7.3 Aquatic Resources

7.3.1 Overview

This section discusses aquatic resources in the vicinity[1] of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project). Section 7.3 is divided into four major sections, including this overview. Section 7.3.2 describes the history of fishes in the Yuba River Basin. Section 7.3.3 identifies specific special-status aquatic species that have the potential to be affected by continued Project operation and maintenance (O&M), provides a brief life history description for each of the special-status aquatic species, and describes the known occurrence of the special-status aquatic species in relation to Project facilities and features. Section 7.3.4 describes existing, relevant, and reasonably available information regarding aquatic resources in areas upstream of the Project (*i.e.,* on the Middle Yuba River upstream of Our House Diversion Dam, on Oregon Creek upstream of Log Cabin Diversion Dam, on the South Yuba River upstream of the mouth of the river at the United States Army Corps of Engineers' (USACE's) Englebright Reservoir which is impounded by USACE's Englebright Dam, and on the North Yuba River upstream of New Bullards Bar Reservoir), within the Project Area,[2] and downstream of the Project (*i.e.,* on the lower Yuba River downstream of the USACE's Daguerre Point Dam).

7.3.2 Historic Distribution of Fish and Influences Affecting Yuba River Fisheries

7.3.2.1 Historic Distribution

Climatic and geologic forces are the dominant architects of Sierra Nevada ecosystems (SNEP 1997). The natural lakes and streams in the Project Vicinity were most recently formed during the Pleistocene Age from 2 million to 10 thousand years ago. During this time, glaciers periodically covered the high country of the Yuba River watershed, carving out numerous cirque valleys and shallow lake basins. Glacial scouring also created the hanging valleys, steep stream gradients, and numerous barrier falls common in the watersheds, features that prevented fish from colonizing most high elevation lakes and streams after the glaciers receded. This glacial scouring and harsh climate left most soils in the high Sierra thin and nutrient-poor, resulting in nutrient poor conditions in most high lakes and streams (CDFG 2007a).

The recession of glaciers 10,000 years ago created the Sierra mid- and high-elevation lakes, most of which were isolated from colonization by downstream fish populations by barrier falls on outflowing rivers and streams. The estimated elevation above which most Sierra Nevada lakes

[1] For the purposes of this document, the Project Vicinity is defined as the area surrounding the Project, as represented by United States Geological Survey (USGS) 1:24,000 topographic quadrangles.

[2] For the purposes of this document, the Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) Project Boundary and the land immediately surrounding the FERC Project Boundary (*i.e.,* within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure, the United States Army Corps of Engineers' (USACE) Daguerre Point Dam.

and streams were fishless ranges between 4,900 and 6,000 feet[3], depending on the drainage (CDFG 2007a; Moyle *et al.* 1997). In the western Sierra Nevada, the fish reaching the highest elevations generally were trout. Streams at elevations above 4,900 feet were dominated instead by amphibians, insects, and other aquatic invertebrates (CDFG 2007a). While some lakes and streams in the high Sierra were accessible to fish (*e.g.,* golden or Lahontan trout), accessible waterbodies were few in number (Moyle *et al.* 1997). Accessible, historically fishless high Sierra lakes and streams identified by Moyle *et al.* (1997) are not located in the Project Vicinity.

Since the massive influx of Euro-Americans began in 1850, the fish fauna and fisheries of the Sierra Nevada have changed dramatically (Moyle 1995). Historically, the Sacramento–San Joaquin Drainage, which includes most of the watersheds on the west side of the Sierra Nevada range, contained the richest native fish fauna with 22 taxa, including three anadromous fish - Chinook salmon, steelhead, and Pacific lamprey – that were an important source of food for Native Americans of the region (Moyle 1976; Lindstrom 1993; Moyle *et al.* 1997). The only native non-trout species found at high elevations on the west side of the Sierra is Sacramento sucker, which occurred naturally as high as 8,200 feet in the Kern River (Moyle *et al.* 1997). Native foothill fish included both anadromous and resident salmonid species, lamprey, hitch, roach, hardhead, pikeminnow, dace, sucker, perch, and sculpin (Moyle *et al.* 1997). Based on the biological data available, streams in the Project Vicinity may serve as a transition zone that provides habitat suitable for both cold- and warm water fish species (Table 7.3.2-1).

Table 7.3.2-1. Fish native to the upper Yuba River watershed.

Family/Species	Presence/Trend[1]	Habitat[2]
CHINOOK SALMON (SALMONIDAE)		
Spring-run (*Oncorhynchus tshawytscha)*	Extirpated/Unknown[3]	Anadromous, mid-elevation, lowlands
Fall-run (*Oncorhynchus tshawytscha)*	Extirpated/Unknown[4]	Anadromous, foothills, lowlands
LAMPREYS (PETROMYZONTIDE)		
Pacific Lamprey (*Lampetra tridentata*)	Extirpated	Anadromous, foothills, lowlands
TROUT (SALMONIDAE)		
Resident rainbow trout (*Oncorhynchus mykiss)*	Present/abundant	Resident, foothills, high elevation
Winter steelhead (*Oncorhynchus mykiss)*	Extirpated/Unknown[4]	Anadromous, lowlands, foothills
MINNOWS (CYPRINIDAE)		
Sacramento hitch (*Lavinia exiilcauda)*	Rare/declining	Lowlands, foothills
Sacramento roach (*Lavinia s. symmetricus)*	Uncommon/stable	Lowlands, foothills
Hardhead (*Mylopharodon conocephalus)*	Unknown/unknown	Lowlands, foothills
Sacramento pikeminnow (*Ptychocheilus grandis)*	Common/stable expanding	Lowlands, foothills
Sacramento speckled dace (*Rhinichthys osculus ssp)*	Common/stable	Lowlands, foothills
SUCKERS (CATASTOMIDAE)		
Western sucker (*Catostomus o. occidentalis)*	Common/stable expanding	Lowlands, foothills
SCULPINS (COTTIDAE)		
Riffle sculpin (*Cottus gulosus)*	Uncommon/stable	Lowlands, foothills
Prickly sculpin (*Cottus asper)*	Uncommon/stable	Lowlands, foothills

[1] Tahoe National Forest Fish Species Past/Present. Updated January 1, 2001 (applies only to FS lands)
[2] Moyle *et al.* 1996
[3] Extirpated in all sub-basins of the Project Vicinity. Historically, inhabited mid-elevation portions of Project Vicinity sub-basins. Lowland portions of sub-basins were mainly used as migratory corridors.
[4] Extirpated from the upper Yuba River watershed by blockage at USACE's Englebright Dam on the lower Yuba River.
Source: Modified from NID 2008.

[3] All elevation data are in United States Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) National Geodetic Survey Datum of 1988 (NGVD 88).

7.3.2.2 Anadromous Fish

7.3.2.2.1 Historic Range

Under the Magnuson-Stevens Fisheries and Conservation Act, the United States Department of Commerce (USDOC), National Oceanic and Atmospheric Administration (NOAA), Marine Fisheries Service (NMFS) has identified "Essential Fish Habitat" (EFH) for Chinook salmon in the North, Middle and South Yuba rivers. EFH on the Yuba River includes all water bodies NMFS believes were occupied or historically accessible to Chinook salmon within the United States Geological Survey's Hydrologic Unit Code (HUC) 18020125, (See http://swr.ucsd.edu/hcd/HCD_webContent/EFH/chinsalmon_historic_distribution.htm accessed by Licensee on September 20, 2009)

In the North Yuba River, NMFS has designated Chinook salmon EFH "*To Salmon Creek, near Sierra City*." There are no known natural obstructions from Downieville upstream to Sierra City, where Salmon Creek enters the North Yuba River (Yoshiyama *et al.* 2001). Deep pools are present throughout the North Yuba River from its mouth up to Sierra City (E.R. Gerstung, personal observation in Yoshiyama *et al.* 2001), and could have provided holding habitat for spring-run Chinook salmon (Yoshiyama *et al.* 2001).

On the Middle Yuba River, NMFS' EFH includes; *"The lower river, near where the North Fork joins"* (*i.e.,* a distance of about 14 miles). This assessment is presumably based on Yoshiyama *et al.* (2001) who considered a 10-foot-high falls on the lower Middle Yuba River near river mile (RM) 14 as the effective upstream limit of salmon movement, and who cited 1938 unpublished California Department of Fish and Game (CDFG) data supposedly documenting both salmon and steelhead in this lower part of the Middle Yuba River.

On the South Yuba River, NMFS' EFH includes *"1-2 miles upstream, perhaps spring run accessed to the present town of Washington."* There are records of salmon occurring within 1 to 2 miles upstream of the mouth of the South Yuba River (CDFG unpublished data as cited in Yoshiyama *et al.* 2001).

NMFS has not established EFH for steelhead in the Yuba River. However, in the North Yuba River it is likely that steelhead ascended to near Sierra City with salmon since there are no known obstructions. In the Middle Yuba River, it is likely that the barrier in the lower river restricted steelhead upstream movement as well as Chinook salmon. However, based on unpublished CDFG data in Yoshiyama *et al.* (2001), it is possible that steelhead were found as far upstream as the mouth of Bloody Run Creek. In the South Yuba River, based on unpublished CDFG data in Yoshiyama *et al.* (2001) steelhead, similar to Chinook salmon, ascended as far as the present town of Washington.

7.3.2.2.2 Influences Affecting Anadromous Fish Abundance

Historically, the Yuba River watershed reportedly was one of the most productive habitats for runs of Chinook salmon and steelhead (Yoshiyama *et al.* 1996). Although it is not possible to estimate from historical data the numbers of spawning fish, an assessment by CDFG (1993)

suggests that the Yuba River "*historically supported up to 15% of the annual run of fall-run Chinook salmon in the Sacramento River system*" (Yoshiyama *et al.* 1996).

However, by the late 1800s, anadromous fish populations were experiencing significant declines, primarily because of mining activities and extreme sedimentation following flood events (McEwan 2001; Yoshiyama *et al.* 2001). In the process of disturbing streambeds and banks, mining operations also destroyed large salmon runs in Sierra Nevada streams and turned shady, pool-and-riffle trout streams into long, shallow, exposed runs (Moyle 2002).

To control flooding and the downstream movement of sediment, construction of several man-made instream structures on the Yuba River occurred during the early 1900s. A structure referred to as Barrier No. 1, built in 1904–1905, was located 4.5 miles above the later site of Daguerre Point Dam and probably hindered salmon upstream movement until floods destroyed it in 1907 (Sumner and Smith 1940). In 1906, the California Debris Commission, a partnership between the Federal Government and the State of California, constructed Daguerre Point Dam, specifically to stabilize the mining debris and reduce flood risks. This 28-foot high dam served to retain the debris and made it difficult for spawning fish to migrate upstream, although salmon reportedly did surmount that dam in occasional years because they were observed in large numbers in the North Yuba River at Bullards Bar during the early 1920s (Yoshiyama *et al.* 2001). In 1924, the USACE installed fish ladders at Daguerre Point Dam, but these ladders were washed out during winter storms in 1927-28. Although USACE rebuilt the ladders, passage at the dam was considered to remain impeded, and CDFG (1953) reported that adequate fish ladders only were later provided in about 1950–1952.

USACE's 260-foot-high Englebright Dam constructed in 1941, upstream of USACE's Daguerre Point Dam, has no fish ladders and blocks anadromous fish access to all areas upstream of the dam (Eilers 2008; PG&E 2008; CDWR 2009). The dam effectively restricts anadromos fish to the lower 24 miles of the Yuba River. The lower Yuba River is among the last Central Valley floor tributaries supporting populations of naturally-spawning spring-run Chinook salmon and steelhead. There is no fish hatchery located on the lower Yuba River.

While the lower Yuba River historically served primarily as a migration corridor for anadromous salmonids to upstream habitats, since completion of New Bullards Bar Reservoir by Licensee in 1970, higher, colder flows in the lower Yuba River have improved conditions for adult over-summer holding, spawning and juvenile rearing of anadromous salmonids in the lower Yuba River. Compared to pre-Project hydrology, present Project operations provide flows that are generally lower during the winter and spring and higher during the summer and fall, and provide generally suitable flows and water temperatures throughout the year for anadromous salmonids. With the recent implementation of the Lower Yuba River Accord (Yuba Accord), including its schedules of minimum flow requirements based on indices of water availability, identified flow-related major stressors including flow-dependent habitat availability, flow-related habitat complexity and diversity, and water temperatures are expected to be further alleviated. Presently, the lower Yuba River is one of the few Central Valley floor tributaries that consistently provides suitable water temperatures for salmonids throughout the year.

7.3.3 Special-status Aquatic Species

For the purpose of this Preliminary Information Package, a species is considered to be a special-status aquatic species (*i.e*., fish, amphibian, aquatic reptile, turtle, mollusk, or invertebrate) if it has a reasonable possibility of occurring in the Project Area and meets one or more of the following criteria:

- Found on public land administered by the United States Department of Interior (USDOI) Bureau of Land Management (BLM), and formally listed as Sensitive (BLM-S) on BLM's *Animal Sensitive Species List* (USDOI BLM 2006).
- Found on USDOC, NOAA, NMFS *List of Species of Concern* (NOAA 2009), and listed as a Species of Concern (NMFS-S).
- Found on National Forest System (NFS) land managed by the United States Department of Agriculture (USDA) Forest Service (Forest Service) and listed on the Forest Service's list of *Forest Sensitive Species* (FSS), updated as of June 8, 1998, Appended March 6, 2001; May 7, 2003; April 21, 2004; March 3, 2005; and October 15, 2007.
- Found on NFS land managed by the Forest Service as either the Tahoe National Forest (TNF) or the Plumas National Forest (PNF), and formally listed by that forest as a Management Indicator Species (MIS) (USFS 2007, 2008).
- Found on the CDFG Commission's list of *State and Federally Listed Endangered and Threatened Animals of California* (CDFG 2009b). Species on the list that are considered special-status for the purpose of this Relicensing are those that are candidates for listing under the California Endangered Species Act (CESA) as endangered (SCE), threatened (SCT), or a candidate for delisting (SCD). Also considered special-status are those wildlife species CDFG has designated Species of Special Concern (CSC).[4]
- Found on the list of species afforded protection under the federal Endangered Species Act (ESA) that occur in the Project Area, which includes the United States Geological Survey (USGS) 1:24,000 topographic quadrangles Strawberry Valley (574D, 1994), Clipper Mills (574C, 1994), Challenge (558B, 1995), Camptonville (558A, 1995), Pike (557B, 1975), French Corral (558C, 1995), Oregon House (559D, 1995), and Smartville[5] (543A, 1995) (USFWS 2009). Species on the list that are considered special-status species for the purpose of the relicensing are those species that are proposed for listing as endangered or threatened under the ESA (FPE and FPT, respectively), a candidate for listing under the ESA (FC), or proposed for delisting from the ESA (FPD).[6]

[4] Species listed as threatened (ST) or endangered (SE) under the CESA, and species that are considered Fully Protected (SFP) are not considered special-status for the purpose of the relicensing proceeding These species are discussed separately in the Threatened, Endangered and Fully Protected Species Section of this Preliminary Information Package (Section 7.7).

[5] In 2008, the people of this community petitioned to have the name changed to Smartsville, with an 's'. However, the USGS gage refers to the former spelling of the community name. Therefore in this document, the community is referred to as such.

[6] Species listed as threatened (FT) or endangered (FE) under the ESA are not considered special-status for the purpose of the relicensing proceeding. These species are discussed separately in the Threatened, Endangered, and Fully Protected Species Section of this Preliminary Information Package (Section 7.7).

