E - ENVIRONMENTAL RESOURCES

3.0 AQUATIC RESOURCES

3.1 Applicable Laws, Ordinances, Regulations, Statutes, and Plans

Aquatic resources in California are protected by a variety of federal, state, and local laws, ordinances, regulations, and statutes. In addition, numerous comprehensive plans and programs have been developed that include detailed policies and guidelines for management of aquatic resources present in the vicinity of the Project. These laws, ordinances, regulations, statutes, programs, and plans and their application to aquatic resources in the Project area are summarized below.

3.1.1 Eldorado National Forest Land and Resource Management Plan, as Amended

The Eldorado National Forest (ENF) Land and Resource Management Plan (LRMP), as amended by the Sierra Nevada Forest Plan Amendment (SNFPA), is discussed in Section E1.1.1. The ENF LRMP addresses fish, botanical, and wildlife resources, as well as associated management strategies throughout the ENF, including the Project area. The ENF LRMP includes a discussion of what kinds and amounts of fish, wildlife, and plant habitat should be protected in the ENF, and a list of Management Indicator Species (MIS) whose presence on ENF lands directs habitat protection and management practices. The management practices are then listed with standards and guidelines for their implementation.

3.1.2 Clean Water Act Section 404 Dredge and Fill Permit

The Clean Water Act (CWA) Section 404 dredge and fill permits are discussed in Section E1.1.2. These permits require that the United States Army Corps of Engineers (USACE) consult with the United States Fish and Wildlife Service (USFWS) regarding potential impacts of dredge and fill activities on aquatic resources.

3.1.3 Sacramento River-San Joaquin River Water Quality Control Board Basin Plan

The Sacramento River-San Joaquin River Water Quality Control Plan (Basin Plan) is discussed in Section E2.1.6. The plan specifies that existing designated beneficial uses of the Middle Fork American River (MFAR) and South Fork American River (SFAR) include cold, freshwater habitat, and wildlife habitat. Warm freshwater habitat is identified as a potential use.

3.1.4 Endangered Species Act

The primary purpose of the Federal Endangered Species Act (ESA) of 1973, as amended, is to protect and conserve endangered and threatened species and the ecosystems upon which they depend. An endangered species is one that is declared by a state or federal agency to be in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is declared by a state or federal agency to be likely to become endangered within the foreseeable future.

Two sections of the ESA are most applicable to relicensing of the Project. Section 7(a)(2) of the ESA requires the Federal Energy Regulatory Commission (FERC), as the lead federal agency for relicensing of the Project, to consult with the USFWS and the National Marine Fisheries Service (NMFS) to ensure that the Project is not likely to jeopardize the continued existence of any listed species, or result in the destruction or adverse modification of any designated critical habitat. Jeopardy exists when an action would "appreciably reduce the likelihood of both the survival and recovery of a listed species…" (50 CFR 402.02). As the lead federal agency, FERC may designate a "non-federal representative" to conduct informal consultation or prepare a biological assessment by giving written notice to the USFWS of such designation (50 CFR 402.08). However, ultimate responsibility for compliance with Section 7 would remain with FERC in this situation. Consultation involves a request to the USFWS for an inventory of listed species, and species proposed for listing, which may be present in the Project area. A biological assessment is then prepared to determine whether listed species or critical habitat is likely to be adversely affected by the federal action, thereby requiring formal consultation. At the end of the consultation process, the USFWS issues a biological opinion that specifies whether or not the action will place the species or critical habitat in "jeopardy." If a jeopardy opinion is issued, the USFWS must include reasonable and prudent alternatives to the action. An "incidental take statement" that specifies impacts of the taking, mitigation measures, and terms and conditions for implementation of the mitigation measures may accompany a non-jeopardy opinion.

Section 9(a)(1) of the ESA prohibits any person from "taking" a listed species. "Taking" has been broadly defined by the courts as: "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." To "harass" is to commit an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. "Harm" under the ESA refers to acts that actually kill or injure wildlife, including significant adverse habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns during feeding, breeding, or sheltering.

Federally listed endangered and threatened species are discussed extensively in Section E6.0.

3.1.5 Federal Power Act Section 18 Fishway Prescription Authority

The NMFS and USFWS have the authority to mandate "fishway prescriptions" as FERC license conditions under Section 18 of the Federal Power Act (FPA). Section 18 states that "the Commission shall require the construction, maintenance, and operation by a licensee at its own expense of…such fishways as may be prescribed by the Secretary of Commerce." There is significant debate over the definition of a "fishway" and those waterways that are subject to prescriptions.

3.1.6 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661 et seq.), as amended, authorizes the Secretary of the Interior to provide assistance to and cooperate with, federal, state, and public or private agencies and organizations in the conservation of wildlife and their habitat. The Act also requires consultation between the USFWS and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted... or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." Provisions of the Act require equal consideration and coordination of wildlife conservation with other water resources development programs. The USFWS has primary responsibility for compliance with the FWCA as it relates to the Project relicensing. As a result, the USFWS may consult with public agencies or private organizations to determine their interests and concerns pertaining to fish and wildlife resources during the relicensing process.

3.1.7 California Endangered Species Act

The California Endangered Species Act (CESA), enacted in 1984 and patterned after the ESA, is administered by the California Department of Fish and Game (CDFG). The CESA requires state lead agencies preparing California Environmental Quality Act (CEQA) documents to consult with CDFG regarding potential impacts on state listed species; the CESA does not require consultation with CDFG by local lead agencies or state permitting agencies not preparing CEQA documents. Consultation is intended to ensure that actions authorized, funded, or carried out by the lead agency are not likely to jeopardize the continued existence of listed threatened or endangered species, or destroy or adversely modify "essential habitat" (i.e., habitat necessary to the continued existence of the species). If jeopardy is determined, the state lead agency must adopt reasonable and prudent alternatives as specified by CDFG to prevent jeopardy. If a project may affect species listed jointly under the ESA and CESA, CDFG must participate in ESA Section 7 consultation to the maximum extent possible. The federal biological opinion will generally reflect both CDFG and USFWS (or NMFS) findings, and CDFG is encouraged by CESA to adopt, when possible, the USFWS (or NMFS) biological opinion as its own formal written determination on whether jeopardy exists. However, if the two agencies ultimately fail to agree, they may each issue an independent biological opinion. A review of the CESA listing indicates there are no CESA-listed aquatic species that have the potential to occur in the Project area based on the species' known geographic distribution and habitat requirements.

3.1.8 California Fish and Game Code Section 1601 Streambed Alteration Agreement

Section 1601 of the California Fish and Game Code (Streambed Alteration Agreement) is discussed in Section 1.1.3. These regulations require that the CDFG assess the impacts of activities in the streambed on aquatic resources.

3.1.9 California Fish and Game Code Section 5980 Fish Screening

Section 5980 (and subsequent sections) of the California Fish and Game Code provide direction on the screening of conduits where fish may be entrained, including facilities such as diversions and powerhouses associated with hydroelectric projects. Although screening of existing diversions for the purposes of fish protection is not required, CDFG has discretion over decisions related to fish screening and provides consultation regarding the specifications of any required fish screen structures.

3.1.10 California Fish and Game Code Section 5937 Flows Below Dams

California Fish and Game Code Section 5937 requires the owner of any dam to allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, to allow sufficient water to pass over, around, or through a dam to keep any fish that exist, or have been planted, below the dam in good condition.

3.1.11 El Dorado County General Plan

The El Dorado County (EDC) General Plan (EDC 2001) addresses biological resources as part of its land use and parks and recreation elements. The parks and recreation element includes the River Management Plan (RMP) from 1984, which documents a commitment to managing the SFAR in a fair and equitable manner, preserving the river corridor’s environmental quality, and reducing river-related conflicts. The 1984 RMP is currently being updated to also protect the rural character of the area and to promote river appreciation by river users and property owners. A River Management Advisory Committee (RMAC) was established to assist in the application of these goals and meets regularly.

As part of the land use element, Policy 2.2.5.15 states that any imposition of national recreational or wild and scenic river designations on lands within EDC shall be deemed inconsistent with the EDC General Plan. Policy 2.2.2.4 states that ecological preserves may be established by private contract and/or memoranda of understanding affecting interested public agencies.

In the Conservation and Open Space element, the Plan identifies several key fisheries and wildlife resource conservation goals that are supported by various policies and implementation programs. These goals are to: 1) conserve, enhance, and manage water resources and protect their quality from degradation; 2) identify, conserve, and manage wildlife, wildlife habitat, fisheries, and vegetation resources of significant biological, ecological, and recreational value; and 3) conserve open space land for the continuation of the County's rural character, commercial agriculture, forestry and other productive uses, the enjoyment of scenic beauty and recreation, the protection of natural resources, for protection from natural hazards, and for wildlife habitat.

3.1.12 Sacramento County General Plan

The portion of the transmission line component of the Project extends into Sacramento County. The Sacramento County General Plan (County of Sacramento 1993) influences operation and maintenance of this portion of the transmission line. The Sacramento County General Plan addresses biological resources within four elements. First, the vegetation and wildlife section of the conservation element discusses the preservation and management of biotic resources, including protecting native species, restoring degraded habitats, and minimizing environmental impacts. Second, the open space element is devoted to preserving natural resources and managing production of resources, including rivers, streams, bays, estuaries, and watershed lands important for the management of fisheries, and assuring public health and safety, including protection of watershed integrity and water quality. Third, the land use element discusses the importance of identifying critical natural habitat for priority resource protection, as well as identifying areas with special resource management needs. Fourth, the public facilities element discusses the importance of minimizing biological impacts of energy facilities (including production and distribution) to wetlands, riparian habitats, and marshes in Sacramento County.

3.1.13 Federal Power Act

The Federal Power Act, in particular sections 4(e), 10(j) and 18 of the act, are described in Section E1.1.4.

