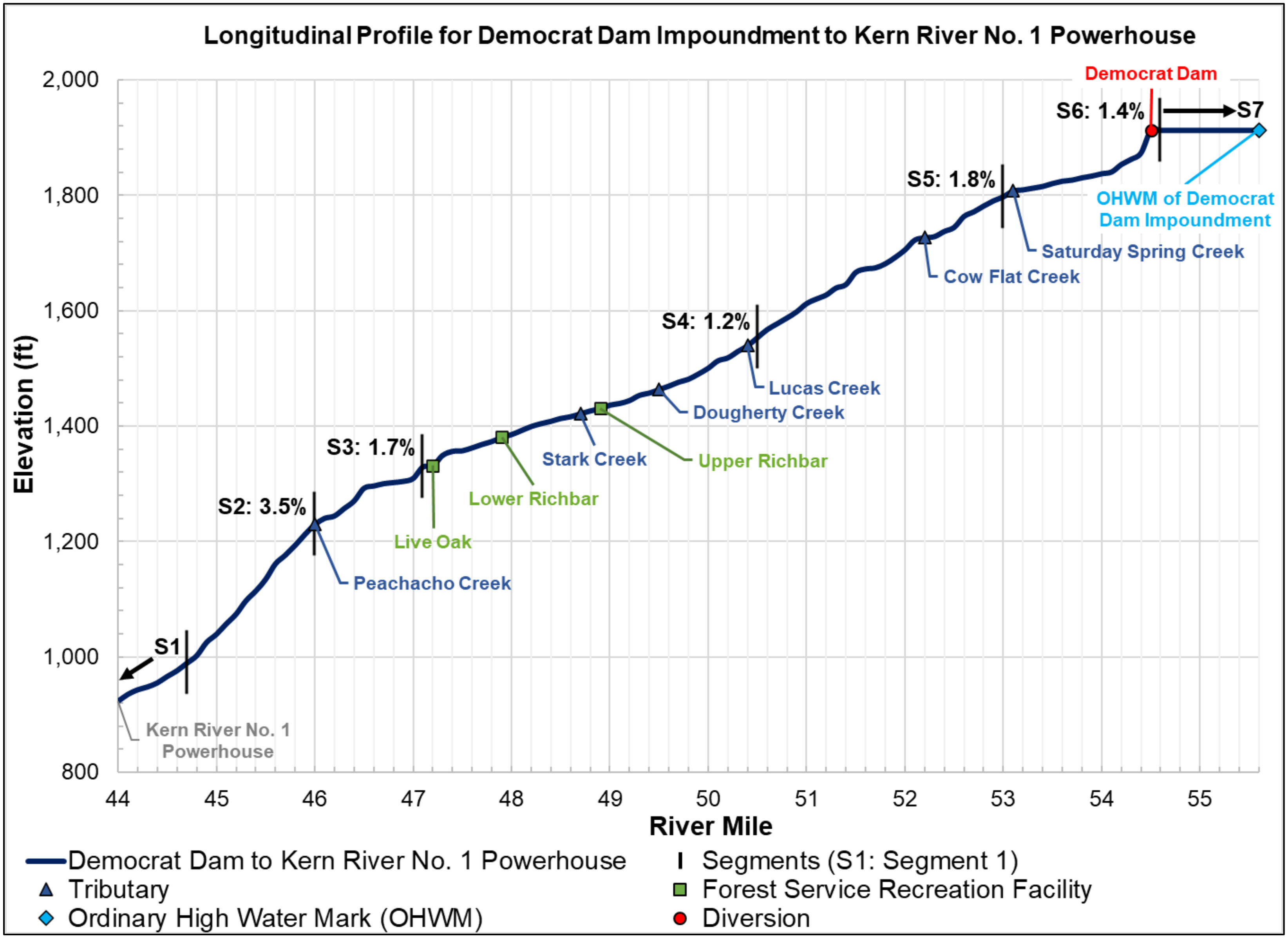

**Figure 3.8-2. Representative Photographs of the A) Boulder Cascade (RM 45), B) Pool-Riffle Sequence (RM 47.5), C) Bar (RM 46.5), and D) Bedrock Channel (RM 53) Morphologies in the Bypass Reach**

**Figure 3.8-3. Representative Historical Aerial Imagery of Channel Reach Morphology in the Bypass Reach with Minimal Change Throughout the Previous License Term (1998 to Present). A) Bar morphology downstream of Peachacho Creek (RM 45.9) that shows minimal morphologic change from 2002 to 2015. B) Step-pool sequence located near RM 63 that has been maintained with minimal change from 2002 to 2013**