Based on Licensee's review, seven special-status aquatic species may occur in the Project Area or otherwise be affected by continued Project O&M. These species are:

- Fishes
  - Central Valley fall- and late-fall-run Chinook salmon (*Oncorhynchus tshawytscha)* Evolutionarily Significant Unit (ESU) (NMFS-S, CSC, FSS)
  - Hardhead minnow (*Mylopharodon conocephalus*) (CSC, FSS)
  - Sacramento splittail (*Pogonichthys macrolepidotus*) (CSC)
  - Sacramento-San Joaquin Roach (*Lavinius symmetricus symmetricus*) (CSC)
- Amphibians
  - Foothill yellow-legged frog *(Rana boylii)* (CSC, FSS, BLM-S)
- Aquatic Reptiles and Turtles
  - Western (or Pacific) pond turtle *(Emys* [*Actinemys*] [formerly *Clemmys*] *marmorata)* (CSC, FSS)

Not included in this list is Sierra Nevada yellow-legged frog (SNYLF)[7] (CSC), which has been documented within the USGS topographic quadrangles queried in the California Natural Diversity Database (CNDDB), but does not occur at the elevations associated with the Project. Historically, SNYLF occurred at sites primarily at elevations above 5,900 feet at lake, pond, and stream complexes in montane or sub-alpine forests and meadows (Knapp and Matthews 2000; Pope and Matthews 2001; USFWS 2003a). This species occurs infrequently at elevations as low as 4,400 feet in streams in forested settings, including two sites on the PNF (Matthews *et al.* 2005). CNDDB (2009) reports one occurrence of SNYLF in the Project Vicinity at Pinkard Creek, north of Lost Creek Reservoir.

Central Valley steelhead and spring-run Chinook salmon also were not included in this list of special-status species because the Yuba River populations of these species, which are federally threatened, occur below USACE's Englebright Dam. Therefore, these species are addressed in the descriptions of threatened and endangered species, in Section 7.7 of this Preliminary Information Package.

A description of each of the seven special-status aquatic species, including its nearest known occurrence to Project facilities and features, is provided here.

[7] Sierra Nevada yellow-legged frog (SNYLF) was previously described as the Sierra Nevada Distinct Population Segment (DPS) of the mountain yellow-legged frog (*Rana muscosa*). The southern population segment found in the San Gabriel, San Bernardino, and San Jacinto mountains of southern California retains the name *R. muscosa* and is listed as a federally endangered species (USFWS 2003; Vredenburg *et al.* 2007).

7.3.3.1 Fishes

Central Valley fall and late fall-run Chinook salmon ESU (NMFS-S, CSC, FSS)[8]

Four principal life history variants of Chinook salmon are recognized in the Central Valley and are named for the timing of their spawning runs: fall-run; late fall-run; winter-run; and spring-run. Seventeen distinct groups, or ESUs, of naturally-spawned Chinook salmon occur from southern California to the Canadian border and east to the Rocky Mountains; five of these groups occur in California (Myers *et al.* 1998). All variants (*i.e.*, fall-, late fall-, winter-, and spring-runs) occur in the Project Vicinity (NMFS 2008a) and the spring-, fall-, and late fall-runs have been documented in the lower Yuba River (Massa and McKibbin 2005). Of these variants, the Central Valley fall-/late fall-run Chinook salmon ESU (a combination of the fall- and late fall-runs as characterized by NMFS) was included on the Species of Concern List under the ESA in 2004 due to concerns about population size and hatchery influence (NMFS 2009). Although an important commercial and recreational fish species, recent declines in populations of this species have resulted in harvest management restrictions. In April 2009, the Pacific Fishery Management Council (PFMC) and NMFS adopted a closure of all commercial ocean salmon fishing through April 30, 2010, and placed restrictions on inland salmon fisheries (CDFG 2009b).[9]

Chinook salmon are the largest salmonids, with adults often exceeding 40 pounds, with individuals over 120 pounds reported (NMFS 2008a). The generalized life history of Pacific salmon involves spawning, incubation, hatching, emergence, and rearing in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of the life-cycle (Myers *et al*. 1998). Adult Chinook salmon migrate from the ocean into the freshwater streams and rivers of their birth to mate (*i.e.*, anadromy) and, following a single spawning event, they die (*i.e.*, semelparity). Adult fall-run Central Valley Chinook salmon generally begin migrating upstream annually in June, with immigration continuing through December (Moyle 2002; NMFS 2008a). Immigration generally peaks in November and, typically, greater than 90 percent of the run has entered their natal river by the end of November (Moyle *et al.* 2008).

The timing of adult Chinook salmon spawning activity is influenced by water temperatures. In general, when daily average water temperatures decrease to approximately 60 degrees Fahrenheit (°F), female Chinook salmon begin to construct nests (*i.e.,* redds) into which their eggs are eventually released and simultaneously fertilized by males. Fall-run Chinook salmon require gravel and cobble areas, primarily at the head of riffles, with water flow through the substrate for spawning. Gravel and cobble sizes can range from 0.1 to 6 inches. The fall-run Chinook salmon

[8] Photo source: http://www.usgs.gov/features/lewisandclark/images/Chinook_Salmon.jpg

[9] Chinook salmon listed as threatened (ST) or endangered (SE) under the CESA, and species that are considered Fully Protected (SFP), or listed as threatened (FT) or endangered (FE) under the ESA, are not considered special-status for the purpose of the relicensing proceeding. These species are discussed separately in the Threatened, Endangered, and Fully Protected Species Section of this Preliminary Information Package (Section 7.7).

spawning and embryo incubation period generally extends from October through March, but may occur earlier if temperature conditions fall below 60°F (Moyle 2002; NMFS 2008a). Within the Project Vicinity, fall-run Chinook salmon fry emergence typically occurs from late December through March (Moyle 2002). Growth rates are largely influenced by water temperature, and the optimal range of juvenile rearing temperatures is 55°F-65°F. Young Chinook salmon will survive and grow within the range of 41°F-66°F, whereas steady temperatures above 75°F are lethal (UC Davis 2009).

In the Central Valley, fall-run Chinook salmon are the most numerous of the four salmon runs and are the principal run raised in hatcheries (Moyle 2002). Historical accounts indicate that prior to construction of the original Bullards Bar Dam in the early 1920s, large numbers of Chinook salmon were present as far upstream as Downieville on the North Yuba River, but these runs were believed to be the ESA-listed spring-run Chinook salmon (Yoshiyama *et al.* 2001). Although actual numbers are not known, historical annual escapements of Chinook salmon into the Sacramento River are estimated to have reached 600,000 spawners (Massa and McKibbin 2005; Massa 2008). Within Yuba County, the Bear, Feather and Yuba (downstream of USACE's Englebright Dam) river watersheds support runs of Chinook salmon (CDWR 2008, 2009; UC Davis 2009).

Fall-run Chinook salmon are raised at five major Central Valley hatcheries that release more than 32 million smolts each year into California waterbodies (CDFG 2007). While hatchery programs can increase overall returns to the fishery, Lindley *et al.* (2007) concluded that hatchery programs have negative effects on wild populations of Chinook salmon, which can stem from competition by hatchery fish with wild juveniles, and straying of hatchery fish both within and between basins and resultant introgression of hatchery stocks with native populations.

Recent habitat assessments for portions of the upper Yuba River within the Project Area indicate that the analyzed habitat and temperature conditions in the upper Yuba River watershed are capable of supporting anadromous salmonids (CDWR 2008). However, the habitat assessment study was unable to conclude that the introduction of Chinook salmon or steelhead would be feasible over the long term, due to the need for additional data relating to biological and habitat issues, water supply and hydropower impacts, flood risk, water quality, sediment transport, and socio-economics (CDWR 2008).

Escapement surveys within the Project Area for Chinook salmon occur from the Narrows Pool to USACE's Daguerre Point Dam. Surveys below the Project Area extend from USACE's Daguerre Point Dam to the Simpson Lane Bridge. Throughout the Central Valley, including the lower Yuba River, the number of Chinook salmon returning in the fall to spawn has declined in recent years. CDFG estimated that approximately 2,600 fall-run Chinook salmon spawned in the Yuba River in 2007 and 3,600 in 2008, compared to an estimated average of about 15,000 fish over the 30 years prior. Altered and reduced habitat, climate change and changing ocean conditions are all considered possible factors in the recent declines in the salmon populations throughout the Central Valley. Escapement surveys suggest that the majority (on average approximately two-thirds) of Chinook salmon spawning occurs above USACE's Daguerre Point Dam (Jones & Stokes 2006; Massa 2006, 2007). During the escapement surveys, recoveries of Chinook salmon with coded wire tags (CWT) indicate that straying of spring-run and fall-run

Chinook salmon from the Feather River hatchery occurs in the lower Yuba River. Additionally, during 2008 six Chinook salmon adults were recovered during the late-winter and early-spring portion of the escapement surveys with CWTs demonstrating that these were late fall-run fish from the Coleman National Fish Hatchery located on Battle Creek.

Since 2001, juvenile Chinook salmon outmigration studies using rotary screw traps have been conducted in the lower Yuba River and have indicated that fall- and late fall-run Chinook salmon juveniles generally outmigrate from November to June. Currently available data indicate that a total of 285,034 juvenile Chinook salmon were captured during the 2004/2005 sampling period, with peak catch occurring during February.

Length-at-date capture criteria developed for run identification on the Sacramento River at the Red Bluff Diversion Dam were used to identify the specific run at the time of capture. During 2004, juvenile Chinook salmon were first observed on November 12th and were assumed to be spring-run; however, no true demarcation was established between fall- and spring-runs due to an overlap in spawning times. A distinct modal peak during April may have represented late fall-run individuals. Overall, preliminary data examinations indicated highest concentrations of fall-run Chinook salmon with fewer numbers of spring- and late fall-run. This pattern is consistent with prior sampling years.

Hardhead Minnow (FSS, CSC)[10]

The hardhead minnow is a large cyprinid species that can reach lengths of over 23 inches, and generally occurs in large, undisturbed, low- to mid-elevation, cool- to warm-water rivers and streams (Moyle 2002). Hardhead was designated CSC by CDFG in 1995, and is listed as a Class 3 Watch List species, meaning that it occupies much of its native range but was formerly more widespread or abundant within that range (CDFG 2009a, b). Historically, hardhead were considered a widespread and locally abundant species in California, but their specialized habitat requirements, widespread alteration of downstream habitats, and predation by smallmouth bass, have resulted in population declines and isolation of populations (Moyle 2002).

Hardhead also have been abundant in reservoirs. However, most of these reservoir populations have proved to be temporary, presumably the result of colonization of the reservoir by juvenile hardhead before introduced predators became established. Brown and Moyle (1993) observed that hardhead disappeared from the upper Kings River when the reach was invaded by bass. A similar situation has been documented in the South Yuba River (Gard 1994, as cited in Moyle *et al*. 1995).

Hardhead mature following their second year. Spawning migrations, which occur in the spring into smaller tributary streams, are common. The spawning season may extend into August in the foothill streams of the Sacramento and San Joaquin River basins. Spawning behavior has not been documented, but hardhead are believed to elicit mass spawning in gravel riffles (Moyle

[10] Photo source - http://calfish.ucdavis.edu/calfish/Hardhead.html

2002). Little is known about life stage specific temperature requirements of hardhead; however, temperatures ranging from approximately 65°F to 75°F are believed to be suitable (Moyle 2002).

Within Yuba County, hardhead have been reported to occur in the upper Yuba River, the lower Bear, Feather, and Yuba rivers, and the Honcut Creek headwaters (UC Davis 2009). Hardhead have been documented during the 2003-2004 and 2004-2005 juvenile salmon emigration studies on the Yuba River (Massa 2006). Adult hardhead were observed in the South Yuba River at river mile (RM) 3.9, approximately 0.3 mile downstream of the confluence of Owl Creek (Gast *et al*. 2005).

Sacramento Splittail (CSC)[11]

The Sacramento splittail, a minnow, was federally listed as threatened on February 8, 1999, and delisted on September 22, 2003 (USFWS 2003b). However, Sacramento splittail are designated CSC (CDFG 2009a, b). Splittail are large cyprinids, growing in excess of 12 inches and are adapted to living in freshwater and estuarine habitats as well as alkaline lakes and sloughs (Moyle 2002).

Historically, splittail inhabited sloughs, lakes, and rivers of the Central Valley with populations extending upstream to Redding in the Sacramento River, to the vicinity of Colusa-Sacramento River State Recreation Area, in Butte Creek/Sutter Bypass, to Oroville in the Feather River, to Folsom in the American River, and to Friant in the San Joaquin River (Moyle *et al.* 2004, USFWS 2003c). The current distribution is limited by dams and other barriers. Currently the species is known to migrate up the Sacramento River to Red Bluff Diversion Dam and up the San Joaquin River to Salt Slough in wet years as well as into the lower reaches of the Feather and American rivers (USFWS 2003c).

Within Yuba County, splittail have been documented only in the lower Feather River (UC Davis 2009) and according to Moyle, evidence of self-sustaining populations of splittail occurring outside of these areas is weak (Moyle *et al.* 2004). During the preparation of this Preliminary Information Package, no documentation of splittail in the Yuba River (either historical or current distribution) was found.

Sacramento-San Joaquin Roach (CSC)[12]

The Sacramento-San Joaquin roach, a California species of special concern, is part of the California roach complex, which is composed of various subspecies. The Sacramento-San Joaquin roach is found in the Sacramento and San Joaquin River drainages, except the Pit River, as well as tributaries to San Francisco Bay. Sacramento-San Joaquin roach are generally found in small, warm intermittent streams, and are most abundant in mid-elevation streams in

[11] Photo source http://swr.nmfs.noaa.gov/overview/sroffice/2Dredge_species_list.html
[12] Photo source - http://calfish.ucdavis.edu/calfish/CaliforniaRoach.htm

the Sierra foothills and in the lower reaches of some coastal streams (Moyle 2002; Moyle *et al.* 1982). Assuming that the Sacramento-San Joaquin roach is indeed a single taxon (which is unlikely), it is abundant in a large number of streams although it is now absent from a number of streams and stream reaches where it once occurred (Moyle 2002). Roach are tolerant of relatively high temperatures (86°F to 95°F) and low oxygen levels (1 to 2 parts per million (ppm)) (Taylor *et al.* 1982). However, they are habitat generalists, also being found in cold, well-aerated clear "trout" streams (Taylor *et al.* 1982), in human-modified habitats (Moyle 2002; Moyle and Daniels 1982) and in the main channels of rivers.

Reproduction occurs from March through early July, depending on water temperature (Moyle 2002). Murphy (1943) in CDFG 2008 states that spawning is determined by water temperature, which must be approximately 60°F (16°C) for spawning to be initiated. During the spawning season, schools of fish move into shallow areas with moderate flow and gravel/rubble substrate (Moyle 2002). Females deposit adhesive eggs in the substrate interstices and the eggs are fertilized by attendant males. Typically, 250-900 eggs are produced by a female and the eggs hatch within two to three days. Fry remain in the substrate interstices until they are free-swimming.

Within Yuba County, Sacramento-San Joaquin roach have been reported to occur in the upper Yuba River, the lower Bear and Feather rivers, the Middle Fork of the Feather River, and the Honcut Creek headwaters (UC Davis 2009). In addition, Sacramento-San Joaquin roach have been documented during the rotary screw trapping monitoring on the lower Yuba River (Casey Campos, PSMFC, 2009 pers. comm.).