3.2 Historical Trends and Overview

3.2.1 Fish

Forty species of fish are native to the Sierra Nevada and 11 of these are found only in the Sierra Nevada range (Moyle et al. 1996). Historically, the high elevation streams in the western Sierra Nevada remained fishless due to extensive glaciation, steep topography, and summer drying/winter freezing of streams. Coastal rainbow trout, the trout species native to most west-side watersheds, were mostly found below an elevation of 4,900 feet (Moyle et al. 1996). Fish populations in the Sierra Nevada have changed substantially in three major ways since the influx of Euro-Americans began in the 1820s. These are: 1) exclusion of anadromous fishes, especially chinook salmon, from historical riverine habitat; 2) decreasing populations and fragmented habitats of many native resident fishes; and 3) introduction of nearly 30 non-native fish species into most waters of the Sierra Nevada. In general, fisheries of the Sierra Nevada have shifted from native species to introduced or non-native species, often resulting in the presence of fish in historically fishless areas. Non-native fish are likely responsible for declines in the abundance of native invertebrate and amphibian species, particularly at higher elevations (Moyle et al. 1996). In addition, the native strain of rainbow trout has likely hybridized extensively with introduced hatchery-bred trout, resulting in a significant shift of their genetic composition (Rogers et al. 1996). Also, livestock grazing, timber harvesting, recreational fishing and water developments have altered habitat conditions for fish.

Based on information from Moyle et al. (1996) and other sources, there are 21 species or subspecies of native fish that may have historically occurred or may currently occur in the Project area (Table E3.2-1). Three species (Pacific lamprey; steelhead; and spring-, fall-, winter- and late-winter-runs of chinook salmon) are migratory. Their historical ranges probably extended upstream in the SFAR to points in the stream where they would have encountered natural barriers to migration. These species no longer occur upstream of Nimbus Dam. Of the remaining 18 native species and subspecies listed in Table 3.2-1, eight do not occur within the Project area. Three species (Kern River rainbow trout, Little Kern golden trout, and California golden trout) occur only at high elevations in areas outside the Project area. Three species (threespine stickleback, Sacramento blackfish, Sacramento hitch) are found in lowland areas only, or otherwise at elevations below the Project area. Two roach subspecies (San Joaquin roach and Red Hills roach) are also found only outside the Project area. One species, Lahontan cutthroat trout, is not native the Project area, but has been planted there. Nine native species and subspecies may be found in the Project area: rainbow trout, Sacramento roach, hardhead, Sacramento pikeminnow (formerly squawfish), speckled dace, Sacramento sucker, Sacramento tule perch, prickly sculpin, and riffle sculpin.

3.2.2 Fish Stocking and Other Introduced Fishes

The introduction of non-native fish species likely had significant impacts on the abundance and distribution of fish in the Sierra Nevada. Fish introduced to the Sierra Nevada (Sacramento-San Joaquin Drainage) are listed in Table E3.2-2. As in other Sierra Nevada watersheds, CDFG has extensively stocked the river and tributaries for many years. Essentially every major tributary and reservoir in the Project area is or has been stocked with a variety of trout species. CDFG fish stocking numbers in the Project area and other selected waters are listed in Appendix E3-1. In addition to the waters listed the appendix, Slab Creek was also stocked with 6,000 to 25,000 brown trout and rainbow trout every year from 1931 to 1953 (CDFG Slab Creek surveys, various dates).

3.2.3 Amphibians and Aquatic Reptiles

Thirty-two amphibian taxa occur in the Sierra Nevada; thirty-one are native species or subspecies (nine frogs and toads, 22 salamanders) and one species is introduced (bullfrog) (Jennings 1996). Widespread decline in amphibian species in the Sierra Nevada over the past 25 years is attributed to the cumulative effects of a number of factors including habitat alteration, introduction of non-native predatory fishes and aquatic macrofauna, livestock grazing, construction of hydroelectric projects, recreation activities, creation of water-storage reservoirs, removal of surface and ground water, and placer mining (Jennings 1996). Introduced bullfrogs, fishes and crayfish severely limit the abundance and distribution of native amphibian species. In 2001, CDFG decided to halt fish stocking in reservoirs above elevation 6,000 feet, to reduce impacts on mountain yellow-legged frog.

Table E3.2-1. Native fishes of the Sierra Nevada (Sacramento-San Joaquin Drainage) based partly on Moyle et al. (1996).

Species		Status[1]	Habitat, Distribution & Comments[2]
Common Name	**Scientific Name**		
Lampreys	***Petromyzontidae***		
Pacific lamprey	*Lampetra tridentata*		Anadromous, foothills, lowlands. Precluded from Project area by Folsom Dam. Declining based on Moyle et al. 1996.
Salmon and Trout	***Salmonidae***		
Spring Run Chinook salmon	*Oncorhynchus tshawytscha*	FT	Anadromous, foothills, lowlands. Precluded from Project area by Folsom Dam.
Winter-run Chinook salmon	*Oncorhynchus tshawytscha*	FE	Anadromous, foothills, lowlands. Originally present only in Upper Sacramento River system. Precluded from Project area by Folsom Dam.
Fall-Run Chinook salmon	*Oncorhynchus tshawytscha*		Anadromous, lowlands. Precluded from Project area by Folsom Dam. Declining based on Moyle et al. 1996.
Late-Fall-Run Chinook salmon	*Oncorhynchus tshawytscha*	CSC	Anadromous, foothills, lowlands. Precluded from Project area by Folsom Dam.
*Rainbow trout	*Oncorhynchus mykiss*	MIS	Foothills and high elevations. Introduced outside of native range. Found throughout Rubicon River, Silver Creek, and the Upper American River. Stable/Expanding based on Moyle et al. 1996.
Central Valley steelhead	*Oncorhynchus mykiss irideus*	FT	Anadromous, foothills, lowlands. Precluded from Project area by Folsom Dam.
Kern River rainbow trout	*Oncorhynchus mykiss gilberti*	CSC	High elevations. Endemic only to the Kern River basin.
Little Kern golden trout	*Oncorhynchus mykiss whitei*	FE	High elevations. Endemic only to the Kern River basin.
California golden trout	*Oncorhynchus mykiss aquabonita*	CSC	High elevations. Introduced outside native range**;** endemic only to Kern River basin.
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	FT	Introduced outside of native range; endemic to east side of Sierra Nevada; stocked in Hidden Lake, upstream of Project area.
Minnows and Carps	***Cyprinidae***		
Sacramento hitch	*Lavinia exilicauda exilicauda*		Lowlands, foothills. Found at elevations below Project area.
*Sacramento roach	*Lavinia symmetricus symmetricus*	CSC	Foothills. Found in Loon Lake Reservoir. Stable based on Moyle et al. 1996.
San Joaquin roach	*Lavinia symmetricus* ssp.	CSC	Foothills. Only found in the San Joaquin basin.
Red Hills roach	*Lavinia symmetricus* ssp	CSC	Foothills. Endemic only to part of Tuolumne County.
Sacramento blackfish,	*Orthodon microlepidotus*		Lowlands. Found at elevations below Project area. Stable/Expanding based on Moyle et al. 1996.
*Hardhead	*Mylopharodon conocephalus*	CSC	Lowlands, foothills. Found in Slab Creek Reservoir.

Table E3.2-1 (Continued)			
Species		**Status**[1]	**Habitat, Distribution & Comments**[2]
Common Name	**Scientific Name**		
*Sacramento pikeminnow (squawfish)	*Ptychocheilus grandis*		Lowlands, foothills. Expected in Project area. Stable/Expanding based on Moyle et al. 1996.
*Sacramento speckled dace.	*Rhinichthys osculus* ssp		Lowlands, foothills. Found in Slab Creek Reservoir. Stable based on Moyle et al. 1996.
Suckers	***Catostomidae***		
*Sacramento sucker	*Catostomus occidentalis*		Lowlands, foothills, high elevations. Found in Slab Creek Reservoir and Loon Lake Reservoir. Stable/Expanding based on Moyle et al. 1996.
Sticklebacks	***Gasterosteidae***		
Threespine stickleback	*Gasterosteus aculeatus*		Lowlands. Introduced outside of native range. Naturally occurs only in San Joaquin River. Stable/Expanding based on Moyle et al. 1996.
Surf Perches	***Embiotocidae***		
*Sacramento tule perch	*Hysterocarpus traski traski*		Lowlands, foothills. Likely occurs in lower elevation project reservoirs. Stable based on Moyle et al. 1996.
Sculpins	***Cottidae***		
*Prickly sculpin	*Cottus asper*		Lowlands, foothills. Found in Slab Creek Reservoir. Stable/Expanding based on Moyle et al. 1996.
*Riffle sculpin	*Cottus gulosus*		Foothills, high elevations. Found in Camino Reservoir, Camino Dam Reach, and downstream of the Project area. Stable based on Moyle et al. 1996.

*Species known to occur in the Project area
[1]Status: FT = Listed as threatened under ESA
FE = Listed as endangered under ESA
CSC = Listed as California Species of Concern
MIS = Management Indicator Species
[2]Fish sighting verification is derived from CDFG surveys (various dates). These sightings do not reflect exhaustive searches, i.e., these species may occur in more areas in the Project area than noted.

Several literature sources were referenced in order to compile a list of amphibian species, including special status species, with reasonable potential to occur in the Project drainage. These sources are: Jennings (1996), Jennings and Hayes (1994), Thelander (1994), and a review of relevant field guides as well as the California National Diversity Database. Seventeen amphibians and one aquatic reptile were identified as potentially occurring in the Project drainage (Table E3.2-3).

As indicated in Table E3.2-3, nine of the 18 species potentially located in the Project area are believed to have stable or expanding populations. Nine of the species are designated as federal or state special-status species. Habitat and life history information for these species is provided in Section E3.2.5.

3.2.4 Aquatic Invertebrates

The aquatic invertebrate fauna in the Sierra Nevada is diverse and includes many endemic species (Erman 1996). Aquatic invertebrates are relatively sensitive to changes in their habitats and are often used to indicate quality of, and changes in, aquatic habitat and water quality. Although little information is available regarding historical aquatic invertebrate populations in the Sierra Nevada, it is believed that aquatic invertebrate populations have changed in abundance, composition, and range based on a number of factors, including logging, grazing, mining, water development, and the introduction of exotic species (Erman 1996).