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# MAPS

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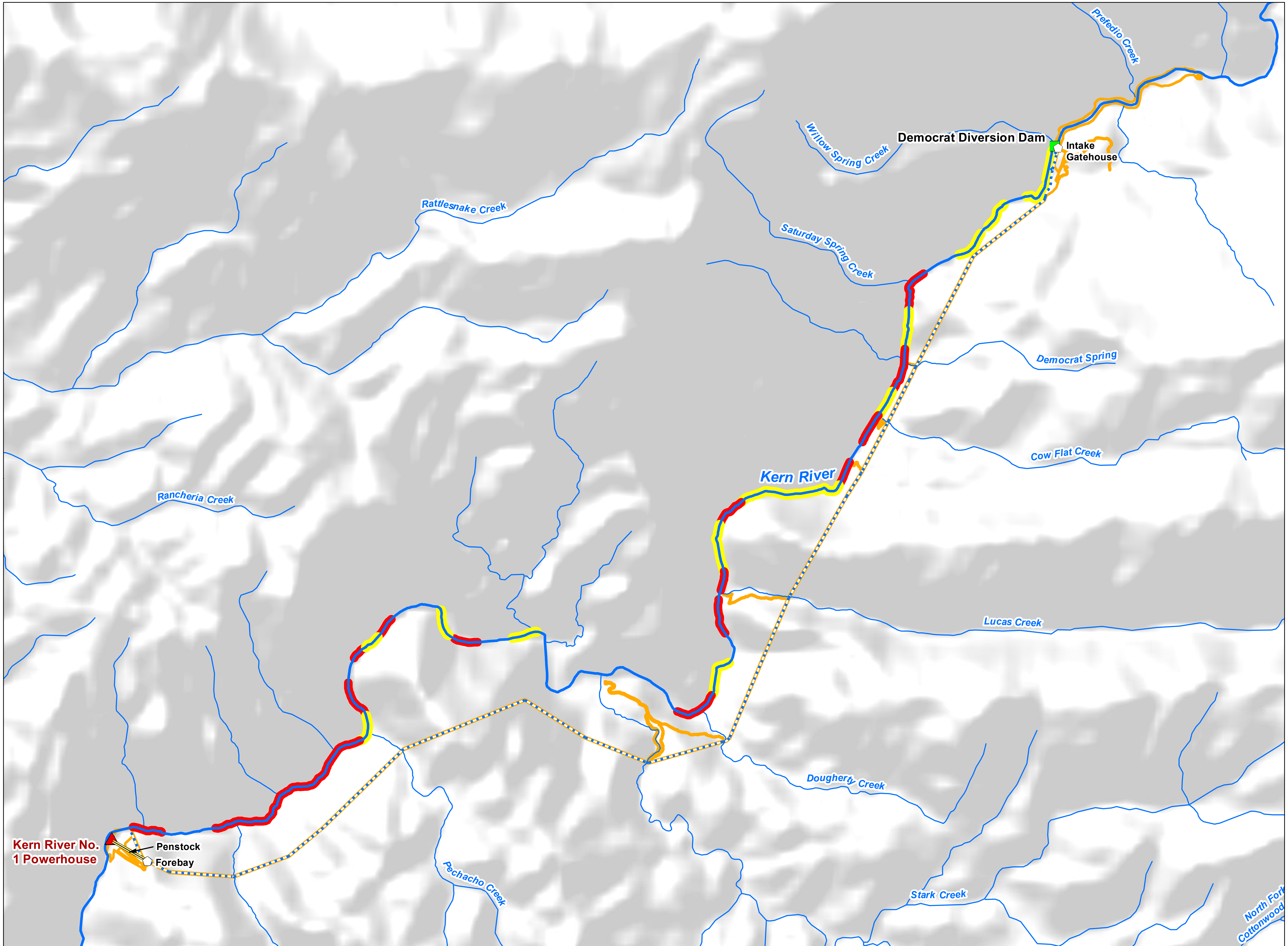



**Facilities**

- Dam
- Powerhouse
- Water Conveyence Feature
- Flowline
- Penstock
- FERC Boundary