7.3.3.2 Amphibians

Foothill yellow-legged frog (CSC, FSS, BLM-S)[13]

The foothill yellow-legged frog (FYLF) is a stream-adapted species, usually associated with shallow, flowing streams with backwater habitats and coarse cobble-sized substrates (Jennings *et al.* 1994) between about 600 to 5,000 feet elevation (Moyle 1973; Seltenrich and Pool 2002; ECORP 2005). The status of FYLF in the Sierra Nevada is perilous and this is reflected in its listing as a CSC, FSS, and BLM-S. However, populations apparently persist on at least some portions of most previously occupied drainages (NatureServe© 2009). FYLF populations may require both mainstem and tributary habitats for long-term persistence. Streams too small to provide breeding habitat for this species may be critical as seasonal habitats (*e.g.*, in winter and during the hottest part of the summer) (VanWagner 1996; Seltenrich and Pool 2001), and there is evidence that habitat use by young-of-the-year, sub-adult, and adult frogs differs by age-class and changes seasonally (Randall 1997). Breeding tends to occur in spring or early summer and eggs are laid in areas of shallow, slow moving, waters near the shore. FYLF are infrequent in habitats where introduced fish and bullfrogs are present (Jennings *et al.* 1994).

[13] Photo source: Stephen Nyman, PhD

CNDDB (2009) reports nine occurrences of FYLF in the Project Vicinity: two occurrences in Kanaka Creek (north-northwest of N. Bloomfield); South Fork Feather River (PNF); in the vicinity of Slate Creek Reservoir (PNF); Oroleve Creek (PNF); Grizzly Gulch Creek (TNF); Youngs Ravine (north of Camptonville); Oak Valley (north-northeast of Camptonville); and Middle Yuba River (southeast of Camptonville).

7.3.3.3 Aquatic Reptiles and Turtles

Western pond turtle (CSC, FSS)[14]

The western, or Pacific, pond turtle (WPT) occurs in a wide variety of aquatic habitats up to 6,000 feet elevation, particularly permanent ponds, lakes, side channels, backwaters, and pools of streams, but is uncommon in high-gradient streams (Jennings and Hayes 1994). WPT has declined due to loss of habitat, introduced species, and historical over-collection (Jennings and Hayes 1994), and has been designated as CSC and FSS. Isolated occurrences of WPT in lakes and reservoirs sometimes occur from deliberate releases of pets. Although highly aquatic, WPT often overwinters in forested habitats and eggs are laid in shallow nests in sandy or loamy soil in summer at upland sites as much as 1,200 feet from aquatic habitats (Jennings and Hayes 1994). Hatchlings do not typically emerge from the covered nests until the following spring. Reese and Welsh (1997) documented WPT away from aquatic habitats for as much as seven months a year and suggested that terrestrial habitat use was at least in part a response to seasonal high flows. Basking sites are an important habitat element (Jennings and Hayes 1994) and substrates include rocks, logs, banks, emergent vegetation, root masses, and tree limbs (Reese undated). Terrestrial activities include basking, overwintering, nesting, and moving between ephemeral sources of water (Holland 1991). Breeding activity may occur year-round in California, but egg laying tends to peak in June and July in colder climates, when females begin to search for suitable nesting sites upslope from water. Adult WPT have been documented traveling long distances from perennial watercourses for both aestivation and nesting, with long-range movements to aestivation sites averaging about 820 feet, and nesting movements averaging about 295 feet (Rathbun *et al.* 2002). During the terrestrial period, Reese and Welsh (1997) found that radio-tracked WPT were burrowed in leaf litter. Introduced species of turtles (*e.g.*, red-eared sliders) may out-compete WPT for basking sites, and bullfrogs are known to consume hatchling WPT.

CNDDB (2009) reports three occurrences of WPT in the Project Vicinity: Dry Creek (south-southwest of Collins Lake); a tributary to French Creek (south of South Yuba River State Park); and Sicard Flat Ditch (west of USACE's Englebright Dam).

7.3.4 Aquatic Resources of the Yuba River Area

Further information regarding aquatic resources of the Yuba River area found by Licensee is provided in the sections below for areas upstream, within, and downstream of the Project Area.

[14] Photo source: CaliforniaHerps.com ©2009.

7.3.4.1 Upstream of the Project

This section presents relevant and reasonably available information regarding aquatic resources located upstream of the Project (*i.e.,* on the Middle Yuba River upstream of Our House Diversion Dam, on Oregon Creek upstream of Log Cabin Diversion Dam, on the North Yuba River upstream of New Bullards Bar Reservoir, and on the South Yuba River upstream of its mouth at USACE's Englebright Reservoir).

Fishes

Licensee found five source documents[15] of relevant information regarding existing fish populations in the Yuba River upstream of the Project. The contents of these source documents, as well as anecdotal information, are described here.

Upper Yuba River Studies Program (CDWR 2006a). The Upper Yuba River Studies Program (UYRSP) (CDWR 2006a) included an extensive study of trout fisheries and habitat in the Yuba River watershed upstream of the Project. The UYRSP was a multi-disciplinary investigation into the feasibility of introducing anadromous salmonids to the upper Yuba River system and involved numerous fish studies (CDWR 2006a) as well as bathymetric, geophysical, and geological studies of USACE's Englebright Reservoir conducted by the USGS (Childs *et al.* 2003). While the program focused on habitat assessments to evaluate the feasibility of reintroduction of salmon and steelhead into the Middle and South Yuba rivers upstream of USACE's Englebright Dam, portions of the report are informative on resident fish populations and their habitats in the Middle Yuba River. UYRSP fisheries studies included the South Yuba River from its confluence at USACE's Englebright Reservoir to Jordan Creek, and the Middle Yuba River from the confluence with the North Yuba River to Milton Diversion Dam. The North Yuba River from USACE's Englebright Reservoir to New Bullards Bar Dam was not included in the study.

Of particular value for the Middle and South Yuba rivers is the 2004 dive count survey for rainbow trout by Gast *et al*. (2005) included as Appendix G of the California Department of Water Resources (CDWR) (2006a) report. The survey area covered the section of the Middle Yuba River extending from USACE's Englebright Reservoir to the Milton Diversion Dam Impoundment, and the South Yuba River extending from USACE's Englebright Reservoir to Spaulding Dam (refer to CDWR 2006a for study details).

Middle Yuba River

The UYRSP survey section and related findings (Gast *et al.* 2005) for the Middle Yuba River above Our House Diversion Dam are considered "upstream" of the Project. However, because the original study findings were reported for the Middle Yuba River as a longitudinal continuum from its mouth to the Milton Diversion Dam, the separation between "upstream" and "within" the Project is difficult to create without losing the value of the findings. For this reason, many of

[15] A "source document" contains original data collected by the author's and associated conclusions, interpretations and other information developed *de novo* by the authors.

the findings have been left intact to show the longitudinal trends in fish distribution between the lower and upper Middle Yuba River.

According to Gast *et al.* (2005), the potential distribution of available rearing habitat for anadromous salmonids in the Middle Yuba River was assessed using the distribution and abundance of endemic rainbow trout as a surrogate. The relative distribution and abundance of rainbow trout were assessed in the Middle Yuba River during August and early September 2004 using direct observation (snorkeling) methodologies. Potential migration barriers and thermal refugia for trout also were investigated.

In addition to mainstem surveys, qualitative assessments of all accessible significant tributaries were conducted by visually estimating the stream flow, measuring water temperature, photographing, and visually assessing the rearing potential of the lower reaches (Gast *et al.* 2005). Surveys were conducted in tributaries to 1,000 to 2,000 feet upstream of their confluences with the Middle Yuba River, or to the first impassable fish barrier, whichever was encountered first. All potential barriers to fish migration encountered during the surveys were photographed and qualitatively described, with estimated vertical heights and Global Positioning System (GPS) positions recorded for each barrier.

The following description of results from 2004 snorkel surveys in the Middle Yuba River from just upstream of Our House Diversion Impoundment to the Milton Diversion Dam is based on Gast *et al*. (2005). Referenced river miles are based on RM 0.0 at the confluence of the Middle and North Yuba rivers. Throughout the surveyed reach, estimated index densities of rainbow trout in specific habitats varied between 0 and 1,506 rainbow trout per mile.

Generally, trout densities were higher in the cooler, upstream reaches, above Our House Diversion Dam (see Table 7.3.4-1 for a list of survey locations and water temperatures). Adult trout densities progressively increased upstream to RM 17.1. Densities upstream of this point showed no apparent trend and averaged 204 trout per mile. Adult rainbow trout observations were more frequent in pools than riffles. However, most riffles contained abundant whitewater, fast chutes, and other obstructions, making dive counts difficult and, thus, observation probabilities were lower than in pools. Rainbow trout densities in run habitats were between the lower densities in riffles and the higher densities in pools. In the lower reaches, most of the rainbow trout in pools were concentrated at the heads of the pools. Rainbow trout larger than 14 inches were observed only in runs and pools during the dive counts, and only downstream of RM 31.0. The index density of rainbow trout fry was variable, but generally increased upstream to RM 27.5, where they averaged 343 rainbow trout per mile. A spike (1,218 per mile) in the density of rainbow trout fry was observed at RM 39. Excluding that high-density observation, the average fry density in the upper section of the river was 213 rainbow trout per mile. The furthest downstream observation of rainbow trout fry in dive counts was at RM 12.6 (approximately 0.5 mile above Our House Diversion Dam). However, rainbow trout fry were observed at non-sampling locations near Oregon Creek (RM 4.8). Fry densities were generally highest in riffles as opposed to pools, with runs exhibiting intermediate densities. Fry densities among pools were highest in the cooler upstream reaches.

Besides rainbow trout, observed fish species included brown trout, Sacramento sucker, Sacramento pikeminnow, hardhead, smallmouth bass, and various sunfish. No smallmouth bass, adult pikeminnow, or hardhead were observed upstream of Our House Diversion Dam (RM 12.8), although a few minnow fry were observed a short distance upstream of the dam.

According to Gast *et al*. (2005), tributaries to the mainstem of the Middle Yuba River, having cooler summertime water temperatures, may provide refuge for salmonids from higher than optimum mainstem water temperatures. Kanaka Creek and Wolf Creek were cooler than the mainstem, appeared to provide good habitat, and were inhabited by juvenile and adult rainbow trout.

Table 7.3.4-1. Distribution of fish species relative to river mile and stream temperature observed during 2004 Middle Yuba River snorkel surveys upstream of Our House Diversion Dam.

RM (beginning at the confluence of the Middle Yuba and the North Yuba rivers)	Tributary Inflow	Middle Yuba Water Temperature (°C)	Rainbow Trout	Brown Trout	Pikeminnow Hardhead[1]	Pikeminnow	Hardhead	Suckers	Smallmouth Bass	Rainbow (Fry Lane)	Non-game (Fry Lane)
13.0	---	21.8	●	---	●	---	---	---	---	---	---
16.5	Kanaka Creek		---	---	---	---	---	---	---	---	---
17.1	---	20.8	●	---	---	---	---	---	---	---	---
26.1	---	17.6	●	---	---	---	---	---	---	●	---
26.9	Wolf Creek		---	---	---	---	---	---	---	---	---
27.5	---	19.8	●	---	---	---	---	●	---	●	●
30.5	---	16.8	●	---	---	---	---	●	---	---	---
31.0	---	17.6	●	---	---	---	---	●	---	---	---
37.5	---	11.5	●	●	---	---	---	---	---	●	---
37.6	---	12.4	●	●	---	---	---	---	---	●	---
39.1	---	16.1	●	●	---	---	---	---	---	●	---
39.6	---	14.3	●	---	---	---	---	---	---	●	---

Source: Gast *et al*. 2005
[1] Pikeminnow and hardhead less than 4" in length not discernible.

Gast *et al*. (2005) identified Our House Diversion Dam, at RM 12.8, as the only man-made barrier in the survey area that currently blocks upstream fish migration. There were no natural barriers to upstream migration between Our House Diversion Dam and Jordan Creek.

Lahontan cutthroat trout occur in two tributaries to the mainstem of the Middle Yuba River. Small, introduced populations exist in Macklin and East Fork creeks and were probably derived from the now extinct Lake Tahoe population (Coffin and Cowan 1995, as cited by Beedy *et al.* 2002 a and b). CDFG successfully transplanted Lahontan cutthroat trout into East Fork Creek. The Macklin Creek population is believed to have originated via a transfer of fish from Lake Tahoe in the early 1900s (E. Gerstung, CDFG, pers. comm. as cited by USFWS 2003d). According to the USDOI United States Fish and Wildlife Service (USFWS), these are both strong, viable populations (USFWS 1975).

Macklin Creek enters the Middle Yuba River on the south bank at approximately RM 41.9. The stream rises steeply at a 23 percent gradient for the first 0.5 mile. For the remaining 1.6 miles, the stream gradient averages 4.5 percent. The steep gradient in the lower reach of Macklin Creek

restricts fish movement from the Middle Yuba River into Macklin Creek. Licensee found no citings in the literature of Lahontan trout in the Middle Yuba River.

East Fork Creek enters the Middle Yuba River on the south bank, approximately 7 miles downstream of Macklin Creek. Licensee was unable to find any information on the Lahontan trout population in East Fork Creek.

South Yuba River

The UYRSP also included work in the South Yuba River from Lake Spaulding to the confluence with USACE's Englebright Reservoir. The 2004 dive count survey for rainbow trout by Gast *et al.* (2005) is included as Appendix G of the CDWR (2006a) report. The survey area covered the South Yuba River from USACE's Englebright Reservoir upstream to the confluence with Jordan Creek (refer to CDWR 2006a for study details).

According to Gast *et al.* (2005), the potential distribution of available rearing habitat for anadromous salmonids in the South Yuba River was assessed using the distribution and abundance of endemic rainbow trout as a surrogate. The relative distribution and abundance of rainbow trout were assessed in the South Yuba River during August and early September 2004 using direct observation (snorkeling) methodologies. Potential migration barriers and thermal refugia for trout also were investigated.

In addition to mainstem surveys, qualitative assessments of all accessible significant tributaries were conducted by visually estimating the stream flow, measuring water temperature, photographing, and visually assessing the rearing potential of the lower reaches (Gast *et al.* 2005). Tributary surveys were conducted upstream one to two thousand feet or to the first impassable barrier, whichever was encountered first. All potential barriers to fish migration encountered were photographed and qualitatively described, with estimated vertical heights and GPS positions recorded for each barrier. While the focus was on rainbow trout, other species were observed and recorded.

The following description of results from 2004 snorkel surveys of the upper South Yuba River is based on Gast *et al.* (2005). Estimated index densities of rainbow trout in all size classes in specific habitats varied between 0 and 1,402 rainbow trout per mile. Generally, these trout index densities were lower in the warmer, lower reaches and higher in the cooler, upstream reaches (Table 7.3.4-2). Densities of adult trout (*i.e.,* 8 in. and larger) progressively increased upstream to RM 18.1, approximately 1.7 miles upstream of Edwards Crossing. Densities of such larger trout upstream of this point were relatively consistent and showed no apparent trend, averaging 273 trout per mile. Adult rainbow trout observations were more frequent in pools than riffles. However, most riffles contained abundant whitewater, fast chutes, and other obstructions, making dive counts difficult and thus observation probabilities were likely lower than in pools. Trout densities in run habitats were intermediate to the lower densities found in riffles and higher densities in pools. In the lower reaches, most of the trout in pools were concentrated at the heads of the pools. Trout larger than 14 inches were observed only in runs and pools during the dive counts and only downstream of RM 28.3, approximately 1.6 miles downstream of Washington Bridge.

The index density of rainbow trout fry (*i.e.,* 4 inches and less) was variable, but generally increased upstream to RM 27.5, approximately 2.7 miles downstream of Washington Bridge, where they averaged 455 fish per mile. When compared to identical surveys on the Middle Yuba River by Gast *et al.* (2005), the average fry density in the South Yuba River was approximately twice the Middle Yuba River fry density. The observation of trout fry furthest downstream in the South Yuba River dive counts were at RM 15.2, approximately 1.2 miles downstream of Edwards Crossing. Trout fry were, however, visually observed from the streambank in the vicinity of Owl Creek (RM 4.2) in the South Yuba River. Fry densities were generally highest in riffles as opposed to pools, with runs exhibiting intermediate densities. Fry densities among pools were highest in the cooler upstream reaches.