Table E3.2-2. Introduced fishes of the Sierra Nevada (Sacramento-San Joaquin Drainage), based partly on Moyle et al. (1996).

Species		Status[1]	Habitat, Distribution & Comments
Common Name	**Scientific Name**		
Salmon and Trout	***Salmonidae***		
Sockeye salmon (kokanee)	*Oncorhynchus nerka*		Foothills. Planted in the Project area
*Brown trout	*Salmo trutta*	MIS	Foothills/High elevations. Fish stocked in Union Valley Reservoir (Henry 1980)
*Brook trout	*Salvelinus fontinalis*	MIS	High elevations. Planted in 1981 (Bontadelli 1991)
*Lake trout	*Salvelinus namaycush*		Foothills/high elevations. Planted in the Project area
Minnows and Carps	***Cyprinidae***		
*Carp	*Cyprinus carpio*		Foothills. Observed from Chili Bar (Ramsey 1949)
*Golden shiner	*Notemigonus crysoleucas*		Foothills. Common bait fish. Planted in 1981 (Bontadelli 1991)
Catfish	***Ictaluridae***		
Brown bullhead	*Ictalurus nebulosus*		Foothills/high elevations
Channel catfish	*Ictalurus punctatus*		Foothills
Livebearers	***Poeciliidae***		
*Mosquitofish	*Gambusia affinis*		Foothills. Observed in Union Valley (EA 1980)
Sunfishes	***Centrarchidae***		
*Green sunfish	*Lepomis cyanellus*		Foothills. Observed above Chili Bar (Ramsey 1949)
Bluegill	*Lepomis macrochirus*		Foothills
Redeye bass	*Micropterus coosae*		Foothills
*Smallmouth bass	*Micropterus dolomieui*		Foothills. Fish stocked in Union Reservoir in 1981 (Bontadelli 1991). Observed in Union Valley Reservoir in 1990 (CDFG 1990)
Spotted bass	*Micropterus punctulatus*		Foothills
Largemouth bass	*Micropterus salmoides*		Foothills
White crappie	*Pomoxis annularis*		Foothills
Black crappie	*Pomoxis nigromaculatus*		Foothills

* Known to occur in the Project area.
[1]MIS = Management Indicator Species

Table E3.2-3 Amphibian and aquatic reptiles that may occur in the Upper American River Drainage.

Species		Status[1]	Native/Introduced, Habitat, Comments
Common Name	**Scientific Name**		
Lungless Salamanders	***Plethodontidae***		
California tiger salamander	*Ambystoma californiense*	FC, CP	Native. Foothills
Southern long-toed salamander	*A. macrodactylum sigillatum*		Native. High elevations. Stable/Expanding based on Jennings 1996
Aboreal salamander	*Aneides lugubris*		Native. Foothills. Stable/Expanding based on Jennings 1996
California slender salamander	*Batrachoseps attenuatus*		Native. Foothills. Stable/Expanding based on Jennings 1996
Hell-Hollow slender salamander[2]	*Batrachoseps* spp.		Native. Foothills. Stable/Expanding based on Jennings 1996
Sierra Nevada salamander	*Ensatina eschscholtzii platensis*		Native. Foothills. Stable/Expanding based on Jennings 1996
Mount Lyell salamander	*Hydromantes platycephalus*	FSC, CSC, CP	Native. High elevations
Newts	***Salamandridae***		
Sierra newt	*Taricha torosa sierrae*		Native. Foothills. Stable/Expanding based on Jennings 1996
True Toads	***Bufonidae***		
California toad	*Bufo boreas halophilus*		Native. Foothills/High elevations. Stable/Expanding based on Jennings 1996
Yosemite toad	*B. canorus*	FC, CSC, CP, FSS	Native. High elevations.
Chorus Frogs	***Hylidae***		
Pacific chorus frog	*Pseudacris regilla*		Native. Foothills/High elevations. Stable/Expanding based on Jennings 1996
True Frogs	***Ranidae***		
California red-legged frog[3]	*Rana aurora draytonii*	FT, CSC, CP	Native. Foothills.
Foothill yellow-legged frog	*R. boylii*	FSC, CSC, CP, FSS	Native. Foothills.
Bullfrog	*R. catesbeiana*		Introduced. Foothills/High elevations. Stable/Expanding based on Moyle et al. 1996
Mountain yellow-legged frog	*R. muscosa*	FC, CSC, CP, FSS	Native. High elevations.
Northern leopard frog	*R. pipiens*	CSC, FSS	Native. High elevations.
Spadefoot Toads	***Pelobatidae***		
Western spadefoot toad	*Scaphiopus hammondii*	FSC, CSC, CP	Native. Foothills.
Water Turtles	***Emydidae***		
Western pond turtle	*Clemmys marmorata*	FSC, CSC, CP, FSS	Native. Foothills/high elevations.

Table E3.2-3 (Continued)			
Species		Status[1]	Native/Introduced, Habitat, Comments
Common Name	Scientific Name		
Number of Native Species and Subspecies			18
Number of Introduced Species			1
Total Number of Species and Subspecies			19

[1] Status:
FT = Federal threatened species
FC = Federal candidate for listing
FSC = Federal species of concern
FSS = Forest Service sensitive species
CSC = California species of concern
CP = California protected species
[2] No occurrences reported but Project area is within the expected range of the species.
[3] Presumed extinct from historical locations in region.

chemicals, such as insecticides, herbicides, fertilizers and fire retardants, which have the potential to adversely affect benthic macroinvertebrates.

Benthic macroinvertebrates are a taxonomically expansive group that generally includes any visible, non-planktonic invertebrates found in aquatic environments. While no benthic macroinvertebrates are listed as endangered in the study area, the structure of the benthic macroinvertebrate community may impact species of concern because it serves as the primary food source to many fish species and other vertebrates. In addition to their role as a food source, benthic macroinvertebrate fauna are an important component of cycling nutrients and breaking down organic material within the aquatic system.

In addition to a direct effect on ecosystem health as consumers of organic material in the channel and as food sources for higher trophic levels, benthic macroinvertebrate species composition and abundance can provide an important indicator of ecological health of a system. As a group, benthic macroinvertebrates are highly diverse in their environmental functions, life history requirements, and tolerances for varying conditions. Furthermore, because populations typically respond quickly to environmental change, studying the structure of benthic macroinvertebrate communities has been used as a tool to evaluate the status and health of stream systems.

Benthic macroinvertebrate studies are a potentially useful tool for understanding the impacts of flow impoundments and regulation within the Project area. According to Erman (1996), several aspects of water and land management activities have the potential to influence benthic macroinvertebrate community composition. Seasonal and short-term water level fluctuations in reservoirs and streams can result in stranding or asynchrony between environmental conditions (e.g., water level and temperature) and organisms' life history activities. Sedimentation can induce physiological stress, interfere with feeding, and may fill interstitial space in the streambed, thus reducing habitat area for invertebrates. Increased thermal gain by the system, due to removal of riparian vegetation or retention in impoundments, has the potential to increase thermal stress on organisms and may potentially shift the trophic structure of the system toward being more algae-based and less dependent on inputs of terrestrial vegetation (i.e., allochthonous material). Finally, human activity frequently results in some level of impact from industrial chemicals, such as insecticides, herbicides, fertilizers and fire retardants, which have the potential to adversely affect benthic macroinvertebrates.

Based on the ENF's LRMP (USDA 1988), one aquatic invertebrate species has been identified as a Federal species of concern, Button's Sierra sideband snail (*Monadenia mormonum buttoni*). This species is discussed in more detail in Section E3.2.5.

3.2.5 Special Status Aquatic Species

Special-status species refer to those species or subspecies that are: 1) listed, proposed for listing, or candidates for listing under the ESA or CESA as endangered or threatened; 2) listed by a federal or state agency as a species of special concern, sensitive species, protected species or fully protected species; or 3) listed by the USFS or ENF as a MIS.

Twelve aquatic special-status species or subspecies that may occur in the Project area have been identified (Table E3.2-4). Two of these are fish species or subspecies, eight are amphibians, one is a reptile, and one is an invertebrate. Of these, California red-legged frog is the only federal threatened species and resident rainbow trout and Lahontan cutthroat trout are USFS MIS species or subspecies. Of the remaining special-status species, nine are either federal or California species/subspecies of special concern or protected by the state of California. It should be noted that the population of Lahontan cutthroat trout in the Sacramento River is outside its native range, so the ESA listing as threatened does not apply to this population.

Trout (MIS)

The ENF considers all species of trout (rainbow, brook, brown, and Lahontan cutthroat trout) to be MIS (pers. comm. George Elliott, USFS, March 2001). Rainbow and Lahontan cutthroat trout are native to California, while brook and brown trout are introduced. Of the four species, rainbow trout are the most abundant harvest species and have the widest distribution within the Project area. Brook trout occur in higher elevation perennial streams. Brown trout occur mostly at low- to mid-elevation ranges, but are not as abundant as rainbow trout due to the heavy stocking of rainbow trout in the Project area. Lahontan cutthroat trout have the narrowest distribution within ENF, known only from stocking of Hidden Lake, which is located upstream of the Project area, approximately 0.5 mile northeast of Loon Lake Reservoir. Lahontan cutthroat trout are discussed in more detail below.

Although the four trout species have similar spawning habits, rainbow and Lahontan cutthroat trout spawn in the spring, and brook and brown trout spawn in the fall. The specific spawning time is influenced by factors such as the genetic strain of the fish, water temperature, and period of daylight. Spawning usually occurs in gravel riffles of small streams, although brook trout are able to spawn on the gravel bottoms of lakes. The Lahontan cutthroat population is sustained by stocking in Hidden Lake, but no fish reproduce there (pers. comm. George Elliott, USFS, March 2001; pers. comm. Stafford Lehr, CDFG, May 2001). Females excavate a nest, or "redd," in the

Table E3.2-4. Special status aquatic species that may occur in the Project area.