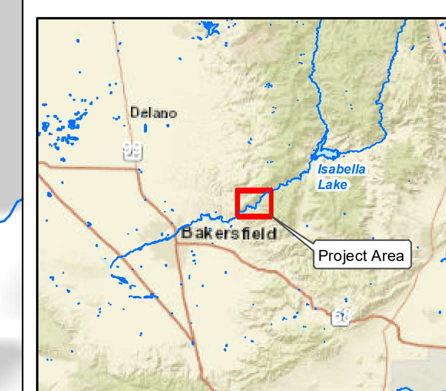
**Other Features**

- Watercourse

**Substrate Conditions***

- Bedrock Control
- Large Boulders

*SOURCE: SCE, 1994

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FERC Project No. 1930

**Map 3.8-1**

**Substrate Conditions of the Project Reach**

Date: 3/17/2023

0 0.25 0.5 Miles

**Projection: UTM Zone 11**
**Datum: NAD 83**



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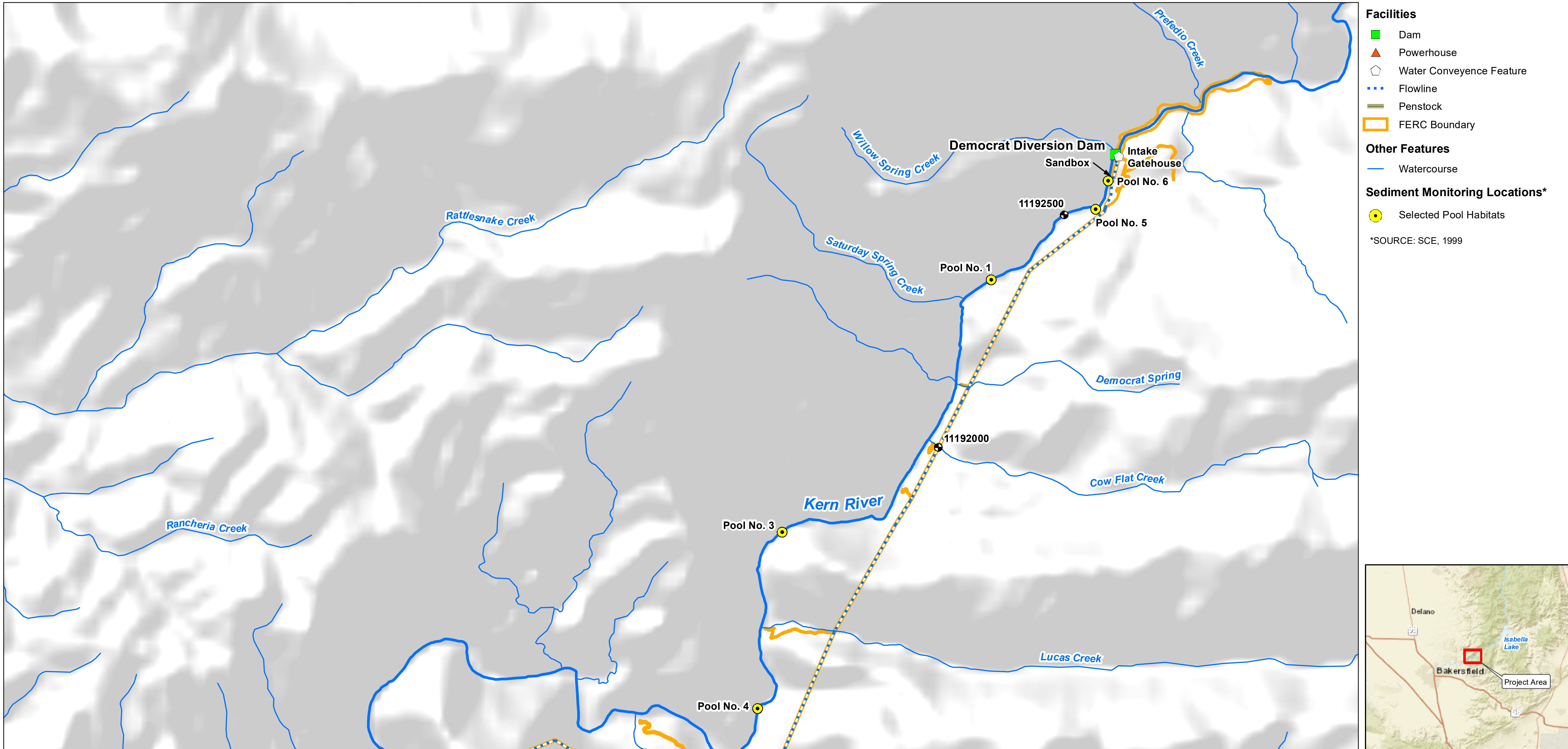


Kern River No. 1 Hydroelectric Project
FERC Project No. 1930

**Map 3.8-2**

**Location of Selected Pool Habitats Where Sediment Monitoring Measurements Were Performed**

**Date: 3/17/2023**

**Projection: UTM Zone 11**
**Datum: NAD 83**



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