Adult hardhead were observed at RM 3.9, approximately 0.3 mile downstream of the confluence with Owl Creek, whereas adult pikeminnow were observed at several locations downstream of RM 10.4, approximately 2.3 miles upstream of the Highway 45 crossing. Fry and juvenile minnows and Sacramento sucker were observed upstream to RM 28.3, approximately 1.6 miles downstream of Washington Bridge. No smallmouth bass or brown trout were observed, but a few sunfish were observed in a shallow backwater pool at RM 5.7, approximately 2.4 miles downstream of the Highway 45 crossing (Gast *et al.* 2005). Table 7.3.3-2 below shows the distribution of observed fish in the South Yuba River relative to stream mile and stream temperature.

According to Gast *et al.* (2005), tributaries to the mainstem, having cooler summertime water temperatures, may provide refuge for salmonids from higher than optimum mainstem water temperatures. Poorman Creek, a tributary to the South Yuba River at RM 28.8, was cooler than the mainstem, appeared to provide good habitat, and was inhabited by juvenile and adult rainbow trout.

Table 7.3.4-2. Distribution of fish relative to river mile and stream temperature observed during 2004 South Yuba River snorkel surveys.

River Mile (beginning at the confluence of the South Yuba River with USACE's Englebright Reservoir)[1]	Tributary Inflow	South Yuba Water Temperature (°C)	Rainbow Trout	Pikeminnow Hardhead[2]	Pikeminnow	Hardhead	Suckers	Rainbow (Fry Lane)	Non-game (Fry Lane)
0.0	---	---	---	---	---	---	---	---	---
3.5	---	25.1	---	●*	---	---	---	---	●
3.9	---	23.3	●	●*	---	●	---	---	●
4.2	Owl Creek	---	---	---	---	---	---	---	---
5.7	---	25.1	---	●*	---	---	●	---	●
6.7	---	23.1	---	---	●	---	●	---	---
10.4	---	24.0	●	●*	●	---	---	---	---
12.0	---	20.7	●	●*	---	---	---	---	●
15.2	---	22.9	●	●*	---	---	●	---	●
16.0	Spring Creek	21.9	●*	●	---	---	●	●	●
18.1	---	24.5	●*	●	---	---	●	●	●
19.7	---	24.3	●*	●	---	---	---	---	●
20.6	Humbug Creek	22.8	●*	---	---	---	●	●	---
23.3	---	22.6	●*	●	---	---	●	●	---
24.5	---	21.4	●*	●	---	---	---	●	●

Table 7.3.4-2. (continued)

River Mile (beginning at the confluence of the South Yuba River with USACE's Englebright Reservoir)[1]	Tributary Inflow	South Yuba Water Temperature (°C)	Rainbow Trout	Pikeminnow Hardhead[2]	Pikeminnow	Hardhead	Suckers	Rainbow (Fry Lane)	Non-game (Fry Lane)
27.5	---	20.9	●*	---	---	---	●	●	---
28.1	McKilligan Creek	---	---	---	---	---	---	---	---
28.3	---	20.3	●*	●*	---	---	●	---	●
28.8	Poorman Creek		---	---	---	---	---	---	---
35.8	---	18.1	●*	---	---	---	---	●	---
36.0	---	17.3	●*	---	---	---	---	●	---
40.6	---	17.3	●*	---	---	---	---	---	---

Source: Gast *et al.* 2005
[1] RM from Gast *et al.* (2005) is slightly different than Licensee's RM measurement.
[2] Pikeminnow and hardhead less than 4" in length not discernible.
* Higher population levels (Rainbow trout and Pikeminnow/Hardhead only)

Table 7.3.4-3 summarizes the occurrence of fish species upstream of the Project in the North, Middle and South Yuba rivers.

Table 7.3.4-3. Fish species known or likely to occur in stream reaches upstream of the Project.

Family	Common Name	Middle Yuba	South Yuba	North Yuba
Salmonid	Rainbow Trout	X	X	X
	Brown Trout	X	X	X
Sunfishes	Smallmouth Bass	---	X	X
Cyprinidae	Hardhead	X	X	X
	Pikeminnow	X	X	X
Catostomidae	Suckers	X	X	X
Cottidae	Sculpin	X	X	X

Gast *et al.* (2005) also identified three potential barriers to upstream anadromous salmonid migration in the South Yuba River. Two are natural falls or cascades located at RM 6.2 and RM 20.0, and one is an abandoned diversion dam located at RM 10.4 (Table 7.3.4-4).

Table 7.3.4-4. Location and height of migration barriers found on the South Yuba River between USACE's Englebright Reservoir and Spaulding Dam.

River Mile	Barrier Height (feet)
6.2	6
10.4	< 6 (remnant breached dam)
20	6 to 7

Source: Gast *et al.* 2005

For information on fisheries resources in the South Yuba watershed upstream of Spaulding Dam please refer to the Pacific Gas and Electric Company's (PG&E) Drum-Spaulding Project (FERC Project No. 2310) Preliminary Application Document (PAD) (2008).

South Feather Power Project Relicensing. Slate Creek Diversion Tunnel conveys water from the Slate Creek Diversion Dam in the Yuba River Basin to Sly Creek Reservoir in the Feather

River Basin (South Feather Power Project, FERC 2088-068). A Final Environmental Impact Statement (FEIS) was completed for relicensing of this project in 2009 (FERC 2009).

The FEIS describes the results of recent fisheries studies. During 2004-2006 stream surveys, South Feather Water & Power Agency (SFWPA) sampled all project reaches and reference reaches with similar habitat characteristics selected for comparison of fish populations. The fish species composition in Slate Creek consisted of rainbow trout and speckled dace in the upper watershed, changing to a transitional zone (*e.g.*, Sacramento pikeminnow) and warmwater species (*e.g.*, smallmouth bass) in the lowest section of the stream near the North Yuba River confluence. Average trout biomass from 1993 to 2005, at trout-dominated sites ranged from 24 to 28 pounds per acre, and the average number of catchable trout ranged from 248 to 304 trout per mile.

Nevada Irrigation District's (NID) Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project Relicensings Studies (2009). The remaining source documents consist of technical memoranda that describe the 2008 results of NID's and PG&E's ongoing fish related studies being conducted in support of the coordinated relicensing of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project.

The 2008 results for these studies (NID and PG&E 2009a, b, and c) are available on the NID/PG&E Relicensing Website at www.nid-relicensing.com, and can be accessed by selecting "Technical Memoranda" on the Quick Launch bar located on the left side of the website's main page.

The 2008 studies include:

- One-dimensional instream flow studies on the Middle Yuba River between Our House Diversion Dam and Jackson Meadows Reservoir Dam, and on the South Yuba River between the North Yuba River confluence and Spaulding Dam.
- Stream fish population studies on the Middle Yuba River between Our House Diversion Dam and Jackson Meadows Reservoir Dam, on the South Yuba River between the North Yuba River confluence and Spaulding Dam, and on the North Yuba River at three locations including near the towns of Bassetts and Sierra City, and near the confluence of Indian Creek.
- Fish passage studies in selected tributaries to the Middle and South Yuba rivers and Jackson Meadows and Spaulding reservoirs.

In addition to the ongoing studies above, studies in 2009 include:

- Reservoir fish population studies in Jackson Meadows Reservoir on the Middle Yuba River and in Spaulding Reservoir on the South Yuba River.
- Benthic Macroinvertebrate studies on the Middle Yuba River between Our House Diversion Dam and Jackson Meadows Reservoir Dam, and on the South Yuba River between the North Yuba River confluence and Spaulding Dam.

Progress reports of all of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project fisheries and aquatic relicensing studies conducted in 2009 will be completed in spring of 2010.

CDFG 1970. Between 1929 and 1950, CDFG established an experimental fish hatchery on Fiddle Creek, a tributary to the North Yuba River located about 34 miles from Nevada City. This site was selected by CDFG because the water was very suitable (CDFG 1970). Floods during the severe winter of 1937–38 caused some damage, but CDFG made repairs and hatchery operations continued. During January 1950, heavy snows caused the CDFG Yuba River Hatchery to be closed temporarily, and CDFG began hatchery operations again in April 1950. Eggs were hatched and the water supplies were adequate, due to the large snowpack. However, by July 1950, increased water temperatures and decreases in the amount of water available made it necessary for CDFG to plant fish rapidly. By August, CDFG's fish planting was completed. Storms during November 1950 caused such extensive damage the hatchery that repairs could not be made. Since the hatchery was outmoded and suitable for rearing fingerlings only, CDFG permanently closed its hatchery and all reclaimable material was salvaged (CDFG 1970).

Anecdotal Information

Licensee found three sources of anecdotal information that may be relevant to fish populations upstream of the Project. The content of these anecdotal sources is described below.

NID's Yuba-Bear Hydroelectric Project PAD (2008). As discussed in the PAD prepared by NID for the Yuba-Bear Hydroelectric Project relicensing, located on the Middle and South Yuba rivers (NID 2008), there are two NID reservoirs or impoundments upstream of the Project on the Middle Yuba River. Furthest upstream is Jackson Meadows Reservoir and the Milton Diversion Impoundment is the furthest downstream.

CDFG manages Jackson Meadows Reservoir as a Trout Put-and-Grow and Catchable fishery with rainbow and brown trout (Hiscox 2007). A large spawning migration of wild rainbow trout, averaging 11 inches in length, was observed in the inflowing Middle Yuba River in May 1967 Hiscox (2007). The reservoir contains both Lahontan redside and speckled dace. Hiscox (2007) indicates that Arctic Grayling have been seen in the past but not for many years. Bacher (2002) reports there are populations of brook trout, brown bullheads, and Lahontan redsides in the reservoir.

Licensee found little definitive information regarding fish in the reach of the Middle Yuba River between Jackson Meadows Reservoir and the Milton Diversion Impoundment. However, given the high elevation and cool water, Licensee expects the reach supports populations of rainbow, brown, and brook trout. Other species, such as brown bullhead, Lahontan redside, and golden shiner may occur in Jackson Meadows Reservoir or in the Milton Diversion Dam Impoundment, but Licensee believes it is unlikely that these species have become established in the reach.

CDFG manages the Milton Diversion Dam Impoundment as a self-sustaining fishery for rainbow and brown trout, and has designated the impoundment as wild trout water with a size bag limit (Hiscox 2007). According to Schaffer (2005), the Milton Diversion Dam Impoundment is a

quality brown trout fishery and has excellent fly-fishing. Both brown and rainbow trout reproduce in the Middle Yuba River inlet to the Milton Diversion Dam Impoundment. Wiza (2000) states that large (*i.e.,* 18 to 22 inches) brown trout are common in the impoundment. Hiscox (1986-1993) reports a fish rescue from 1993 recovered rainbow trout, brown trout, cutthroat trout, brown bullhead, Lahontan redside, and golden shiner. Hiscox (2007) states that the lake has "flow-down" recruitment from Jackson Meadows Reservoir.

PG&E's Drum-Spaulding Project PAD (2008). A PAD was prepared for PG&E's Drum-Spaulding Project relicensing which includes the South Yuba River from near the town of Truckee downstream to its confluence with the North Yuba River (PG&E 2008). Included in the Drum-Spaulding Project Area is the South Yuba Spaulding Dam Reach extending 41.1 miles from the base of Lake Spaulding Dam (RM 41.1) downstream to the confluence with USACE's Englebright Reservoir (RM 0).

Fish species identified in the PAD as likely to occur in the South Yuba River below Spaulding Dam include rainbow trout, hardhead, pikeminnow, suckers, and other small non-game fishes.

The first documented CDFG capture of trout was reported in 1970, and the summary memorandum associated with the event provides anecdotal information indicating that anglers fishing the nearby Willow Creek and the North Yuba River landed 35 rainbow trout (CDFG 1970). It is unknown whether the species were planted or resident fish.

The University of California Davis (UC Davis) reported native species in the upper Yuba River on their fish website. These reported native species include California roach, hardhead, hitch, Lahontan redside, Paiute sculpin, rainbow/steelhead trout, riffle sculpin, Sacramento blackfish, Sacramento pikeminnow, Sacramento sucker, speckled dace, Tui chub, and Western brook lamprey (UC Davis 2009).

A query of the CNDDB within quadrangles located immediately upstream of the Project (*i.e*., Clio, Calpine, Antelope Valley, Loyalton, Beckwourth Pass, Constantina, Evans Canyon, Frenchman Lake, and McKesick Peak) did not reveal any occurrences of special-status fish species upstream of the Project Area (CDFG 2009c).

CDFG's Fish Stocking Program. CDFG's fish stocking records through 2007 for New Bullards Bar Reservoir, USACE's Englebright Reservoir, and several river reaches in the watershed are provided in Attachment 7.3A. Fish populations in the Sierra Nevada have been dramatically altered by numerous factors, one of which is the introduction of both native and non-native fish species, many of which have occurred in areas previously devoid of fish. Fish have been introduced into the lakes and streams on the Sierra Nevada since the 1800s, and by the 1860s, stocking of salmonids and other recreational fish was being conducted by various sportsman's groups (Pister 2001). Although involved in sporadic planting activities pre-1900s, the California Fish and Game Commission did not begin stocking activities on a regular basis until the 1920s (Pister 2001).

Fish stocking has taken place upstream of the Project Area in the North Yuba River, and three locations in the South Yuba River (*i.e.*, Washington Area, Highway 80, and Bridgeport) (CDFG

1989, 2007). Stocked species were raised primarily at the Bear Valley, Mt. Shasta, and Mobile hatcheries. Stocking in the Washington area has taken place from 1951 through 2003; during this time some 354,000 rainbow trout, 10,300 brown trout and 1,620 rainbow trout (Kamloops and Coleman strains) were planted (CDFG 2007). At the Highway 80 location, nearly 903,000 rainbow trout were released between 1950 and 1978, the last recorded planting at this location (CDFG 2007). About 990 eastern brook trout and 4,000 brown trout also were stocked at this location. Only three stocking events are documented at the Bridgeport site. Stocking was conducted from 1998 through 2000, and 2,350 rainbow trout were released during this period (CDFG 2007). No records of Chinook salmon plantings in the North, Middle, and South Yuba rivers were found during the preparation of this Preliminary Information Package.

In 2006, a lawsuit was filed against CDFG contending that no Environmental Impact Report (EIR) had been completed for CDFG's stocking programs. As a result, an order was issued that placed a restriction against stocking non-native fish in California fresh waterbodies where surveys have demonstrated the presence of any of the 25 specified amphibian or fish species of special concern or where a survey for those species has not yet been done (CDFG 2008a). In accordance with an agreement, in 2008 CDFG halted stocking in nearly 200 lakes and streams pending completion of the EIR, which is anticipated in 2010 (CDFG 2008a). However, in the agreement, stocking is allowable and continues in waterbodies that meet certain requirements, some of which include: 1) human-made waterbodies >1,000 acres; 2) human-made waterbodies <1,000 acres and not connected to a river or stream; and 3) those that are not within California red-legged frog (CRLF) habitat (CDFG 2008a). Stocking in waters located upstream of the Project Area in 2009-2010 will take place in 11 waterbodies in Plumas County, 18 waterbodies in Sierra County, and 23 waterbodies in Nevada County (CDFG 2008b). Several "allowable" lakes are located in the headwaters of the Middle and South Yuba watersheds, upstream of the Project. These include Carr Lake, Culbertson Lake, Faucherie Lake, Feeley Lake, Fuller Lake, Jackson Meadows Reservoir, Lower Lindsey Lake, Upper Lindsey Lake, Milk Lake, Penner Lake, Lower Rock Lake, Upper Rock Lake and Sawmill Lake.