Species		Status[1]	Native/Introduced & Habitat
Common Name	**Scientific Name**		
Invertebrates			
Button's Sierra sideband	*Monadenia mormonum*	FSC	Native. Foothills.
Amphibians			
California tiger salamander	*Ambystoma californiese*	FC, CP	Native. Foothills.
Mount Lyell salamander	*Hydromantes*	FSC, CSC, CP	Native. High elevations.
Yosemite toad	*Bufo canorus*	FC, CSC, CP, FSS	Native. High elevations.
California red-legged frog	*Rana aurora draytonii*	FT, CSC, CP	Native. Foothills.
Foothill yellow-legged frog	*R. boylii*	FSC, CSC, CP,	Native. Foothills.
Mountain yellow-legged	*R. muscosa*	FC, CSC, CP, FSS	Native. High elevations.
Northern leopard frog	*R. pipiens*	CSC, FSS	Native. High elevations.
Western spadefoot toad	*Scaphiopus hammondii*	FSC, CSC, CP	Native. Foothills.
Reptiles			
Western pond turtle	*Clemmys marmorata marmorata*	FSC, CSC, CP, FSS	Native. Foothills/high elevations.
Fish			
Trout	*Salmonidae*, spp.	MIS	Both. Foothills/high elevations.
Lahontan cutthroat trout[2]	*Oncorhynchus clarki*	FT	Native. High elevations.
Hardhead	*Mylopharodon conocephalus*	CSC	Native. Foothills.
Sacramento roach	*Lavinia symmetricus*	CSC	Native. Foothills.

[1] Status:
FT = Federal threatened species
FC = Federal candidate for listing
FSC = Federal species of concern
FSS = Forest Service sensitive species
CSC = California species of concern
CP = California protected species
MIS = Management Indicator Species

[2] Project area is outside native range.

gravel, and after spawning, cover the eggs with gravel. A single female may spawn a number of times during one season. After hatching, the fry remain in the gravels until their yolk sacs are absorbed. The fry then venture into open water, feeding on plankton. As they mature, they begin to feed on aquatic terrestrial insects; large trout also feed on fish.

<u>Lahontan Cutthroat Trout (FT but outside its native range, and MIS)</u>

Lahontan cutthroat trout are native to streams and lakes of the Lahontan system on the east-side of the Sierra Nevada (Moyle 1976). The Lahontan cutthroat trout is generally similar in appearance to rainbow trout, but is more heavily marked with black spots on its body, has two yellow to red slashes of pigment on the underside of its lower jaws, has a larger mouth, and has a more slender body (Moyle 1976). The cutthroat trout is also ecologically similar to rainbow trout. It occurs in a wide variety of cool waters from large alkaline lakes (e.g., Pyramid Lake, NV) to small mountain lakes (e.g., Blue Lake, CA) and major rivers to small tributaries (Moyle 1976). It is opportunistic, feeding on whatever is most abundant in the drift (Behnke 1992, Moyle 1976). Stream-dwelling cutthroat trout are often sedentary and may stay within the same

60 feet of stream for their entire lives (Miller 1957). The Lahontan cutthroat trout occurs in Hidden Lake as a result of planting by CDFG. It is a non-reproducing population, since there are no streams available with suitable spawning habitat (pers. comm., Stafford Lehr, CDFG, May 2001). Lahontan cutthroat trout generally do not compete well with other species of trout (Behnke 1992). Consequently, it is unlikely that the Lahontan cutthroat trout would ever become established in the vicinity of the Project due to the presence of rainbow, brown, and brook trout. Crosses of Lahontan cutthroat and other trout species have been planted in the Project area at Hidden Lake, which is upstream of the Project area approximately 0.5 mile northeast of Loon Lake.

Hardhead (CSC, FSS)
The hardhead is a large, native minnow generally found in undisturbed areas of larger low- to middle-elevational streams (elevation 30 to 4,760 feet) of the Sacramento and San Joaquin watersheds. Its range extends from the Kern River, Kern County in the south to the Pit River, Modoc County, in the north (Moyle et al. 1989). Hardhead inhabit areas that have clear, deep pools with sandy, gravel/boulder substrates and slow water velocities (less than 0.05 ft/sec) (Moyle and Nichols 1973; Knight 1985; Moyle et al. 1989). Hardhead co-occur with Sacramento pikeminnow and usually with Sacramento suckers and tend to be absent from streams where introduced species, especially centrarchids, predominate (Moyle and Nichols 1973; Moyle et al. 1989). Hardhead are well established in several mid-elevation reservoirs used exclusively for hydroelectric power generation (Moyle et al. 1989). Hardhead have been identified in the Slab Creek Reservoir and the SFAR east of the El Dorado Irrigation District's FERC Project No. 184. Hardhead are still relatively widespread in foothill streams, but extensive alteration of downstream habitats in conjunction with their specialized habitat requirements have resulted in local populations becoming isolated, thus making them vulnerable to localized extirpation (Moyle et al. 1989).

Sacramento Roach (CSC)
The Sacramento roach is a subspecies of California roach that is found in tributaries to the Sacramento River, except for the Pit River (which supports a different subspecies) (Moyle et al. 1995). California roach are generally found in small, warm intermittent streams, and dense populations are frequently found in isolated pools. They are most abundant in mid-elevation streams in the Sierra Nevada foothills and in some coastal streams (Moyle 1976). Roach are tolerant of relatively high temperatures (up to 86° to 95°F) and low oxygen levels. The California roach is a small (less than 4 inches long) minnow that feeds primarily on filamentous algae. Much of their habitat is on private land, which is subject to development and/or intense grazing pressure. As a result, many of the streams dry up more frequently or more completely than usual, due to diversions and to pumping from the aquifers that feed them. Predators such as largemouth bass and green sunfish often occur in the remaining deep pools, often feeding on roach (Moyle et al. 1995).

California Tiger Salamander (FC, CP)
The California tiger salamander ranges from near Petaluma, Sonoma County, east through the Central Valley to the Colusa-Yolo county line, south to Tulare County, and from the vicinity of

San Francisco Bay south at least to Santa Barbara County. In California, most populations occur below 1,000 feet elevation, but they have been recorded up to 4,500 feet (Zeiner et al. 1988).

The California tiger salamander is most commonly found in annual grassland habitat, but also occurs in grassy understory of valley-foothill hardwood habitats and uncommonly along stream courses in valley-foothill riparian habitats. California tiger salamanders typically breed in vernal pools, or other depressions that fill with water during winter rains and dry by mid-summer. California tiger salamanders may also utilize artificial impoundments, such as farm ponds. Permanent aquatic sites may be used for breeding if they do not contain fish (Jennings and Hayes 1994). California tiger salamanders may occur in ponds where bullfrogs are found if vegetation is present to provide cover (Shaffer and Fisher 1991). Streams are rarely used for reproduction (Zeiner et al. 1988).

Adult tiger salamanders spend most of the year in subterranean refugia, especially burrows of California ground squirrels and Botta's pocket gopher and occasionally in man-made structures (Stebbins, 1972; Shaffer et al. 1993). In areas that lack fossorial mammal burrows, tiger salamanders may use cracks in the ground or may burrow into loose soil or seek refuge in and under rotting logs or fallen branches (CDFG 1997).

The California tiger salamander engages in nocturnal breeding migrations from subterranean refuge sites to breeding sites following relatively warm late winter and spring rains (Voigt 1989; Shaffer and Fisher 1991; Barry and Shaffer 1994) with peak activity December through March. These migrations may cover more than half a mile providing there are no artificial barriers, such as heavily traveled roads or solid road dividers, that impede migration (Jennings and Hayes 1994). During breeding migrations, individuals are sometimes found under surface objects such as rocks and logs. Tiger salamanders usually stay at breeding ponds a few days, but some individuals may remain up to several weeks after breeding is completed. Females lay numerous small clusters of eggs, each containing from one to more than 100 eggs (Stebbins 1972). Eggs are laid singly or in clumps on both submerged and emergent vegetation and on submerged debris in shallow water (Stebbins 1972; Shaffer and Fisher 1991; Barry and Shaffer 1994; Jennings and Hayes 1994). In total, individual females may lay more than 1,000 eggs. Eggs require at least 10 weeks to complete development through metamorphosis (Anderson 1968; Feaver 1971). Aquatic larvae seek cover in turbid water, clumps of vegetation, and other submerged debris. Larvae transform during late spring or early summer, usually by the first week of July. They disperse from the breeding sites after spending a few hours or days near the pond margin (Jennings and Hayes 1994).

Following metamorphosis, juveniles emigrate at night from the drying breeding site after spending a few hours or days near the pond margin (Zeiner et al. 1988; Jennings and Hayes 1994). Juveniles may migrate up to a mile from breeding sites to refuge sites (Austin and Shaffer 1992). Postmetamorphic juveniles retreat to small-mammal burrows after spending a few hours or days in mud cracks near water or tunnels constructed in soft soil. California tiger salamanders are not likely to be observed outside the wet season interval, unless refuge sites are disturbed or under conditions of unseasonal rainfall (Holland et al. 1990; Jennings and Hayes 1994).

Mount Lyell Salamander (FSC, CSC, CP)

The Mount Lyell salamander occurs only in the Sierra Nevada from Sierra County south to Tulare County. Populations are discontinuously distributed in isolated patches of suitable habitat. Usually common where they occur, individuals are active on the surface only when free water in the form of seeps, drips, or spray is available. Its known elevation range extends from 4,000 feet to 11,600 feet.

The Mount Lyell salamander occurs in massive rock areas in mixed conifer, red fir, lodgepole pine, and subalpine habitats. Such areas must include a water source. North and east slopes, often at the base of cliffs or rockpiles, appear to be favored. Preferred rocky areas are often over decomposed granite soils, which are moistened by seeps or melting snow. Cover is provided during the period of surface activity primarily by flat granite rocks. Winter hibernation probably occurs within deep rock fissures or under slabs of exfoliating granite. No information is available on water requirements, but Adams (1942) pointed out the apparent importance of high humidity and substrate moisture as habitat requirements of this species. Water requirements during the period of surface activity are met by snowmelt, seepages, and spray from waterfalls. During the remainder of the year, seepages within rock fissures or other subsurface refugia provide moisture. No other salamander normally occurs in the preferred habitat of this species.