Amphibians

Licensee found five source documents of relevant information regarding amphibians in the Yuba River Basin of the Project. The content of these source documents, as well as anecdotal information, is described below.

NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project Relicensings Studies (2009). Amphibians upstream of the Project are addressed by two ongoing studies being conducted in support of the coordinated relicensing of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project:

- FYLF surveys on the Middle Yuba River beginning approximately 1 mile upstream of Our House Diversion Dam and on the South Yuba River beginning 11 miles upstream of USACE's Englebright Dam. Study results to date (NID 2009; PG&E 2009) have documented breeding occurrences of FYLF at four sites on the Middle Yuba and at nine sites on the South Yuba River. This report also includes descriptions of habitats and photographs of each site, and incidental observations of other amphibians, aquatic reptiles, and turtles.

- FYLF habitat modeling is being conducted at one site on the Middle Yuba River and one site on the South Yuba River.

The 2008 results for these studies (NID and PG&E 2009d) are available on the NID/PG&E Relicensing Website at www.nid-relicensing.com, and can be accessed by selecting "Technical Memoranda" on the Quick Launch bar located on the left side of the website's main page.

Progress reports of all studies conducted in 2009 will be completed in spring of 2010.

South Feather Water and Power Relicensing, 2006. Multi-year, weekly visual encounter surveys (7 sites in the Slate Creek Diversion Dam Reach) were conducted for amphibian from April to June during 2004 and 2005. The Slate Creek Diversion Dam Reach has a known breeding FYLF population. Tadpoles found were observed both survey years. One account from 2004 described a large aggregation (of approximately 450 individuals) in a gravel and sand shallow-water area immediately adjacent to an egg mass on the right bank. Tadpoles of approximately the same size and aggregation size were directly across the stream on the left bank in a backwater, boulder-dominated habitat area.

Also, documented were two historical occurrences of FYLF observations. The first occurrence was an observation of 13 adults and 18 juveniles at Slate Creek upstream and downstream of Slate Creek Diversion Dam (Stillwater Sciences 2001). The second documented observation were three adults and 5 juveniles at Slate Creek north of the forest road 512, southeast of Little Grass Valley Reservoir (CNDDB database). Mountain yellow legged frogs and CRLF were not found during any of the surveys.

Masters Thesis – Van Wagner (1996). Habitat associations and life history characteristics of a population of FYLF on Clear Creek, a tributary of the Middle Yuba River below the confluence of Oregon Creek, were the topics of a Masters thesis (van Wagner 1996), which included reference to the presence of bullfrogs in the study area.

Licensee found six sources of anecdotal information that may be relevant to existing amphibian populations upstream of the Project. The contents of these anecdotal sources are described here.

Anecdotal Information

NID's Yuba-Bear Hydroelectric Project PAD (2008) and PG&E's Drum-Spaulding Project PAD (2008). A PAD was prepared by NID for the Yuba-Bear Hydroelectric Project relicensing, located on the Middle and South Yuba rivers (NID 2008), and similarly, a PAD was prepared for PG&E's Drum-Spaulding Project relicensing, which includes the South Yuba River from near the town of Truckee downstream to its confluence with the North Yuba River (PG&E 2008). Ten species of amphibians are known to occur in the vicinity of the NID and PG&E projects. Most of these species could potentially occur across a wide range of elevations (Table 7.3.4-5). Three other species were considered, but were not included in this list based on known and expected patterns of occurrence (Table 7.3.4-6) (Jennings and Hayes 1994; Zeiner 1988-1990; Vindum and Koo 1999a, 1999b.)

With the exception of two completely terrestrial species without free-living larval stages (ensatina and California slender salamander), all of these documented species require still or slow-flowing water in which to breed. The species most likely to occur in aquatic habitats at lower elevations of these Projects are probably California newt, Sierra treefrog, foothill yellow-legged frog, and bullfrog. At elevations above 5,000 feet, long toed salamander, Sierra treefrog, western toad, and Sierra Nevada yellow-legged frog are the characteristic species, but, because of introduced fish and other recent changes to high elevation ecosystems, these species cannot be assumed to occur.

Table 7.3.4-5. General distribution of amphibian species that have been reported in the vicinity of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project (NID 2008; PG&E 2008).

Species/Status[1]	General Distribution[2]
Long-toed salamander *Ambystoma macrodactylum*	Widespread species, primarily restricted to high elevations in the Sierra Nevada, but there are few known populations. Breeds in ponds and high elevation lakes, where the introduction of fish has adversely affected some populations.
California newt *Tarichan torosa*	Widespread and common species. Breeds in ponds, lakes, reservoirs, and streams mostly at low to middle elevations in forested areas.
Ensatina *Ensatina eschscholtzii*	Widespread and common species; completely terrestrial, associated with forested areas over a broad range of elevations (known from 1,300-5,300 ft).
California slender salamander *Batrachoseps attenuatus*	Widespread and common species; completely terrestrial. Occurs mostly in the forested foothills and chaparral (occasionally to 3,000 ft elevation).
Sierra treefrog (chorus frog) *Pseudacris sierra*[3]	Widespread and common species over a wide range of elevations, and breeding in ponds, lake and reservoir edges, ditches, and slow-moving or still sections of streams. Possibly reduced in abundance at high elevations.
Western toad *Anaxyrus boreas*[4]	Widespread species, breeding in ponds, lake, and reservoir edges, and slow-moving or still sections of streams across a wide range of elevations. In the Sierra Nevada more likely to occur at higher elevations (may have declined in the foothills). May be reduced in numbers but most known populations appear to be extant.
California red-legged frog[FT, CT, FSS] *Rana draytonii*[5]	Nearly extirpated in the Sierra Nevada. Formerly occurred on at least 30 drainages in the foothills (mostly below 3,500 ft elevation). Breeds in slow-moving or still sections of streams and ponds, usually where there is emergent and aquatic vegetation.
Foothill yellow-legged frog [CSC, FSS] *Rana boylii*	Estimated to no longer occur in at least 50 percent of former range in the Sierra Nevada. Occurs on small to large streams and rivers with pools and low-gradient riffles (small streams are probably non-breeding habitat). Most known occurrences are below 5,000 ft elevation.
Sierra Nevada yellow-legged frog[FC, CSC, FSS] *Rana sierrae*[6]	May be absent from more than 80 percent of former range in the Sierra Nevada. Extant populations are often small. Inhabits ponds, lakes, and streams, mostly above 5,000 ft elevation. Introduction of fish to high elevation areas may have eliminated many populations.
Bullfrog *Lithobates catesbeianus*[7]	Introduced and well established in slow-moving streams, stock ponds, lakes, and reservoirs to at least 5,000 ft elevation. The presence of bullfrogs may be associated with declines of other native *ranids.*

[1]Status: FT = federal threatened, FC = federal candidate, CT = California threatened, CSC = CDFG California species of special concern, FSS = Forest Service sensitive.
[2]Sources include Jennings and Hayes 1994, Jennings 1996, Vindum and Koo 1999a, 1999b
[3]Previously classified as *Hyla regilla* (Pacific treefrog) (see Recuero *et al.* 2006a, 2006b). Retention of the common name "treefrog" reflects longstanding, popular usage.
[4]Previously classified as *Bufo boreas* (see Frost *et al.* 2006)
[5]Previously classified as *Rana aurora draytonii* (see Frost *et al.* 2006)
[6]Previously classified as *Rana muscosa* (mountain yellow-legged frog) (see Vredenburg *et al.* 2007).
[7]Previously classified as *Rana catesbeiana* (see Frost *et al.* 2006)

Table 7.3.4-6. General distribution of amphibian species considered for inclusion, but determined not to occur in the Project Vicinity.

Species/Status[1]	General Distribution
Mount Lyell salamander [CSC] *Hydromantes platycephalus*	A terrestrial species associated with granite outcrops and only known to occur in disjunct alpine and sub-alpine areas well N and SE of the Project Vicinity.
Western spadefoot [CSC] *Spea hammondii*	Primarily found W of the Sierra Nevada foothills and has never been recorded in any of the counties associated with the Project Vicinity.

Table 7.3.4-6. (continued)

Species/Status[1]	General Distribution
Northern leopard frog [CSC] *Lithobates pipiens*	Occurs in only a few scattered sites in the Sierra Nevada, the nearest of which are in NE Sierra County and S of Lake Tahoe (populations possibly extirpated).

[1] Status : CSC = CDFG California species of special concern, FSS = Forest Service sensitive.
[2] Previously classified as *Rana pipiens* (see Frost *et al.* 2006)

In addition to the two PADs described above, searchable museum collection records reviewed from the California Academy of Sciences (CAS) (2009) and the Museum of Vertebrate Zoology (MVZ) (2009), sight records provided by TNF, and range maps and descriptions (California Herps 2009) indicate that a total of nine species of amphibians may occur in or near the North and Middle Yuba rivers upstream of the Project (Table 7.3.4-7). This total includes two completely terrestrial species: California slender salamander, which has rarely been documented in the Project Vicinity; and ensatina, for which there are numerous records. TNF data include sight records for rough-skinned newt (*Taricha granulosa*) on Grizzly Creek (Middle Yuba Watershed) and at the confluence of Brandy and Horse Valley creeks (North Yuba Watershed). However, these are likely misidentifications as there are museum records for Sierra newt from the same locations and no other sources suggest that the distribution of rough-skinned newt extends south of central Butte County.

Records for FYLF upstream of the Project include the North Yuba River and many of the tributaries, including Cherokee Creek, Goodyears Creek, Downie River, Indian Creek, and Slate Creek. There are records for the Middle Yuba River from Our House Diversion Dam to Kanaka Creek, and on the following tributaries: Grizzly Creek, Hornswoggle Creek, Indian Creek, and Oregon Creek. In addition, FYLF has been found on Willow Creek and Grizzly Gulch Creek, which flow into New Bullards Bar Reservoir.

The data suggest that the other widespread species associated with aquatic habitats upstream of the Project Area are Sierra newt and Sierra treefrog. Sierra newt occurrences are mostly associated with creeks, whereas Sierra treefrog records are from creeks, ponds, and small wetlands. Bullfrogs are documented in the Middle Yuba Watershed on Clear Creek, Hornswoggle Creek, Oregon Creek, Willow Creek, and a tributary to Grizzly Creek. There was one documented locality for long-toed salamander (*i.e.,* larvae and juveniles in a pond on a tributary to Slate Creek more than 20 miles upstream of New Bullards Bar Reservoir). There were no records found for western (California) toad in the upstream Project Vicinity.

Table 7.3.4-7. Amphibian species that have been reported upstream of the Project Area.

Species	General Distribution
Long-toed salamander *Ambystoma macrodactylum*	Widespread species, primarily restricted to high elevations in the Sierra Nevada, but there are few known populations. Breeds in ponds and high elevation lakes, where the introduction of fish has adversely affected some populations.
California (Sierra) newt *Taricha torosa sierra*	Widespread and common species, breeding in ponds, lakes, reservoirs, and streams mostly at low to middle elevations in forest and woodland areas.
Ensatina *Ensatina eschscholtzii*	Widespread and common species, completely terrestrial and associated with forest and woodland areas.
California slender salamander *Batrachoseps attenuatus*	Widespread and common species, completely terrestrial. Occurs mostly in the forested foothills and chaparral. Completely terrestrial.
Sierra treefrog (chorus frog) *Pseudacris sierra*[1]	Widespread and common species over a wide range of elevations, and breeding in ponds, lake and reservoir edges, ditches, and slow-moving or still sections of streams.

Table 7.3.4-7. (continued)

Species	General Distribution
Western (California) toad *Anaxyrus boreas halophilus*[2]	Widespread species, which may be in decline. Breeds in ponds, lake and reservoir edges, and slow-moving or still sections of streams across a wide range of elevations.
California red-legged frog *Rana draytonii*[3]	Nearly extirpated in the Sierra Nevada. Formerly occurred on at least 30 drainages in the foothills (mostly below 3,500 ft elevation). Breeds in slow-moving or still sections of streams and ponds, usually where there is emergent and aquatic vegetation. (see Section 7.7.2.1)
Foothill yellow-legged frog *Rana boylii*	Occurs on small to large streams and rivers with pools and low-gradient riffles (small streams are probably non-breeding habitat). Most known occurrences are between 600-4,500 feet elevation. See Section 7.3.2.
Sierra Nevada yellow-legged frog *Rana sierrae*[4]	May be absent from more than 80 percent of former range in the Sierra Nevada. Extant populations are often small. Inhabits ponds, lakes, and streams, mostly above 5,000 ft elevation and not known to occur below about 4,400 ft. Introduction of fish to high elevation areas may have eliminated many populations.
Bullfrog *Lithobates catesbeianus*[5]	Introduced and well established in slow-moving streams, stock ponds, lakes, and reservoirs. The presence of bullfrogs may be associated with declines of other native frogs.

Source(s): Jennings and Hayes 1994; Jennings 1996; Lannoo 2005; NatureServe 2009

[1] Previously classified as *Hyla regilla* (Pacific treefrog) (see Recuero *et al.* 2006a, 2006b). Retention of the common name "treefrog" reflects longstanding, popular usage.

[2] Previously classified as *Bufo boreas* (see Frost *et al.* 2006)

[3] Previously classified as *Rana aurora draytonii* (see Frost *et al.* 2006)

[4] Previously classified as a form of *Rana muscosa* (see Vredenburg *et al.* 2007)

[5] Previously classified as *Rana catesbeiana* (see Frost *et al.* 2006)

Aquatic Reptiles and Turtles

Licensee found two source documents of relevant information regarding turtles (Class Chelonia) associated with aquatic environments upstream of the Project Area, and found no source documents with relevant information regarding reptiles (Class Reptilia, snakes and lizards) upstream of the Project. The contents of these source documents, as well as anecdotal information, are described here.

NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project Relicensings Studies (2009). WPT is addressed by an ongoing study in support of the coordinated relicensing of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project.

The 2008 results for this study (NID and PG&E 2009e) are available on the NID/PG&E Relicensing Website at www.nid-relicensing.com, and can be accessed by selecting "Technical Memoranda" on the Quick Launch bar located on the left side of the website's main page.
This relicensing study is currently ongoing and the 2009 results will be available in early 2010.

South Feather Water and Power Relicensing, 2006. Visual encounter surveys were conducted for WPT in the Slate Creek Diversion Dam Reach, and none were found.

Anecdotal Information

Licensee also found two sources of anecdotal information regarding reptiles (Class Reptilia, snakes and lizards) or turtles (Class Chelonia) associated with aquatic environments upstream of the Project, which are described below.

There are museum records from CAS and MVZ for four species (Table 7.3.4-8). These include one special-status aquatic turtle, WPT, which is discussed in Section 7.3.2. Garter snakes also are often associated with aquatic habitats to varying extents.

There are records for Sierra garter snake on the North Yuba River and tributaries (*i.e.,* Cherokee Creek and Deadwood Creek) upstream of the Project. The western terrestrial garter snake has been recorded on the North Yuba River, Deadwood Creek, and tributaries to New Bullards Bar Reservoir (*i.e.,* Willow Creek and Mill Creek), and the common garter snake is documented on Willow Creek.

WPT occurrences upstream of the Project are associated with ponds, and occasionally with streams in the North Yuba (pond near Grizzly Gulch Creek), Middle Yuba (pond near Grizzly Creek and in Little Willow Creek), and South Yuba (pond near Shady Creek) watersheds.

Table 7.3.4-8. Aquatic reptile and turtle species that have been reported from the Project Vicinity.