Little is known about specific microhabitat requirements of the Mount Lyell salamander for breeding and egg laying. Museum specimens (Stebbins 1951, 1954) collected during summer possessed from 6 to 14 eggs. It is possible that oviposition occurs during the fall, with hatching occurring in the spring or early summer. Eggs are probably deposited beneath granite rocks or slabs covering moist granite soil. Individuals are nocturnal during the period of surface activity and are most likely to be encountered on the surface during or after rains. Individuals occupy surface microhabitats during periods of surface moisture in the spring, summer, and fall but retreat to moist subsurface refugia during dry periods and winter. Individuals are not known to have home ranges exceeding 320 feet in the longest dimension. Most individuals probably move much shorter distances.

Yosemite Toad (FC, CSC, CP, FSS)

The Yosemite toad ranges in the Sierra Nevada from the Blue Lakes region north of Ebbetts Pass, Alpine County, south to the Evolution Lake/Darwin Canyon area, Fresno County. Its known elevational range extends from 6,400 feet (Aspen Valley, Tuolumne County) to 11,300 feet (Mount Dana Tuolumne County), although the majority of the population is found at elevations between 8,500 feet and 10,000 feet. The Yosemite toad prefers relatively open montane wet meadows and the forest cover around meadows, but also occurs in seasonal ponds associated with lodgepole pine, whitebark pines, and subalpine conifer forests. Suitable breeding sites are generally found at the edges of meadows or slow, flowing runoff streams. Short emergent sedges or rushes often dominate such sites. During inactive periods (overwintering), these toads seek cover inside abandoned burrows of Belding’s ground squirrels and yellow-bellied marmots. These burrows may be preferred for overwintering because their greater depth makes them less susceptible to freezing. The burrows of meadow voles and mountain pocket gophers are probably also used. Burrows of all four species as well as the adjacent forests are probably used as temporary refuge sites during the summer season (Mullally and Cunningham 1956; Karlstrom 1973). Individuals occasionally hide under rocks in streambeds and when disturbed, they often hop into nearby water (Mullally 1953; Cunningham 1963).

The Yosemite toad is largely diurnal and emerges from winter hibernation as soon as snow-melt pools form near their winter refuge sites (Karlstrom 1962; Kagarise Sherman 1980). The timing of emergence varies with elevation and local conditions, but known dates of emergence range from early May to mid-June (Kagarise Sherman 1980). Breeding and egg laying occur from mid-April to mid-July depending on local conditions. Eggs are deposited in shallow, quiet pools in wet meadows, or in shallow tarns surrounded by forest. Egg strings are typically wound around short emergent vegetation in shallow (less than 3 inches), still water with a flocculent or silty bottom (Karlstrom 1962). Eggs are reported to hatch in 10 to 12 days (Davidson 1994), and larvae metamorphose within 40 to 60 days. Individual males may stay at breeding locations for a week or two, but females move to meadow areas shortly after breeding to feed for two to three months prior to hibernation. Terrestrial individuals are primarily diurnal, but have much crepuscular and nocturnal activity during warmer periods.

<u>California Red-Legged Frog (FT, CSC, CP; Presumed extinct from historical locations in the region)</u>
The historical range of the California red-legged frog extends through Pacific slope drainages from Shasta County, California, to Baja, Mexico, including the Coast Ranges and the west slope of the Sierra Nevada Range at elevations below 5,000 feet. The current range of this species is greatly reduced, with most remaining populations occurring along the coast from Marin County to Ventura County. Red-legged frog sitings have been made in El Dorado County, south of highway 50 and west of the Project area.

The California red-legged frog occurs primarily in perennial ponds or pools and perennial or ephemeral streams where water remains long enough for breeding and development of young (Jennings and Hayes, 1994). Habitats with the highest densities of frogs contain dense emergent or shoreline riparian vegetation closely associated with deep (greater than 2.3 feet), still or slow-moving water. The types of vegetation that seem to provide the most suitable structure are willows, cattails, and bulrushes. Another key habitat indicator for California red-legged frog is the absence or near-absence of introduced predators such as bullfrogs and predatory fish, particularly centrarchids (i.e., sunfish), which feed on the larvae at higher rates than naturally co-evolved predatory species (Hayes and Jennings 1988). Emergent vegetation, undercut banks, and semi-submerged rootballs afford shelter from predators (USFWS 1997).

The California red-legged frog lays eggs from late November to late April in ponds or in backwater pools of creeks, attaching them to emergent vegetation such as cattails and bulrushes. Larvae remain in these aquatic habitats until metamorphosis. Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae typically metamorphose between July and September and probably feed on algae (Jennings and Hayes 1994).

The California red-legged frog may disperse upstream, downstream, or upslope of their breeding habitat to forage and seek sheltering habitat. They take shelter in small-mammal burrows and other refugia up to several dozen feet from the water any time of the year (Jennings and Hayes 1994). During wet periods, the California red-legged frog can move long distances between aquatic habitats, traversing upland habitats or ephemeral drainages up to a mile from the nearest known frog populations. Seeps and springs in open grasslands can function as foraging habitat or refugia for wandering frogs (USFWS 1997).

Foothill Yellow-Legged Frog (FSC, CSC, CP, FSS)

The foothill yellow-legged frog occurs in the Coast Ranges from the Oregon border south to the Transverse Mountains, in Los Angeles County, in most of northern California west of the Sierra Nevada-Cascade crest, and along the Coast Ranges north of Monterey. Livezey (1963) reported an isolated population in San Joaquin County on the floor of the Central Valley. In the Sierra Nevada, the species ranges in elevation from sea level to 5,000 feet.

The foothill yellow-legged frog is found in or near rocky streams in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types. Foothill yellow-legged frogs require shallow, flowing water in small-to-moderate streams with some cobble-sized substrate. This species has also been found in streams lacking cobble or larger-sized substrate (Fitch 1936; Zweifel 1955), but it is not known whether these habitats are regularly used (Hayes and Jennings 1988). Adults are usually found in close proximity to water and prefer areas near riffles with rocky banks and require partly shaded banks for basking. Adults often bask on exposed rock surfaces and when disturbed dive into the water and take refuge among stones, silt, or vegetation. During periods of inactivity, especially during cold weather, individuals seek cover under rocks in the streams or on shore within a few meters of water. Foothill-yellow legged frogs are infrequent or absent in habitats where introduced aquatic predators (i.e., fishes and bullfrogs) are present (Jennings and Hayes 1994).

The foothill yellow-legged frog may be active all year in the warmest localities, but may become inactive or hibernate in colder areas. Significant seasonal movements or migrations from breeding areas have not been reported, and the daily and seasonal movement ecology and behavior of adult foothill yellow-legged frogs is essentially unknown. Nussbaum et al. (1983) found frogs underground and beneath surface objects more than 155 feet from water in April. These frogs probably spend most of their time in or near streams at all seasons. Egg laying follows the high-flow periods associated with winter rainfall and snowmelt, usually between late March and early June (Storer 1925; Grinnell et al. 1930; Wright and Wright 1949). However, more recent studies have indicated that egg laying may occur as late as June and July (pers. comm. Sarah Kupferberg, February 2001). Breeding sites are typically located in broad shallow channels, often near point bars, in which the necessary low velocity (approx. 0.1 ft/sec) is present in shallow near-shore habitat. At the sub-basin level, breeding sites tend to be located near tributary confluences (Kupferberg 1996). Females deposit eggs in clusters of 300 to 1,200 attached to the downstream side of cobbles and boulders over which a gentle flow of water occurs (Storer 1925; Fitch 1936; Zweifel 1955). Eggs hatch in about 5 to 30 days depending on water temperature, and tadpoles typically metamorphose in 3.5 to 4 months. Tadpoles are infrequently observed because they are cryptic against the substrate of rocky pools in which they occur. Tadpoles are primarily herbivorous (probably feeding on algae and diatoms) and will preferentially feed on the most profitable foods for development. Juveniles switch to carnivory after metamorphosis. Although no data are available regarding longevity, two years are thought to be required to reach adult size (Storer 1925). Adults prey on terrestrial and aquatic insects, crustaceans and mollusks. The daily and seasonal movement ecology and behavior of adult foothill yellow-legged frogs is essentially unknown.

The foothill yellow-legged frog coexists with the Cascades frog and the California red-legged frog at some localities, but different microhabitat preferences probably diminish competition. Moyle (1973) identified introduced bullfrogs for the observed reduction of foothill yellow-legged frog populations in the Sierra Nevada. Centrarchid fishes readily feed on ranid eggs (Werschkul and Christensen 1977), and, where introduced into foothill streams, may also contribute to the elimination of this species.

Mountain Yellow-Legged Frog (FC, CSC, CP, FSS)
The mountain yellow-legged frog is represented by two broadly separated populations, the southern California distinct vertebrate population segment (DPS) and the Sierra Nevada DPS. The southern California DPS is represented by individuals that are distributed throughout portions of the San Gabriel, San Bernardino, and San Jacinto Mountains and that ranged, at least historically, to Mt. Palomar in northern San Diego County. In the Sierra Nevada, the mountain yellow-legged frog occurs primarily at elevations above 4,500 feet from Plumas County to southern Tulare County (Zweifel 1955). Recent documentation of two mountain yellow-legged frogs in Butte County at approximately 3,600 feet indicates that this species may occur at lower elevations. In addition, the Feather River Canyon separates a population in Butte County from the Sierra Nevada DPS. The mountain yellow-legged frog has been sighted in El Dorado County near the high elevation mountain reservoirs and lakes.

This highly aquatic frog is always found within a few feet of water. It requires rocks or clumps of grass along the shoreline for cover. In the Sierra Nevada, it is associated with streams, lakes, and ponds in montane riparian, lodgepole pine, subalpine conifer, and wet meadow habitats. It seems to be absent from the smallest creeks, probably because these have insufficient depth for adequate refuge and overwintering (Jennings and Hayes 1994). The mountain yellow-legged frog seems to prefer well illuminated, sloping banks of meadow streams, riverbanks, isolated pools, and lake borders with vegetation that is continuous to the water's edge. Although it is found along a variety of shoreline types, it prefers open stream and lake margins that gently slope to a depth of 12 to 20 inches. These shorelines are probably essential for oviposition and important for thermoregulation of larvae and postmetamorphs; additionally, this type of shoreline probably provides a refuge from predation if fishes occur in adjacent deeper water (Jennings and Hayes 1994). Tadpoles and adults are known to overwinter in deep pools with undercut banks that provide cover. At high elevation locations, the species is typically limited to deeper lakes and ponds that do not freeze completely to the bottom. Mountain yellow-legged frogs are apparently intolerant of introduced predatory fishes, since they are rarely found where such fishes have been introduced (Cory 1962, 1963; Bradford 1989; Bradford et al. 1993).

The adult mountain yellow-legged frog is primarily diurnal and emerges from hibernation sites beneath ice-covered streams, lakes, and ponds soon after the ice melts. At lower elevations, breeding generally occurs between March and June. Timing of breeding and egg laying at higher elevations vary depending on local conditions, but usually occurs from June to August. Round clusters of up to 500 eggs are deposited by females in shallow water unattached and clustered; however, in stream situations the egg masses may be attached to gravel or submerged rocks. The time for completion of embryonic development is unknown, but larvae apparently overwinter up to two times for six- to nine-month intervals before attaining adult form (Cory 1962; Bradford 1983). Overwintering results in larvae dying when the aquatic habitat becomes ephemeral in some years (Mullally 1959). Larvae may form diurnal aggregations (numbering in the hundreds) in shallow water (Jennings and Hayes 1994). Like all frogs, tadpoles are herbivorous (probably feeding on algae and diatoms) and switch to carnivory after metamorphosis. Adults prey on terrestrial and aquatic insects, crustaceans, and mollusks. Frogs require water for hibernation, possibly because they can tolerate only limited dehydration (Hillman 1980).

It has been established that invasion of non-native fish, specifically salmonids, into the habitats that have been historically utilized by mountain yellow-legged frog is a significant factor contributing to overall decline of this species (Knapp and Matthews 2000; Knapp et al. 2001). Pesticides, livestock grazing, acidification, and increased levels of ultraviolet radiation have also been implicated in the decline of the species (USFWS 2000; CDFG 1994).

<u>Northern Leopard Frog (CSC, FSS)</u>

The northern leopard frog is one of the most broadly distributed frogs in North America, with over 98 percent of its geographic range occurring outside of California. In California, this species is uncommon and localized, with native populations historically recorded only in Modoc and Lassen counties (Jennings and Hayes 1994). Frogs in the vicinity of Lake Tahoe have been treated as native (Stebbins 1966, 1985), but historical evidence indicates that at least some of these are introduced (Bryant 1917; Storer 1925; Jennings 1984). In California, the known elevational range of this species extends from approximately 3,900 feet to 4,800 feet. The occasional discovery of leopard frogs at new localities is usually the result of introduction.

Highly aquatic, the leopard frog occurs in or near quiet, permanent and semi-permanent water in many habitats and require an aquatic habitat in which to overwinter (Emery et al. 1972) and lay eggs (Corn and Livo 1989). For reproduction, the leopard frog prefers cattail and sedge marshes, weedy ponds, or other water with aquatic vegetation (Nussbaum et al. 1983). A dense, relatively tall, grass- or forb-dominated habitat with a moist substrate for foraging during the active season must occur in the vicinity of the aquatic habitat used for breeding and overwintering (Dole 1965a, 1965b; Rittschof 1975; Merrell 1977). Shoreline cover and emergent or submergent vegetation may be necessary for both oviposition and refuge during the breeding period, but the degree to which leopard frogs require vegetation in their aquatic breeding habitat is unknown. Adults frequently return to small pockets (called forms) at the base of dense graminoid or forb vegetation that has been molded into a resting location where frogs sit (Dole 1965a). Adults are opportunistic feeders, taking a variety of aquatic and terrestrial prey. Primarily foods include small adult insects, but sowbugs, spiders, leeches, snails, small fishes, amphibians (cannibalism has been reported), small snakes, and birds are also taken (Stebbins 1972; Nussbaum et al., 1983). Tadpoles probably feed primarily by filtering algae and diatoms, but may also consume some plant material and animal food incidentally encountered.

In California, the leopard frog breeds from December to June depending on local conditions. Females deposit up to 6,000 eggs in flattened globular clusters attached to vegetation in shallow water. Eggs normally hatch within three weeks; tadpoles typically metamorphose in two to four months and use shallow water near shores. Movement of subadult frogs is greater than that shown for adults (Dole 1965b; 1971), with adults showing a high degree of site fidelity. Terrestrial individuals may be active at all times of the day. In areas with mild winters, leopard frogs are active all year, but in cooler climates they undergo periods of inactivity or hibernation. Underwater overwintering sites consist of small pits that the frogs apparently excavate in the bottom mud (Emery et al. 1972). Pronounced movements by adults are commonly observed during warm fall, winter, or spring rains. They may represent lengthy foraging excursions, or dispersal to breeding localities. During summer or fall (depending on local conditions), newly transformed juveniles travel long distances from water, presumably while dispersing from parental breeding sites.

Western Spadefoot Toad (FSC, CSC, CP)
The western spadefoot toad ranges throughout the Central Valley and adjacent foothills of central California. It also occurs coastally from Point Conception, Santa Barbara County, south to the border of Mexico. In the southern Sierra Nevada foothills, this species can be found from sea level up to 4,500 feet. Populations of this species occur in valley-foothill hardwood woodlands, but are found primarily in open grasslands with vernal pools or other temporary standing water (Zeiner et al. 1988).

Optimal habitat for the western spadefoot toad includes grassland with shallow, temporary pools, but occasional populations also occur in valley-foothill hardwood woodlands. Western spadefoot are rarely found on the surface and spend most of the year in underground burrows up to 36 inches deep (Stebbins 1972). Sometimes burrows are constructed, but abandoned mammal burrows are often used (Stebbins 1972). During dry periods, the moist soil inside burrows provides water for absorption through the skin (Ruibal et al. 1969; Shoemaker et al. 1969). Heavy winter rains are required for emergence and breeding activities. Breeding ponds lasting at least two weeks provide habitat for developing eggs and metamorphosing tadpoles. Recently metamorphosed juveniles seek refuge in the immediate vicinities of breeding ponds for up to several days after transformation. They hide in drying mud cracks, under boards and other surface objects including decomposing cow dung (Weintraub 1980). Dispersal of postmetamorphic juveniles from breeding ponds often occurs without rainfall.

Spadefoots emerge only after winter rains, when breeding activities commence in shallow temporary pools filled by seasonal rains. Breeding and egg laying peak during March and chorusing males may be heard during this time. Females lay numerous, small egg clusters attached to plants or submerged rocks. The total number of eggs laid by a single female may reach 500 (Stebbins 1951). Spadefoot eggs develop and hatch rapidly, usually within two weeks. Tadpoles transform during late spring and disperse away from pond margins after a few days (Zeiner et al. 1988). Tadpoles consume planktonic organisms and algae and sometimes tadpoles of their own species. Adult spadefoots consume butterfly and moth larvae, as well as ants, worms, and beetles (Whitaker et al. 1977; Dimmitt and Ruibal 1980).

Western Pond Turtle (FSC, CSC, CP, FSS)

The western pond turtle, is the only freshwater turtle native to most of the west coast of temperate North America. They occur from sea level to 6,000 feet from British Columbia south to northwestern Baja California, principally west of the Sierra-Cascade crest. The northwestern subspecies, *Clemmys marmorata marmorata*, is restricted to areas from British Columbia south to Marin County in central California, and intergrades with the southern subspecies (*Clemmys marmorata pallidus*) in Marin County.

The western pond turtle inhabits a wide range of fresh and brackish water habitats. Habitat suitability seems to be correlated with the abundance of aerial and aquatic basking sites; northwestern pond turtles often reach higher densities where many aerial and aquatic basking sites are available. Preferred habitats for western pond turtles are permanent ponds, lakes, low-flow regions of rivers, and river side-channels and backwater areas. Deep, still water with abundant emergent woody debris, overhanging vegetation and rock outcrops is optimal for basking and thermoregulation. Western pond turtles are uncommon in high-gradient streams, probably because water temperatures, current velocity, lack of food resources, or any combination of these factors may limit their distribution (Holland 1991). The western pond turtle will move significant distances (at least 1.8 miles) if the local aquatic habitats dry up, but dispersal abilities of juveniles and the recolonization potential of northwestern pond turtles following extirpation of a local population are unknown (Jennings and Hayes 1994). Although adults are habitat generalists, hatchlings and juveniles require very specialized habitat for survival through the first few years. Hatchlings require shallow water habitat with relatively dense submergent or short emergent vegetation in which to forage. Habitats preferred by hatchlings and juveniles are often relatively scarce and subject to disturbance (Jennings and Hayes 1994).

This species often overwinters in forested habitats. Females emerge from hibernation sites and travel overland to riparian or other aquatic sites in the spring for mating. Breeding activity peaks in June and July when females begin to search for suitable nesting sites up to 325 feet away from watercourses (Nussbaum et al. 1983). The western pond turtle requires upland oviposition sites in the vicinity of aquatic habitats. Nests are typically dug in a substrate with high clay or silt content, but may vary from sandy shorelines to forest soil types. Nesting sites have been recorded as far as 400 yards from aquatic areas, but the majority are within 200 yards of the aquatic site (Storer 1930; Jennings and Hayes 1994). Slope of nest sites ranges up to 60 degrees, but most nests are on slopes less than 25 degrees. Three to 11 eggs are laid in sandy or loose soil at least 4 inches deep, and hatchlings emerge the following spring after overwintering in the nest.

Incubation requires 73 to 80 days (Feldman 1982). Sexual maturity is reached at about eight years of age. Low fecundity, low hatchling and juvenile survival, high adult survival and potentially long life spans characterize this species (Jennings and Hayes 1994).