Species	General Distribution
Western pond turtle *Actinemys* [*Emys*] *marmorata*[1]	Occurs in a wide variety of aquatic habitats across a broad range of elevations, particularly permanent ponds, lakes, side channels, backwaters, and pools of streams, but is uncommon in high-gradient streams. Often overwinters in forested habitats and oviposits in summer at upland sites as much as 1,200 feet from aquatic habitats. See Section 7.3.2.
Sierra garter snake *Thamnophis couchii*	Highly-aquatic snake occurring in the Sierra Nevada at elevations of 300-8,000 ft.
Western terrestrial garter snake *Thamnophis elegans*	Occurs throughout the Sierra Nevada up to 13,100 ft elevation. Often forages in or near aquatic habitats.
Common garter snake *Thamnophis sirtalis*	Widespread throughout northern California, occurs east and west of the high Sierras and south to San Joaquin Valley. Often forages in or near aquatic habitats.

Source(s): Storer 1930; Jennings and Hayes 1994; Jennings 1996

[1] formerly called *Clemmys marmorata* or *Emys marmorata*

The discussion above regarding aquatic reptiles and turtles includes compilation of information from the NID's Yuba-Bear Hydroelectric Project PAD (2008) and PG&E's Drum-Spaulding Project PAD (2008).

Aquatic Mollusks and Snails

Licensee found one source document of relevant information regarding existing aquatic mollusks (bivalves and aquatic snails) in the Yuba River upstream of the Project. The contents of this document, as well as anecdotal information, are described here.

NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project Relicensings Studies (2009). Mollusk populations upstream of the Project are addressed by one ongoing study being conducted in support of the coordinated relicensing of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project:

- Mollusk studies on the Middle Yuba River between Our House Diversion Dam and Jackson Meadows Reservoir Dam and on the South Yuba River between the North Yuba confluence and Spaulding Dam.

The 2008 results for this study (NID and PG&E 2009f) are available on the NID/PG&E Relicensing Website at www.nid-relicensing.com, and can be accessed by selecting "Technical Memoranda" on the Quick Launch bar located on the left side of the website's main page.

This relicensing study is currently ongoing and the 2009 results will be available in early 2010.

Anecdotal Information

NID's Yuba-Bear Hydroelectric Project PAD (2008). The Yuba-Bear Hydroelectric Project PAD did not identify any mollusks of special concern in the Yuba-Bear Hydroelectric Project vicinity (NID 2008). Two snails are documented as occurring in PG&E's Drum-Spaulding project vicinity, but none are species of special concern (PG&E 2008).

A query of the CNDDB was conducted within quadrangles located immediately upstream of the Project. One mollusk, the Long Valley Pyrg, was reported in a stream in Long Valley, located about 60 miles upstream (to the northeast) of the Project Area (CDFG 2009c).

Benthic Macroinvertebrates

In virtually all ecosystems, invertebrates comprise the vast bulk of faunal taxa and biomass. Their significance as indicators of ecosystem health is indicative of their proximal relationship to environmental parameters and the reliance of higher animals upon them as prey. In freshwater environments, the larger bottom-dwelling invertebrate species, or BMI provide an essential trophic base for many vertebrate species. Yet, these organisms are a subject and resource that are seldom studied, and available information concerning BMI is primarily general in nature.

Licensee found six source documents of relevant information regarding BMI upstream of the Project. The content of these source documents, as well as anecdotal information, is described below.

Rose *et al.* (1995) and Garcia and Associates (GANDA) (2001). In 1995 and 2001, two studies were conducted in the upper Yuba River Basin. One of the studies was conducted on Fordyce Creek (GANDA 2001) and the other was conducted on Clear, Fall, Trap, and Rucker creeks. Rose *et al.* (1995) not only documented the occurrence of numerous aquatic insects (Table 7.3.4-9), but also found that the consistency of trends in BMI taxa richness, Shannon diversity, and abundance was greatest between sections of streams with similar flow rather than between upstream and downstream reaches with differing flow. This suggests that habitat similarity, as characterized by flow regime and elevation, can be a reliable means for inferring BMI community composition and structure.

Table 7.3.4-9. Orders and families of aquatic macroinvertebrates (all insects) that were found in three studies of high elevation Sierra Nevada streams upstream of the Project Area.

Coleoptera	Diptera	Ephemeroptera	Hemiptera	Megaloptera	Plecoptera	Tricoptera
Elmidae	Chironomidae	Baetidae	Corixidae	Sialidae	Nemouridae	Brachycentridae
Dytiscidae	Empididae	Heptageniidae	---	Corydalidae	Capniidae	Ryacophilidae
Staphylinidae	Ceretopogonidae	Leptophlebiidae	---	---	Chloroperlidae	Hydroptilidae
Tenebrionidae	Tabanidae	Ephemerellidae	---	---	Perlodidae	Limnephilidae

Table 7.3.4-9. (continued)

Coleoptera	Diptera	Ephemeroptera	Hemiptera	Megaloptera	Plecoptera	Tricoptera
Psephenidae	Simuliidae	Ameletidae	---	---	Leuctridae	Hydropsychidae
---	Tipulidae	Siphlonuridae	---	---	Perlidae	Lepidostomatidae
---	Hesperoconopa	---	---	---	Peltoperlidae	Phryganaeidae
---	Dixidae	---	---	---	---	Polycentropodidae
---	Nymphomyiidae	---	---	---	---	Philopotamidae
---	Stratiomyidae	---	---	---	---	Sericostomatidae
---	---	---	---	---	---	Glossosomatidae
---	---	---	---	---	---	Uenoidae
---	---	---	---	---	---	Calamoceratidae

Source(s): Herbst 2003; GANDA 2001; & Rose *et al*. 1995.

The area upstream of the Project contains both flowing (lotic) and still water (lentic) habitats, and likely occurring taxa can be broken into these two habitat categories. Lotic habitats upstream of the Project would likely contain the invertebrate groups Ephemeroptera (mayflies), Plecoptera (stoneflies), Tricoptera (caddisflies), Diptera (midges), Coleoptera (beetles), Megaloptera (alderflies), Hemiptera (true bugs), Hirudinea (leeches), Oligocheata (segmented worms), Turbellaria (flatworms), Nematoda (roundworms), Crustacea (scuds, crayfish), Mollusca (clams, snails), Acari (water mites), and Lepidoptera (aquatic moths). Lentic habitats upstream of the Project likely contains the same higher order groups, with the exception of Plecoptera and Megaloptera, but would share few species with lotic habitats, and also probably include Odonata (dragonflies and damselflies) (Rose *et al.* 1995).

Licensee found three sources of anecdotal information that may be relevant to BMI upstream of the Project, as described below.

Erman 1997. Erman noted that the inadequacy of current studies is compounded by a lack of historical data, and therefore also by unknown and undocumented rates of change within the aquatic invertebrate assemblages of the Sierra Nevada as a result of watershed perturbations that have occurred over the last 150 years. As a result, only a surprisingly small amount of survey information exists for the Sierra Nevada at the species level. A review of anecdotal information suggests that a general description of the aquatic invertebrate taxa likely to occur in the Project Vicinity is possible. Insects undoubtedly comprise the majority of BMI species in Sierra Nevada waters; other groups include flatworms, nematodes, segmented worms, snails, clams, and crustaceans (*e.g.*, fairy shrimp, crayfish, and isopods). Moreover, many aquatic invertebrate species are endemic to the Sierra Nevada. In an attempt to characterize the diversity and degree of endemism present in certain communities, a few areas in the Sierra Nevada have been subjected to extensive invertebrate surveys, but as with other recent endeavors, these surveys are incomplete and there is a good possibility that numerous taxa are unrepresented. Results of one such study by Erman (1997) are summarized in Table 7.3.4-10.

Table 7.3.4-10. Summary of aquatic invertebrate species collections in the Sierra Nevada.

Taxon	Total Species in Sierra Nevada Range	Number of Species Endemic to Sierra Nevada Range	Percent Species Endemic to Sierra Nevada Range
Stoneflies (Plecoptera)	122	31	25
Alderflies (Megaloptera)	4	0	0
Dobsonflies (Megaloptera)	7	?	?
Caddisflies (Trichoptera)	199	37	19
Net-winged midges (Diptera, Blephariceridae)	11	1	9
Mountain midges (Diptera, Deuterophlebiidae)	4	1	25
Snails, clams (Mollusca, Bivalvia)	40	8	20
Fairy shrimp (Crustacea, Anostraca, Branchiopoda)	10	1	10

Source: Erman 1997

Regardless of whether endemic or introduced, the presence and location of any given species within the Project Vicinity is largely dependant on its preference for either still or flowing water. The major taxa of many invertebrate groups are found in both general habitat types, and in gradations between them, but the species that live in these two habitats are usually different, and there is essentially no similarity between the inhabiting assemblages (Erman 1997).

Herbst *et al 2003.* Herbst *et al.* reported that in the Sierra Nevada, BMI, especially those that inhabit streams, are among the most poorly known of all faunal groups. Data pertaining to these organisms is limited, with most collection records having been derived from intensively studied locales or taxonomic units rather than from broad, basin-wide, multi-taxon efforts.

Brown and May (2000). In 2000, Brown and May reported BMI data collected during 1994 to 1996 from various locations throughout the western Sierra Nevada and California Central Valley. The authors reported that BMI assemblages in riffles (as well as species associated with snags) might be useful in family level bioassessments of environmental conditions in valley floor habitats. For the riffle samples, elevation was the most important factor determining BMI assemblage structure.

South Feather Water and Power Relicensing, 2006. BMI sampling was conducted in November 1999 by SFWPA in support of permits to conduct sediment passthrough operations at Slate Creek Diversion Dam. Table 7.3.4-11 contains the BMI metric results for the Slate Creek sampling.

Table 7.3.4-11. Invertebrate biological metrics from November 1999 CSBP sampling of Slate Creek.[1]

	Above Diversion Dam					Below Diversion Dam				
	1	2	3	Mean	Coefficient Of Variation	1	2	3	Mean	Coefficient Of Variation
RICHNESS MEASURES (TOTAL NUMBER OF TAXA)										
Taxa Richness	11.00	20.00	25.00	18.67	38.01	27.00	26.00	26.00	26.33	2.19
Ephemeropteran, Plecopteran, And Trichopteran Taxa	7.00	13.00	15.00	11.67	35.69	21.00	18.00	19.00	19.33	7.90
Ephemeropteran Taxa	3.00	5.00	8.00	5.33	47.19	9.00	9.00	7.00	8.33	13.86
Plecopteran Taxa	0.00	4.00	4.00	2.67	86.60	6.00	5.00	5.00	5.33	10.83
Trichopteran Taxa	4.00	4.00	3.00	3.67	15.75	5.00	4.00	6.00	5.00	20.00
COMPOSITION MEASURES (PERCENT COMPOSITION)										
Ephemeropteran, Plecopteran, And Trichopteran Index	82.14	84.78	89.00	85.31	4.06	83.28	88.42	84.82	85.51	3.09
Sensitive Ephemeropteran, Plecopteran, And Trichopteran Index[2]	71.43	60.14	77.66	69.75	12.73	55.84	46.95	56.11	52.96	9.84
Shannon Diversity[3]	1.65	2.34	2.05	2.01	17.27	2.80	2.63	2.64	2.69	3.46
TOLERANCE/INTOLERANCE MEASURES										
Tolerance Value[4]	1.43	2.05	1.33	1.60	24.29	2.17	2.58	2.33	2.36	8.66
Percent Intolerant (0-2)	67.86	62.32	84.19	71.46	15.92	59.94	48.87	57.76	55.52	10.55
Percent Tolerant (8-10)	0.00	0.00	0.34	0.11	173.21	0.00	0.00	0.00	0.00	-
Percent Hydropsychidae	7.14	21.01	6.87	11.68	69.26	16.09	26.37	13.37	18.61	36.82
Percent Baetidae	0.00	1.45	0.69	0.71	101.79	5.36	10.29	4.77	6.81	44.46
Percent Dominant Taxon	57.14	21.01	39.18	39.11	46.19	16.09	26.37	13.86	18.77	35.53
FUNCTIONAL FEEDING GROUPS										
Percent Collectors[5]	7.14	15.94	29.21	17.43	63.73	23.34	31.83	37.95	31.04	23.63
Percent Filterers[6]	7.14	21.01	6.87	11.68	69.26	17.67	28.62	12.87	19.72	40.93
Percent Grazers[7]	78.57	31.88	45.02	51.82	46.46	23.66	19.61	21.78	21.69	9.34
Percent Predators[8]	3.57	10.14	12.37	8.70	52.62	21.77	14.47	13.20	16.48	28.05
Percent Shredders[9]	3.57	21.01	6.53	10.37	90.00	13.56	5.47	14.19	11.07	43.95

[1] EA 2000b
[2] Percent composition with Tolerance values of 0 to 3.
[3] General measure of sample diversity that incorporates richness and evenness (Shannon and Weiner 1963).
[4] Value (0-10) weighted for abundance of individual designated as pollution tolerant (10) and intolerant (0).
[5] Macrobenthos that collect /gather fine particulate matter.
[6] Macrobenthos that filter fine particulate matter.
[7] Macrobenthos that graze upon periphyton.
[8] Macrobenthos that feed on other organisms.
[9] Macrobenthos that shred coarse particulate matter.

NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project Relicensings Studies (2009). BMI upstream of the Project are addressed by one ongoing study being conducted in support of the coordinated relicensing of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project:

- Benthic Macroinvertebrate studies on the Middle Yuba River between Our House Diversion Dam and Jackson Meadows Reservoir Dam, and on the South Yuba River between the North Yuba River confluence and Spaulding Dam.

This relicensing study is currently ongoing and the 2009 results will be available in early 2010.

The discussion above regarding BMI was developed using the same sources of information used to develop the BMI sections of NID's Yuba-Bear Hydroelectric Project PAD (2008) and PG&E's Drum-Spaulding Project PAD (2008).

Algae

Filamentous alga develops as single cells, which form long, visible chains, threads, or filaments (aquaplant.tamu.edu). When the algae grow in excess, they can form dense mats, which rapidly remove nutrients from the water, killing off other organisms. Large algae blooms can be associated with human disturbance, particularly downstream of dams and other flow-regulated water. During the summer months, heavy blooms of the green alga genus *Cladophora* can occur in unspecified sections of the South Yuba River (Cohen, 2001; Shilling, 2003).

Anecdotal Information

NID's Yuba-Bear Hydroelectric Project PAD (2008). The Yuba-Bear Hydroelectric Project identified that during the summer months, heavy blooms of the green alga genus *Cladophora* can occur in unspecified sections of the South Yuba River and its tributary, Deer Creek. The PAD also found that the Dry Creek Conservancy has observed heavy algae growth in several areas of Coon Creek, probably associated with high nutrient loads during the summer.

7.3.4.2 Within the Project Area

This section presents relevant and reasonably available information regarding aquatic resources located within the Project area (*i.e.,* on the Middle Yuba River downstream of Our House Diversion Dam, on Oregon Creek downstream of Log Cabin Diversion Dam, on the North Yuba River downstream of the normal high water line of New Bullards Bar Reservoir, through USACE's Englebright Reservoir and downstream on the mainstem Yuba River to the USACE's Daguerre Point Dam).

Fishes

Licensee found nine source documents of relevant information regarding fish resources within the Project Area. The contents of these documents, as well as anecdotal information, are described here. Licensee found little definitive information regarding fish in the North Yuba River between its confluence with USACE's Englebright Reservoir and New Bullards Bar Dam. Licensee believes fish populations from the North Yuba River between its confluence with

USACE's Englebright Reservoir and New Bullards Bar Dam would be similar to those in the lower Middle (described below) and lower South Yuba rivers.