Button's Sierra Sideband Snail

The sideband snail species is classified by CDFG as "endangered" to "extremely endangered" (i.e., NDDB rank G1G2) throughout the Pacific Northwest. The subspecies Button's Sierra sideband snail, which has been documented in the Project area (within the USGS Riverton 7.5′-quadrangle), is classified as "extremely endangered" throughout the Pacific Northwest as well as within the state of California (i.e., NDDB rank T1S1). This subspecies is also listed as an FSC. Detailed information regarding its life history is not currently available.

3.3 Aquatic Resources in the Project Area

Previous studies and resource agency records (CDFG and ENF) were reviewed regarding aquatic resource survey data in the Project area. The following sections document existing information on the fish, amphibian, aquatic reptile, and macroinvertebrate populations in various river reaches and reservoirs within the Project area.

Special-status amphibians and aquatic reptiles identified as potentially occurring in the distinct reaches of the Project area have largely been based on distribution and elevational range of the species, preferred habitat, and previously documented occurrences. The elevational range and available habitat considered includes the general Project area defined for amphibians and aquatic reptiles and does not represent only those areas within the FERC boundary. The species identified represent a conservative preliminary list because it is based only on literature and review of topographic maps. As a result, special-status amphibians and aquatic reptiles identified as potentially occurring in the Project area may change when additional information is reviewed.

Since 1980, there have been five benthic macroinvertebrate studies within the Project area that were performed to describe known abundance and distributions. These studies were designed to determine taxonomic richness, indices of diversity and evenness, as well as abundance and allow comparison between reaches of interest, although no statistical comparisons were performed. In addition to these studies, two CDFG stream surveys have been identified to provide some historical reference to invertebrate populations in and around the Project area. The species identified represent a conservative preliminary list because it is only based on literature review and a California Natural Diversity Database search. Special-status invertebrates identified as potentially occurring in the Project area may change when additional information is reviewed. Furthermore, special-status invertebrates that may occur along the transmission lines will be identified upon determination of the extent of the transmission lines to be included with the Project.

3.3.1 Rubicon Reservoir

Fish populations in Rubicon Reservoir have been assessed by CDFG through angler surveys, lake surveys, and fish population monitoring. Fish species in the reservoir include abundant rainbow trout, brook trout, golden trout, and brown trout (unpublished CDFG Rubicon Reservoir surveys, various dates). Mountain yellow-legged frog is the only special-status amphibian with potential to occur in Rubicon Reservoir or its tributaries. The presence of this species has been documented within approximately one mile of Rubicon Reservoir (ENF 2001). Potential presence of this species at Rubicon Reservoir and its tributaries is largely dependent upon availability of suitable habitat. For information on preferred habitat of this species, refer to Section 3.2.5. Numerous additional locations of this species have been recorded by ENF in lakes and tributaries of the Rubicon River in the upper portion of the watershed, upstream of the Rubicon Reservoir (ENF 2001).

3.3.2 Rubicon Dam Reach

ENF has documented eastern brook trout and rainbow trout as being present in the Rubicon Dam Reach downstream of the dam. Electrofishing data estimated the biomass of trout in this reach to be 26.9 pounds per acre (USDA Upper Rubicon River Stream Survey 1979). Special-status amphibians and aquatic reptiles with potential to occur in the Rubicon Dam Reach include: Mount Lyell salamander, Yosemite toad, and mountain yellow-legged frog. As noted, the mountain yellow-legged frog has been documented to occur within approximately one mile of Rubicon Reservoir (ENF 2001). Numerous additional locations of this species have been recorded by ENF in lakes and tributaries of the Rubicon River in the upper portion of the watershed, upstream of the Rubicon Reservoir (ENF 2001).

3.3.3 Rockbound Lake (non-Project facility)

Fish populations in Rockbound Lake have been assessed by CDFG through gill netting, lake surveys, and creel censuses. Fish species in the area include rainbow trout, brook trout, and brown trout (unpublished CDFG surveys, various dates). Mountain yellow-legged frog is the only special-status amphibian with potential to occur in Rockbound Lake or its tributaries. It has been documented at numerous locations above Rockbound Lake in both lake and stream habitats (ENF 2001). Potential presence of this species is largely dependent upon availability of suitable habitat.

3.3.4 Rockbound Dam Reach

Fish species information for this reach of the Project area is not available, but fish resources are expected to include some combination of trout species found in the upstream lake and downstream reservoir. Although not documented in this area, special-status amphibians and aquatic reptiles that may occur include: Mount Lyell salamander, Yosemite toad, and mountain yellow-legged frog.

3.3.5 Buck Island Reservoir

Until 1976, Buck Island Reservoir was heavily stocked with brook trout fingerlings (see Appendix E3-1). In 1977, trout stocking was discontinued in this reservoir. Fish populations in Buck Island Reservoir have been assessed by CDFG through lake surveys, creel surveys and gill netting. Fish species in the area include brown trout, rainbow trout, and brook trout (unpublished CDFG surveys, various dates). Mountain yellow-legged frog is the only special-status amphibian that may occur in Buck Island Reservoir or its tributaries, though its presence has not been documented.

3.3.6 Buck Island Dam Reach

Fish species information for this reach of the Project area is not available, but fish resources are expected to include some combination of trout species found in the upstream reservoir. Although not documented in this area, the following special-status amphibians and aquatic reptiles may occur in the Buck Island Dam Reach: Mount Lyell salamander, Yosemite toad, mountain yellow-legged frog, and western pond turtle.

3.3.7 Loon Lake Reservoir

Loon Lake Reservoir is heavily planted with catchable-sized trout, as well as fingerlings (see Appendix E3-1). Fish populations in Loon Lake Reservoir have been assessed through creel surveys, lake surveys, and gill netting. Fish species in the area include rainbow trout, brown trout, brook trout, California roach, chubs, Sacramento suckers, and green sunfish (unpublished CDFG creel census, various dates; CDFG Loon Lake gill net surveys, various dates; EDAW 1978). Mountain yellow-legged frog is the only special- status amphibian that may occur in Loon Lake Reservoir or its tributaries, although its presence has not been documented.

3.3.8 Loon Lake Dam Reach

Fish species information for the 8.5-mile segment of Gerle Creek between Loon Lake Dam and Gerle Creek Reservoir has been assessed through stream surveys, electrofishing, fishery surveys, and gill netting. Fish species in this reach of the Project area include brook trout, brown trout, rainbow trout, and California roach (CDFG Gerle Creek surveys, various dates). Although not documented in this area, the following special-status amphibians and aquatic reptiles may occur in the Loon Lake Dam Reach: Mount Lyell salamander, Yosemite toad, mountain yellow-legged frog, and western pond turtle.

3.3.9 Gerle Creek Reservoir

Gerle Creek Reservoir has no record of fish stocking. Fish species reported in the reservoir include brook trout, brown trout, and rainbow trout (CDFG 1979). In 1986, the El Dorado Fish and Game Commission, CDFG, and USFS conducted two fish surveys of Gerle Creek Reservoir. The first survey was graph recorder survey that showed “presumably decent fish populations.”

The second survey was an angler survey that showed brown trout was almost exclusively the only species of trout caught (Turney 1986). Although not documented in this area, the mountain yellow-legged frog and western pond turtle may occur in Gerle Creek Reservoir and its tributaries if suitable habitat is present.

3.3.10 Gerle Creek Dam Reach

Fish populations in the Gerle Creek Dam Reach have been assessed by CDFG and ENF. Fish species in the area include brown trout, brook trout, California roach, and rainbow trout (CDFG Gerle Creek surveys, various dates). Naturally producing brown trout have been documented, with fewer rainbow trout and few brook trout. Data from ENF files report an estimated brown trout biomass of 36.4 pounds per acre in 1979 downstream of Gerle Creek Dam (Turney 1986). Thomas (1994a) reports a 1975 brown trout population estimate of 15 to 25 trout per 100 feet, and Thomas (1994b) reports a spawning run of 200 to 330 individuals based upon weir trapping from 1987 to 1989. Thomas (1994b) also documents the presence of rainbow trout in tributaries to Gerle Creek (Rocky Basin and Angel creeks). Although not documented in this area, the following special-status amphibians and aquatic reptiles may occur in the Gerle Creek Dam Reach: Mount Lyell salamander, Yosemite toad, foothill yellow-legged frog, mountain yellow-legged frog, and western pond turtle.

3.3.11 Robbs Peak Reservoir

Robbs Peak Reservoir is not stocked with trout. Fish populations in the Robbs Peak Reservoir have been assessed by CDFG (CDFG Robbs Peak Reservoir surveys, various dates) through lake surveys. Fish species in the area include rainbow trout and brown trout. Although not documented in this area, the following special-status amphibians and aquatic reptiles may occur in Robbs Peak Reservoir or its tributaries: mountain yellow-legged frog, northern leopard frog and western pond turtle.

Substantial information is available regarding aquatic resources upstream of Robbs Peak Reservoir. CDFG and USFS stream surveys and fish population sampling efforts report only rainbow trout in the SFRR upstream of Robbs Peak Reservoir. Rainbow trout populations of 532 to 3,600 individuals per mile have been reported throughout this reach of the Project area (CDFG South Fork Rubicon River fish population data 1968; USFS Region 5 South Fork Rubicon River Stream Survey 1975). EA (1982a) reported an average trout biomass of 31.1 pounds per acre in this reach. EA (1982a) also reported the following special-status amphibians and aquatic reptile may occur in SFRR upstream of Robbs Peak Reservoir: foothill yellow-legged frog, mountain yellow-legged frog, California red-legged frog, northern leopard frog, and western pond turtle. However, EA did not document the presence of these species in the area.

As part of the South Fork Rubicon Diversion application for a UARP license amendment (SMUD 1981), a benthic macroinvertebrate study was conducted on three reaches within the unregulated part of the South Fork Rubicon River upstream of Robbs Peak Reservoir. Presence of chironomids, Ephemeroptera, Plecoptera, and Trichoptera were documented. The study concluded that, overall, benthic macroinvertebrate abundance was generally lower in the reaches studied than in some comparable mountain streams (EA 1982a). More recently, the South Fork Rubicon River was sampled as part of a comprehensive study that investigated numerous streams within and around the Project area in Fall 1999 (USDA 2001). The study produced basic information on overall abundance and taxonomic richness as well as indices of species diversity and evenness. In addition, biotic indices were calculated and an analysis of functional feeding groups was performed. No conclusions were drawn from the study.

3.3.12 Robbs Peak Dam Reach

Fish species information in the South Fork Rubicon River downstream of Robbs Peak Dam is not available, but fish resources are expected to include some combination of trout species found in the upstream reservoir. Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in the Robbs Peak Dam Reach: Mount Lyell salamander, California red-legged frog, foothill yellow-legged frog, mountain yellow-legged frog, northern leopard frog, and western pond turtle.

3.3.13 Ice House Reservoir

Ice House Reservoir is a popular recreation destination, and is well stocked with catchable sized trout and fingerlings (see Appendix E3-1). Fish populations in Ice House Reservoir have been assessed through stream surveys, electroshocking, and fisheries management procedures. Fish species in the area include rainbow trout, brook trout, brown trout, golden shiner, and kokanee salmon (CDFG Ice House Reservoir surveys, various dates; EDAW 1978; EA 1980a). Mountain yellow-legged frog and western pond turtle may occur in Ice House Reservoir and its tributaries, though their presence has not been documented.

3.3.14 Ice House Dam Reach

Rainbow and brown trout, as well as Sacramento sucker have been documented in the South Fork Silver Creek, downstream of Ice House Reservoir (EA 1980a). Based upon a fish population study, (USDA South Fork Silver Creek survey 1979) reports an adult fish population of 240 adult fish per mile, or a biomass of 38.7 pounds per acre. ENF also documents a kokanee salmon run in this reach (USDA South Fork Silver Creek Stream Survey 1979). Although not documented in this area, the following special-status amphibians and aquatic reptiles may occur in the Ice House Dam Reach: Mount Lyell salamander, California red-legged frog, foothill yellow-legged frog, mountain yellow-legged frog, northern leopard frog, and western pond turtle. As part of the Jones Fork Hydroelectric Development Final EIR (EA 1982b), a benthic macroinvertebrate study was conducted at two sites of SFSC between Ice House Reservoir and Junction Reservoir. The site closer to Ice House Reservoir differed strikingly from the reach further downstream with respect to chironomids. Chironomidae larvae were very abundant in the upstream study area (177.33/ft^2). The sites were similar in abundance of most other taxa. However, the upper site had relatively higher numbers of Ephemeroptera, primarily *Baetis* spp., and oligochaete worms. The lower site was characterized by higher numbers of Trichoptera.

South Fork Silver Creek and Big Hill Canyon Creek were sampled as part of a comprehensive study that investigated numerous streams within and around the Project area in Fall 1999 (USDA 2001). The study produced basic information on overall abundance and taxonomic richness as well as indices of species diversity and evenness. In addition, biotic indices were calculated and an analysis of functional feeding groups was performed. No conclusions were drawn from the study.

3.3.15 Union Valley Reservoir

Fish populations in Union Valley Reservoir have been assessed by CDFG through creel surveys, reservoir studies, and gill netting. Fish species in the area include rainbow trout, lake trout, Sacramento suckers, smallmouth bass, cutthroat trout, kokanee, lake trout (mackinaw), and golden shiners (CDFG Union Valley Reservoir surveys, various dates). EA (1980) also lists green sunfish and mosquitofish as being present. Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in Union Valley Reservoir or its tributaries: California red-legged frog, foothill yellow-legged frog, mountain yellow-legged frog, northern leopard frog, and western pond turtle.

A considerable amount of information is available concerning the aquatic resources upstream of Union Valley Reservoir. Rainbow trout, brook trout, and brown trout have been documented in several tributaries to Union Valley Reservoir (USDA Union Valley Reservoir memos and surveys, various dates; USDA Big Silver Creek Survey 1993). Thomas (1993a, 1993b) reports an average of nine trout per 100 feet in Big Silver Creek and 696 trout per mile in Bassi Fork, a tributary to Big Silver Creek just upstream of Union Valley Reservoir. Mountain yellow-legged frogs have been documented in the Bassi Fork of Big Silver Creek approximately four stream miles above Union Valley Reservoir (CNDDB 2001).

Jones Fork Silver Creek, Big Silver Creek, and Wench Creek were sampled as part of a comprehensive study that investigated numerous streams within and around the Project area in Fall 1999 (USDA 2001). The study produced basic information on overall abundance and taxonomic richness as well as indices of species diversity and evenness. In addition, biotic indices were calculated and an analysis of functional feeding groups was performed. No conclusions were drawn from the study.

3.3.16 Junction Reservoir

Stocking records from CDFG (various dates) do not indicate that Junction Reservoir is regularly stocked with fish, although it can be expected to have many, or all, of the same species found in Union Valley Reservoir (upstream) and SFSC (a major tributary to the reservoir). CDFG fish stocking records from 1924 to 1951 reveal that fish species in the area include rainbow trout, brook trout, and brown trout. In addition, Thomas (1994b) documented Sacramento sucker and kokanee, along with rainbow and brown trout. Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in Junction Reservoir or its tributaries: California red-legged frog, foothill yellow-legged frog, mountain yellow-legged frog, northern leopard frog, and western pond turtle.

3.3.17 Junction Dam Reach

Fish species information for the 8.3-mile-long reach of the Silver Creek between Junction Dam and Camino Reservoir is not available, but fish resources are expected to include some combination of trout species found in the adjoining reservoirs (Camino Reservoir and Junction Reservoir). Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in the Junction Dam Reach: Mount Lyell salamander, California tiger salamander, California red-legged frog, foothill yellow-legged frog, mountain yellow-legged frog, northern leopard frog, western spadefoot toad, and western pond turtle.

3.3.18 Camino Reservoir

Records from CDFG do not document fish stocking in Camino Reservoir. The USFS reports that rainbow trout, brook trout, brown trout, Sacramento sucker, "minnows," and California roach as well as riffle sculpin are present in Camino Reservoir (USDA Camino Reservoir surveys, not dated). Western pond turtle is the only special-status aquatic reptile that may occur at Camino Reservoir, though its presence has not been documented.

3.3.19 Camino Dam Reach

Fish species documented in the 6.3-mile-long reach of Silver Creek below Camino Dam include rainbow trout, brown trout, Sacramento sucker, and riffle sculpin (Thomas 1994b). Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in the Camino Dam Reach: California red-legged frog, foothill yellow-legged frog, and western pond turtle. California tiger salamander and western spadefoot toad are not included in this preliminary list even though they occur through the elevational range because of an apparent lack of suitable habitat.

3.3.20 Brush Creek Reservoir

CDFG stocking records report brown trout, rainbow trout, and steelhead being planted in Brush Creek Reservoir (CDFG stocking census 1934-1948). Rainbow trout have also been documented in a tributary to Brush Creek Reservoir (USDA Incline Creek Stream Survey 1979). Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in Brush Creek Reservoir or its tributaries: California red-legged frog, foothill yellow-legged frog, and western pond turtle.

3.3.21 Brush Creek Dam Reach

Fish species information for this reach of the Project area is not available, but fish resources are expected to include some combination of trout species found in Brush Creek Reservoir.

Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in the Brush Creek Dam Reach: California red-legged frog, foothill yellow-legged frog, and western pond turtle. Review of topographic maps indicates that the Brush Creek Dam Reach is a narrow and steep canyon with limited habitat for amphibians. As a result, California tiger salamander and western spadefoot toad are not included in this preliminary list, even though they occur through the elevational range of the reach, because of an apparent lack of suitable habitat.

3.3.22 Slab Creek Reservoir

Slab Creek Reservoir has been stocked with rainbow trout, brook trout, and brown trout (CDFG fish stocking records 1925-1958), as well as kokanee salmon (SMUD et al. 1979). In addition, Sacramento sucker, "minnows," California roach, hardhead, speckled dace, smallmouth bass, and sculpin have been reported as being present in the reach (CDFG Slab Creek stream surveys, various dates; USDA Slab Creek stream surveys, various dates). The California newt has been reported in this reach (Thomas 1994c). Western pond turtle is the only special-status aquatic reptile that may occur at Slab Creek Reservoir, though its presence has not been documented.

Fish populations upstream of Slab Creek Reservoir in the SFAR have been assessed by CDFG (CDFG SFAR stream surveys, various dates). Fish species in the area include rainbow trout, brook trout, brown trout, Sacramento sucker, minnow, green sunfish, kokanee, and California roach. CDFG reported a trout biomass of 14.46 pounds per acre in 1992 in this reach (CDFG SFAR fish population data 1992). The following special-status amphibians and aquatic reptiles potentially occur in the SFAR Reach: California red-legged frog, foothill yellow-legged frog, and western pond turtle. Foothill yellow-legged frogs have been documented on a tributary to the SFAR approximately 2 miles upstream of the confluence of the SFAR and Silver Creek (ENF 2001).

3.3.23 Slab Creek Dam Reach

WESCO (1980) documents the presence of Sacramento sucker, sculpin, speckled dace, rainbow trout, brook trout, hardhead, and smallmouth bass as being present downstream of Slab Creek Dam. Although not documented in this area, the following special-status amphibians and aquatic reptile may occur in the Slab Creek Dam Reach: California tiger salamander, California red-legged frog, foothill yellow-legged frog, western spadefoot toad, and western pond turtle. An unverified sighting of foothill yellow-legged frog was recorded immediately upstream of Slab Creek Reservoir along the SFAR (ENF 2001).

Jordan and Brown (1993), sampled benthic macroinvertebrates downstream of Slab Creek Reservoir to determine if increased turbidity, due to low water levels in Slab Creek Reservoir, negatively impacted reaches downstream of the dam. The results of this field study indicated greater abundance, taxonomic richness and diversity at the site below the reservoir than in upstream areas.

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