Lower Yuba River Accord. The Yuba Accord is a consensus-based, comprehensive set of agreements designed, among other things, to protect and enhance 24 miles of aquatic habitat in the lower Yuba River, which extends from USACE's Englebright Dam downstream to the river's confluence with the Feather River near Marysville. Of this reach, only the part from USACE's Englebright Dam to USACE's Daguerre Point Dam is within the Project Area. The Yuba Accord includes a Fisheries Agreement, under which YCWA cooperatively manages the flows of the lower Yuba River according to certain specified criteria, and provides $550,000 of annual funding for monitoring and evaluation of the condition of fish, and fish habitat.

The Yuba Accord River Management Fund is administered by the River Management Team (RMT). The RMT is composed of a Planning and Operations group tasked with implementing a detailed monitoring and evaluation study program for the Lower Yuba River, as specified in the Yuba Accord. The RMT membership includes YCWA, CDFG, NMFS, USFWS, the South Yuba River Citizens League (SYRCL), the Bay Institute, Friends of the River, Trout Unlimited, PG&E, and CDWR.

Completed or ongoing RMT surveys include the following:

- Chinook Salmon Escapement or Carcass Surveys (Otoliths, Scales, Tissue, CWT Sampling)
- Morphological Unit & Mesohabitat Classification (Digital Elevation Model)
- Substrate and Cover Classification and Mapping
- Rotary Screw Trapping
- Juvenile Snorkel Surveys
- Flow and Water Temperature Monitoring
- Topographic Mapping
- Acoustic Tracking of Salmon
- VAKI Riverwatcher System Monitoring of Fish Passage at USACE's Daguerre Point Dam
- Angler Surveys
- Redd Surveys (Superimposition)
- Rapid Bioassesment Surveys

A description of past activities, reports and upcoming events is found at the RMT website (www.yubaaccordrmt.com). Many of the current surveys are ongoing and initial results are yet not available. A brief summary of a portion of the ongoing RMT projects and available information is described here.

RMT Yuba River Escapement Surveys. Since 1991, YCWA has funded CDFG to conduct Chinook salmon and steelhead Escapement Surveys on the lower Yuba River downstream of USACE's Englebright Dam. The RMT has directed the conduct of the escapement surveys since 2006. The carcass sampling provides estimates of population size, spawning success, and age structure through scale samples. Other additional information includes distribution of spawning, sex composition of spawners, number and origin of tagged hatchery strays recovered through CWTs, and the percentage of females that die before spawning (CDFG 2008). Surveys occur both within and below the Project Area. Surveys occurring within Project reaches include the following: Narrows pool to Timbuctoo Bend (1.5 miles), Timbuctoo Bend to the Highway 20 Bridge (1.5 miles), Highway 20 Bridge to Old Debris Dam (3.1 miles), and Old Debris Dam to USACE's Daguerre Point Dam (3.7 miles). The RMT website identified above provides reporting from 2003 to 2007.

RMT Rehabilitation Assessment. An assessment of habitat structure in the lower Yuba River (USACE's Englebright Dam to the Highway 20 Bridge) and how it changes over time was conducted in 2006. The assessment sought to characterize where salmonid spawning was occurring, and improve conditions through management recommendations and potential habitat restoration. A presentation of the rehabilitation assessment is available on the RMT website and provides an overview of findings from 2-dimensional (2D) modeling and habitat suitability predictions to support recommendations for gravel restoration.

RMT Yuba River Chinook Salmon and Steelhead Life History Evaluation. Starting in 2000, YCWA began monitoring timing of adult salmonid migration, size, and condition using an infrared scanner (VAKI Riverwatcher) and photographic equipment at the north and south ladders at USACE's Daguerre Point Dam (AFRP 2009). The RMT has directed the conduct of the VAKI Riverwatcher system since 2006. Additional information from the monitoring provides time of passage, fish body depth, total fish length, and species. Preliminary results have not been posted on the RMT website yet.

RMT Yuba River Outmigrant Surveys. Outmigration of fish has been monitored in the lower Yuba River using rotary screw traps, located at Hallwood Boulevard (downstream of USACE's Daguerre Point Dam) since 2001. The RMT has directed the conduct of the outmigration monitoring since 2006. Outmigrant monitoring provides important insight into the reproductive success of each cohort of Chinook salmon and steelhead juveniles moving from spawning habitat downstream to the ocean. Data also provide information on the abundance and timing of outmigration, life stage at capture and relative condition at capture, and relationships with instream flows and temperatures. Data on incidental catch of other nonsalmonid species also are collected. Preliminary results have not been posted on the RMT website yet.

In addition to the current RMT studies, other additional reports were found. These projects were conducted by other research groups and provide notable insights on the current status of the stream and its fisheries.

Upper Yuba River Studies Program (CDWR 2006a). The following description of results from 2004 snorkel surveys in the Middle Yuba River from its confluence with the North Yuba River to Milton Diversion Dam is based on Gast *et al*. (2005). Referenced river miles are based

on RM 0.0 at the confluence of the Middle and North Yuba rivers. Generally, trout densities were lower in the warmer, lower section of the river (Table 7.3.4-12). The furthest downstream observations of rainbow trout fry in dive counts was at RM 12.6 (*i.e.*, upstream of the Project, approximately 0.5 mile above Our House Diversion Dam). However, rainbow trout fry were observed at non-sampling locations near Oregon Creek (RM 4.8).

Other than rainbow trout, fish observed included brown trout, Sacramento sucker, Sacramento pikeminnow, hardhead, smallmouth bass, and various sunfish. Sacramento suckers were observed below Our House Diversion Dam.

According to Gast *et al*. (2005), tributaries to the mainstem, having cooler summertime water temperatures, may provide refuge for salmonids from higher than optimum mainstem water temperatures. Oregon Creek was cooler than the mainstem, appeared to provide good habitat, and was inhabited by rainbow trout. The North Yuba River, at the confluence with the Middle Yuba River, also provides ample cool-water trout habitat. At the time of observation, water temperature in the North Yuba River at the confluence with the Middle Yuba River was 18.6°C, which is 4.5°C cooler than the Middle Yuba River water temperature (23.1 °C).

Table 7.3.4-12. Distribution of fish species relative to river mile and stream temperature observed during 2004 Middle Yuba River snorkel surveys downstream of Our House Diversion Dam.

RM (beginning at the confluence of the Middle Yuba and the North Yuba rivers)	Tributary Inflow	Middle Yuba Water Temperature (°C)	Rainbow Trout	Brown Trout	Pikeminnow Hardhead[1]	Pikeminnow	Hardhead	Suckers	Smallmouth Bass	Rainbow (Fry Lane)	Non-game (Fry Lane)
0.0			---	---	---	---	---	---	---	---	---
0.1		23.1	●	---	---	●	---	---	●	---	---
1.8	Yellowjacket Creek		---	---	---	---	---	---	---	---	---
2.6		20.4	●	---	---	●	---	●	●	---	---
4.8	Oregon Creek	21.4	---	---	---	---	---	---	●	---	---
12.6		23.7	●	---	●	●	●	●	●	---	●

Source: Gast *et al*. 2005
[1] Pikeminnow and hardhead less than 4" in length not discernible.

Gast *et al*. (2005) identified four barriers to upstream fish migration, listed in Table 7.3.4-13. Our House Diversion Dam, at RM 12.8, is the only man-made barrier (in the survey area) that currently blocks upstream fish migration. There are natural barriers at RM 0.2 and 3.2 that would only be low flow barriers to upstream migration of small fish. At RM 0.4, there is an estimated 13 foot high cascade that would be a major obstacle to upstream migration. Several very large boulders blocking the narrow bedrock channel created this barrier, and sediment has filled in upstream of the boulders forming a dam. Although large fish may be able to pass at certain flows, the height of the cascade and narrowness of the canyon is expected to at least impede passage at all flows.

Table 7.3.4-13. Location and height of migration barriers found on the Middle Yuba River from the confluence with the North Yuba River to Our House Diversion Dam.

River Mile	Barrier Height in Feet
0.2	5
0.4	13
3.2	2
12.7	Licensee's Our House Diversion Dam

Source : Gast *et al*. 2005

Recreational angling also has provided some information on fish species in New Bullards Bar and USACE's Englebright Reservoir; a list of known game species that occur within these reservoirs is presented in Table 7.3.3-14 below.

Table 7.3.3-14. Game fish species known to occur in New Bullards Bar Reservoir and USACE's Englebright Reservoir.

Family	Common Name	New Bullards Bar Reservoir	USACE's Englebright Reservoir
Salmonid	Rainbow Trout	X	X
	Brown Trout	X	X
	Kokanee	X	X
Sunfishes	Largemouth Bass	X	X
	Smallmouth Bass	X	X
	Spotted Bass	X	X
	Red Ear Sunfish	X	X
	Crappie	X	X
	Bluegill	X	X
Catfishes	Channel Catfish	X	X

Source: Fishsniffer.com 2009; CDWR 2006b

Draft Report - Instream Flow Investigations Yuba River Spring and Fall-Run Chinook Salmon and Steelhead/Rainbow Trout Spawning Habitat (USFWS 2008a). Under the Central Valley Project Improvement Act (CVPIA), the USFWS conducted instream flow investigations of anadromous salmonid adult spawning and juvenile rearing in the lower Yuba River over a 6-year period extending from 2001 through 2007. Flow-habitat relationships using the RIVER2D habitat model were developed for spring- and fall-run Chinook salmon and steelhead/rainbow trout in the lower Yuba River between USACE's Englebright Dam and the Feather River (USFWS 2008a). Habitat was modeled upstream (within the Project) and downstream (below the Project) of USACE's Daguerre Point Dam. The draft report includes study objectives, methods, results, and a discussion of the results.

NMFS Biological Opinion - Effects of USACE's Englebright and Daguerre Point dams (2007). In a Biological Opinion (BO) prepared by NMFS to evaluate the effects of USACE's Englebright and Daguerre Point dams on ESA-protected salmon, steelhead, and green sturgeon, NMFS concluded that human activities have significantly contributed to the species declines and resulted in the eventual listings of the species (NMFS 2007). Although anadromous salmonid species are able to bypass USACE's Daguerre Point Dam (sturgeon are unable to bypass the dam), USACE's Englebright Dam completely blocks access to upstream areas. Additionally,

mining activities and the introduction of non-native predatory fish also have contributed to species decline and loss of critical habitat in upstream areas (NMFS 2007).

However, the BO concluded that future operations would not likely jeopardize the continued existence of these ESA-protected species nor result in adverse modification to their critical habitat due, in part, to existing and proposed modifications to facilities and dam operations that would improve habitat for these species in the lower Yuba River, below USACE's Englebright and Daguerre Point dams. For example, some portions of the lower Yuba River, particularly above USACE's Daguerre Point Dam, provides suitable habitat for anadromous salmonids due to flow releases from USACE's Englebright Dam. The 2006 construction of the Project's Narrows 2 bypass system significantly improved habitat conditions for steelhead and Chinook salmon in the lower Yuba River (NMFS 2007).

A legal challenge of this BO is pending in the United States District Court for the Eastern District of California.

USACE's Daguerre Point Dam Fish Passage Improvement Project 2002 Fisheries Studies. The purpose of this report was to examine available data on habitat conditions, flow, passage, and spawning above and below USACE's Daguerre Point Dam to assist in the analysis of potential benefits or impacts of improved passage at the dam. The report includes a review of available data from CDFG, USFWS, Jones & Stokes Associates, Inc. (JSA), and other sources. It also incorporates field observations of river habitat conditions made by ENTRIX, Inc. (ENTRIX) in September of 2002 (ENTRIX and J. Munroe 2003).

Research and findings are categorized into the following reaches:

- The Rose Bar Reach: USACE's Englebright Dam to Parks Bar (just upstream of Highway 20 (3.99 miles);
- The Parks Bar Reach: Parks Bar to USACE's Daguerre Point Dam (6.34 miles); and
- The Daguerre Reach: USACE's Daguerre Point Dam to Marysville (6.8 miles)

The report describes channel morphology, spawning habitat suitability, historical and potential habitat use by species, water temperature, hydrology, as well as discussions regarding conceptual benefits and impacts for different fish passage alternatives.

Licensee found five sources of anecdotal information that may be relevant to fish resources within the Project Area. The contents of these anecdotal sources are described here.

Anecdotal Information

CALFED Bay-Delta Program. Within the CALFED initiative, the Ecosystem Restoration Program (ERP) works to improve and increase aquatic and terrestrial habitats and ecological functions in the Bay-Delta and associated waterbodies**.** Efforts to date include the construction of the Narrows 2 Flow Bypass on the Yuba River below USACE's Englebright Dam. The structure improves salmonid habitat in the lower Yuba River by eliminating flow and

temperature fluctuations that result from emergency and maintenance shutdowns of the Narrows 2 Powerhouse (CALFED 2009).

CDFG New Bullards Bar Reservoir Fish Surveys. CDFG has been conducting surveys of fish in old and New Bullards Bar Reservoirs since the 1950s. A 1959 survey of fish species in the old Bullards Bar reservoir found 12 species of fish including bass, crappie, sunfish, bluegill, bullhead shiners, squawfish, sucker, and carp species. No trout species were found (Central Valley Fish Hatchery 1959). A subsequent summary report for CDFG fish survey activities in the reservoirs from 1959 through 1974 identified 16 species of fish as relatively common in the reservoirs, including smallmouth and largemouth bass, black and white crappie, warmouth, green and red-ear sunfish, bluegill, brown bullhead, squawfish, sucker, carp, rainbow trout, and kokanee salmon (CDFG 1974). Brown trout and white catfish are noted as rare occurrences. Channel catfish, threadfin shad, and fathead minnow were reportedly planted in the reservoir prior to 1960, but were not captured during any surveys. Golden shiners were observed only in 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). The first documented CDFG capture of trout was reported in 1970 (CDFG 1963, 1970). Kokanee salmon were first documented during CDFG survey efforts in 1972 (CDFG 1963, 1970, 1972).

A letter to CDFG from a concerned angler indicates that the New Bullards Bar Reservoir fisheries experienced declines in smallmouth bass, trout, and kokanee salmon in the mid-1970s (French 1974). Rhodes (1983) notes that kokanee salmon numbers were low in 1978, but were improving through the early 1980s. Low stocking numbers, poor habitat conditions in the reservoir, and competition/predation from other fish species were noted as possible sources for the declines.

Recent blogs on an angling web site indicate that after several years of high quality kokanee fishing in New Bullards Bar Reservoir, the kokanee population has again declined for unknown reasons (Fish Sniffer 2009).

CDFG USACE's Englebright Reservoir Creel Surveys (CDWR 2006b). Creel surveys conducted from July 2003 through May 2004 documented 12 sport fish species in USACE's Englebright Reservoir, including spotted bass, smallmouth bass, largemouth bass, bluegill, brown trout, rainbow trout, carp, channel catfish, crappie, kokanee, sucker, yellow perch, and Sacramento pikeminnow (CDWR 2006b). In addition to the sport fish species documented in the creel surveys, it is known that since 1965 USACE's Englebright Reservoir has been stocked by CDFG with rainbow trout, kokanee salmon, lake trout, brown trout, Eagle Lake rainbow trout, brook trout, white crappie, and black crappie (CDFG 2007).

River Restoration and Fish Management. Restoration efforts have been ongoing in the Yuba River under the CVPIA's Anadromous Fish Restoration Program (AFRP) since 1996 (USFWS 2008b). Fish passage at USACE's Englebright Dam is identified as an important goal for AFRP restoration effort, although documented efforts to date have primarily targeted areas of the Yuba River downstream of the Project Area, which are discussed in Section 7.3.3.3 (USFWS 2008a, b).

CDFG's Fish Stocking Program. New Bullards Bar Reservoir has a long history of annual fish stocking activities dating back to 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). Based on actual CDFG stocking records, between 1969 and 2007 over 4.9 million kokanee salmon, nearly 1.6 million rainbow trout, over 310,000 Eagle Lake rainbow trout, 40,000 brook trout, 200 eastern brook, 200 cutthroat, Kamloop rainbow trout, and 185 spotted bass were planted in New Bullards Bar Reservoir (CDFG 1989, 2007; Attachment 7.3A).

Although not part of the Project, USACE's Englebright Dam is located on the Yuba River between Project facilities. Similar to New Bullards Bar Reservoir, CDFG stocking records indicate that fish plantings in USACE's Englebright Reservoir have taken place from 1965 through 2007 (Attachment 7.3A). During this period just over 756,000 rainbow trout, 228,320 kokanee salmon, 6,973 lake trout, nearly 28,000 brown trout, 4,000 Eagle Lake rainbow trout, 2,640 brook trout, 45 white crappie, and 80 black crappie were planted (CDFG 2007). Stocked species were primarily from the Shasta and San Joaquin hatcheries.

In accordance with new fish planting regulations, stocking of salmon and steelhead is scheduled to take place in one waterbody located within the Project Area - New Bullards Bar Reservoir (CDFG 2008b). Other common sport fisheries species in the reservoir include stocked rainbow and brown trout and kokanee salmon, as well as spotted, largemouth and smallmouth bass, crappie, sunfish, and catfish (CDFG 2002). USACE's Englebright Reservoir is not scheduled for stocking in 2008 to 2010 (CDFG 2008a, b).

Amphibians

Licensee found one source document of relevant information regarding amphibians within the Project Area. The contents of this source document, as well as anecdotal information, are described here.

Yuba County General Plan Update Background Report (2007). The presence of CRLF is addressed in the Yuba County General Plan Update Background Report. CRLF has been documented just outside the Project Area east of New Bullards Bar Reservoir near Little Oregon Creek. Critical habitat has been designated around this occurrence and includes land in the Project Area (USFWS 2006). Licensee modified the FERC approved project recreation plan to seasonally restrict access at the Moran Road area of New Bullards Bar Reservoir, in part to protect CRLF. The modification entailed closing the Moran Road gate from October 15 to May 1, and followed consultation with the Forest Service and USFWS. USFWS concurred with the Forest Service finding that the action is not likely to adversely affect CRLF as long as the mitigation measures listed in the Forest Service Decision Memo dated August 26, 2003, are implemented.

Licensee found two sources of anecdotal information that may be relevant to amphibian resources within the Project Area. The contents of these anecdotal sources are described here.

Anecdotal Information

There are CAS and MVZ museum collection or sight records within the Project Area at New Bullards Bar Reservoir for Sierra newt (vicinity of Dark Day Campground) and bullfrog (Dark

Day Cove Creek on southeast shore). In the vicinity of Log Cabin Diversion Dam on Oregon Creek, there are records for Sierra newt and FYLF (adults and subadults); FYLF also have been documented near (upstream and downstream of) Our House Diversion Dam on the Middle Yuba River. Finally, there is a 1942 record for western toad 1.2 miles south of the mouth of South Yuba River at USACE's Englebright Dam.

Aquatic Reptiles and Turtles

Licensee found no source documents of relevant information regarding reptiles or turtles associated with aquatic environments upstream within the Project Area. However, Licensee found two sources of anecdotal information, which are described below.

There are CAS and MVZ museum collection or sight records from the Project Area for WPT on the north and west sides of New Bullards Bar Reservoir, and for western terrestrial garter snake on Mill Creek near New Bullards Bar Reservoir.

Aquatic Mollusks and Snails

Licensee did not find any additional source documents or anecdotal information regarding mussels or aquatic snails in the Project Area.

Benthic Macroinvertebrates

Licensee did not find any source documents regarding BMI in the Project Area.

However, based on the source and anecdotal documents discussed in Section 7.3.3.1, a general description of the aquatic invertebrate taxa likely to occur within the Project Vicinity is possible. Again, the presence and location of a given BMI species within the Project Vicinity is largely dependant on its preference for either standing or running water. Where flowing habitats within the Project Vicinity are dominant, invertebrate groups likely to occur include Ephemeroptera (mayflies), Plecoptera (stoneflies), Tricoptera (caddisflies), Diptera (midges), Coleoptera (beetles), Megaloptera (alderflies), Hemiptera (true bugs), Hirudinea (leaches), Oligocheata (segmented worms), Turbellaria (flatworms), Nematoda (roundworms), Crustacea (scuds, crawfish), Mollusca (clams, snails), Acari (water mites), and Lepidoptera (aquatic moths). Where still water habitats within the Project Vicinity are dominant, invertebrate groups likely to occur include Ephemeroptera (Mayflies) Tricoptera (caddisflies), Diptera (midges), Coleoptera (beetles), Hemiptera (true bugs), Oligocheata (segmented worms), Hirudinea (leaches), Turbellaria (flatworms), Nematoda (roundworms), Crustacea (scuds, crawfish), Mollusca (calms, snails), Odenata (dragon and damsel flies), and Acari (water mites) (Rose *et al*. 1995).

Algae

As described in Section 7.3.3.1, algae blooms can be associated with human disturbance, particularly downstream of dams and other flow-regulated water.

Licensee is aware of algal blooms in New Bullards Bar Reservoir periodically during the summer months.

During the summer months, heavy blooms of the green alga genus *Cladophora* can occur in unspecified sections of Deer Creek, a non-Project-affected stream that is tributary to the lower Yuba River below USACE's Englebright Dam (Cohen, 2001; Shilling, 2003).

7.3.4.3 Downstream of the Project

Downstream of the Project Area, the Yuba River flows from below USACE's Daguerre Point Dam to the Feather River at Marysville. Twenty-four miles downstream, the Feather River joins the Sacramento River. USACE's Daguerre Point Dam is located 11 miles upstream from the mouth of the lower Yuba River. Two fish ladders provide passage for upstream migrant fish. A 1989 CDFG study reports that habitat conditions for spawning salmonids below USACE's Englebright Dam are improved because of better winter and spring runoff release in the summer and fall and colder water temperatures than before construction of New Bullards Bar Reservoir (CDFG 1989). Average flows in the lower Yuba River below USACE's Englebright Dam were reported to range from 340 cubic feet per second (cfs) to 4,405 cfs between 1949 and 1967, and from 1,320 cfs to 3,544 cfs between 1970 and 1977 (CDFG 1989). Extreme flow events prior to 1970 ranged from 15 cfs to 136,000 cfs (CDFG 1989).

YCWA, the South Yuba River Citizens League, Trout Unlimited, the Bay Institute and Friends of the River - along with CDFG, USFWS, NMFS, CDWR and USDOI Bureau of Reclamation (BOR), developed the comprehensive flow schedules in the Lower Yuba River Fisheries Agreement, which is part of the Yuba Accord. These flow schedules were first implemented during two one-year pilot programs in 2006 and 2007. On March 18, 2008, the SWRCB issued an order permanently adding the Yuba Accord flow schedules to YCWA's water-right permits. Continued implementation of the flow schedules specified in the Fisheries Agreement of the Yuba Accord is expected to address the flow-related major stressors including flow-dependent habitat availability, flow-related habitat complexity and diversity, and water temperatures.

This section presents relevant and reasonably available information regarding aquatic resources located downstream of the Project (*i.e.,* in the lower Yuba River from USACE's Daguerre Point Dam to the confluence with the Feather River).

<u>Fishes</u>
Licensee found two source documents with relevant information regarding fish resources downstream of the Project. The contents of these documents, as well as anecdotal information, are described here.

Draft Report - Instream Flow Investigations Yuba River Spring and Fall-run Chinook Salmon and Steelhead/Rainbow Trout Spawning Habitat (USFWS 2008a). As previously described in Section 7.3.3.2 of this Preliminary Information Package, USFWS conducted instream flow investigations of spring and fall-run Chinook salmon and steelhead/rainbow trout spawning and juvenile rearing in the lower Yuba River using the RIVER2D habitat modeling (USFWS 2008a). Habitat was modeled upstream (*i.e.,* within the Project) and downstream (*i.e.,* below the Project) of USACE's Daguerre Point Dam at locations that received the heaviest use by spawning Chinook and steelhead. The draft report includes study objectives, methods, results, and a discussion of the results.

Outmigration Monitoring (CDFG 2005). As described in Section 7.3.3.2, outmigration of fish has been monitored in the lower Yuba River using rotary screw traps, located at Hallwood Boulevard (downstream of USACE's Daguerre Point Dam and downstream of the Project) since 2001. The location of the traps is primarily intended to document the outmigration of juvenile anadromous salmonids, although the traps also collect resident fishes moving downstream within the river. A list of collected species identified during the 2004 to 2005 monitoring season as reported by CDFG (2005) is presented in the Table 7.3.4-15 below.

Table 7.3.4-15. List of species collected in the 2004 to 2005 rotary screw trap sampling below USACE's Daguerre Point Dam.

Common Name	Species
American shad	*Alosa sapidissima*
Bluegill sunfish	*Lepomis macrochirus*
Brown bullhead	*Ameiurus nebulosus*
Sacramento-San Joaquin roach	*Lavinia symmetricus symmetricus*
Chinook salmon	*Oncorhynchus tshawytscha*
Golden shiner	*Notemigonus crysoleucas*
Green sunfish	*Lepomis cyanellus*
Hardhead	*Mylopharodon conocephalus*
Largemouth bass	*Micropterus salmoides*
Mosquitofish	*Gambusia affinis*
Pacific lamprey	*Lampetra tridentatus*
Prickly sculpin	*Cottus asper*
Steelhead trout	*Oncorhynchus mykiss*
Riffle sculpin	*Cottus gulosus*
Sacramento Pikeminnow	*Ptychocheilus grandis*
Sacramento sucker	*Catostomus occidentalis*
Smallmouth bass	*Micropterus dolomieui*
Speckled dace	*Rhinichthys osculus*
Tule perch	*Hysterocarpus traski*
White catfish	*Ameiurus catus*
White crappie	*Pomoxis annularis*

Lower Yuba River Accord Environmental Impact Report/Environmental Impact Statement. An EIR/EIS was prepared in 2007 for the Yuba Accord. It analyzes environmental conditions in locations both upstream (*i.e.,* within the Project) and downstream (*i.e.,* below the Project) of USACE's Daguerre Point Dam (YCWA 1997; CDWR 2007). This EIR/EIS includes discussions of aquatic resources in the vicinity of the lower Yuba River, both within and immediately downstream of the Project Area. Special-status fish species (as defined in Section 7.3.2) identified in the EIR/EIS and likely to occur in the lower Yuba River downstream of the Project Area include fall- and late fall-run Chinook salmon,[16] hardhead, Sacramento splittail, and Sacramento-San Joaquin roach.

[16] NMFS recognizes the late-fall-run Chinook salmon in the Central Valley fall-run ESU (Moyle 2002). On April 15, 2004, NMFS published a notice in the Federal Register acknowledging establishment of a species of concern list, addition of species to the species of concern list, description of factors for identifying species of concern, and revision of the candidate species list. In this notice, NMFS announced the Central Valley Fall-run and Late Fall-run Chinook Salmon ESU change in status from a candidate species to a species of concern. In 1999, the Central Valley ESU underwent a status review after NMFS received a petition for listing. Pursuant to that review, NMFS found that the species did not warrant listing as threatened or endangered under the ESA, but sufficient concerns remained to justify addition to the candidate species list. Therefore, according to NMFS' April 15, 2004 interpretation of the ESA provisions, the Central Valley Fall-run and Late-Fall-run

Licensee found five sources of anecdotal information that may be relevant to fish resources downstream of the Project. The contents of these anecdotal sources are described here.

Anecdotal Information

Angler surveys conducted by CDFG in the Central Valley report populations of Chinook salmon, steelhead trout, rainbow trout, striped bass, American shad, white and bullhead catfish, bluegill, green sunfish, and black bass in the Feather River (Massa *et al.* 2003). These species, as well as Sacramento-San Joaquin roach, golden shiner, hardhead, mosquitofish, Pacific lamprey, prickly and riffle sculpin, Sacramento pikeminnow and sucker, largemouth and smallmouth bass, speckled dace, Tule perch, and white crappie were documented during 2004-2005 CDFG life history studies conducted in the lower Yuba River (Massa and McKibbin 2005). Native fish species reportedly occurring in the lower Yuba River include Chinook salmon, green sturgeon, hardhead, Pacific lamprey, rainbow trout, steelhead, riffle sculpin, Sacramento pikeminnow and sucker, speckled dace, and tule perch, some of which occur in lower portions of the river near the mouth.

A query of the CNDDB for special concern species within quadrangles located immediately downstream of the Project (*i.e.,* Browns Valley and Yuba City), did not reveal any confirmed occurrences of fish species of special concern (CDFG 2009c).

River Restoration and Fish Management. Since 1996, AFRP efforts in the Yuba River, downstream of the Project Area, have included fish barrier evaluation and improvements, temperature analysis, escapement studies, life history evaluations, sediment studies and fish monitoring programs (Massa 2006, 2007, 2008; USFWS 2008a, b). Additionally, AFRP restoration efforts are ongoing in the Feather River watershed located downstream of the Project. Goals of the Feather River restoration efforts (located to the north and west of the Yuba River) include species life history evaluations, water temperature and flow evaluations, and management for Chinook and steelhead, borrow pit evaluations and implementation of a gravel replenishment program (USFWS 2008a, d). Documented studies include support for an educational program called "Kids and Creeks: Restoration Ecology in Action," which began in 2000.

CDFG's Fish Stocking Program. Salmon and steelhead from the Feather River Hatchery are artificially stocked in waterbodies within numerous counties located downstream of the Project Area including 10 waterbodies in Sacramento County and one in Yuba County (CDFG 2008b).

Amphibians

Licensee found no source documents concerning amphibians in or near the Yuba River downstream of the Project. A review of museum records from the CAS and MVZ revealed only three records for this area: Sierra treefrog at a location near the Yuba Gold Fields and from southeast of USACE's Englebright Dam (1942 record); and bullfrog at a pond southeast of USACE's Englebright Dam.

Chinook salmon ESU now is a species of concern, rather than a candidate species (69 FR 19977).

Aquatic Reptiles and Turtles
Licensee found no source documents or anecdotal information concerning aquatic reptiles and turtles downstream of the Project.

Aquatic Mollusks and Snails
Licensee found no source documents regarding aquatic mollusks downstream of the Project. However, Licensee found one source of anecdotal information, which is described below.

Anecdotal Information

A query of the CNDDB within USGS topographic quadrangles located immediately downstream of the Project (*e.g.*, Browns Valley and Yuba City), did not reveal any confirmed occurrences of mollusks of special concern downstream of the Project Area (CDFG 2009c).

Benthic Macroinvertebrates
Licensee found no source documents regarding BMI downstream of the Project. Licensee found one source of anecdotal information, which is described below.

Brown and May (2000). In 2000, Brown and May reported BMI data collected during 1994-1996 from various locations throughout the western Sierra Nevada and California Central Valley. The authors reported that BMI assemblages in riffles (as well as species associated with snags) might be useful in family level bioassessments of environmental conditions in valley floor habitats. For the riffle samples, elevation was the most important factor determining BMI assemblage structure.

Algae
As described in Section 7.3.3.1 algae blooms can be associated with human disturbance, particularly downstream of dams and other flow-regulated water.

7.3.5 List of Attachments

This section includes one attachment:

- Attachment 7.3A – Fish Stocking Records

Aquatics-related CNDDB query results are included in the attachments to Section 7.4, Wildlife Resources of this Preliminary Information Package.