3.5 AQUATIC BIOLOGICAL RESOURCES

This section addresses common and sensitive aquatic biological resources that could be affected by implementation of the Meeks Bay Restoration Project. It includes a summary description of the existing conditions of Meeks Creek and the Lake Tahoe nearshore habitat in the project area that pertain to fish and other aquatic species and their aquatic habitats, and brief summaries of key or important fish species that are known to exist in the project area and the various factors affecting those species. Data reviewed in preparation of the analysis include aerial photographs of the project area; records searches of the California Natural Diversity Database (CNDDB) and the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation database; USDA Forest Service, LTBMU sensitive species lists, and the project Biological Evaluation for Sensitive Species (incorporated by reference) (CNDDB 2021; USFWS 2022; LTBMU 2022); and recent biological resources surveys and assessments conducted in the project area.

Terrestrial biological resources (including amphibians) and hydrology and water quality are described and analyzed separately in Sections 3.4 and 3.6, respectively.

3.5.1 Regulatory Setting

See Section 3.4, "Terrestrial Biological Resources," for a discussion of the federal Endangered Species Act, California Endangered Species Action, and California Fish and Game Code fully protected species and Section 3.6, "Hydrology and Water Quality," for a discussion of Section 404 of the Clean Water Act.

FEDERAL

Nonindigenous Aquatic Nuisance Prevention and Control Act and National Invasive Species Act

As defined in the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990, as amended (P.L. 106-580, Dec. 29, 2000), aquatic nuisance species are nonindigenous species that threatened the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters. The NANPCA further states that "when environmental conditions are favorable, non-indigenous species become established, may compete with or prey upon native species of plants, fish, and wildlife, and may carry diseases or parasites that affect native species, and may disrupt the aquatic environment and economy of affected nearshore environments." The intent of the NANPCA is to prevent the unintentional introduction and dispersal of nonindigenous species into waters of the United States, coordinate federally conducted, funded or authorize research, prevention, control, information dissemination and other activities regarding zebra mussel and other aquatic nuisance species. In 1996, the National Invasive Species Act (NISA) amended NANPCA of 1990 to address ballast water from ships that enter the U.S.

While the NANPCA nor the NISA do not explicitly affect state authority, an Executive Order on Invasive Species (1999) extended federal efforts and, in addition to a number of federal laws, called for the formation of a National Aquatic Nuisance Species Task Force (ANSTF) (co-chaired by the USFWS and the National Oceanic and Atmospheric Administration [NOAA]) to coordinate the growing number of federal laws and coordinate with states in developing aquatic nuisance species management plans. The *Lake Tahoe Region Aquatic Invasive Species Management Plan: California-Nevada* (TRPA 2014) was approved by the ANSTF and aims to inform management, policy, and funding decisions related to aquatic invasive species (AIS) in the region by enhancing coordination of regional, bi-state, state, and federal programs and to guide implementation of AIS prevention, monitoring, control, education, and research in the Lake Tahoe Region (TRPA 2014).

USDA Forest Service, Lake Tahoe Basin Management Unit

The USDA Forest Service LTBMU manages nearly 80 percent of lands within the Tahoe Basin. With the exception of the portion of the project area within the California Department of Transportation (Caltrans) right-of-way, the project would be implemented on USDA Forest Service lands, and biological resources there could be affected by project implementation.

Management of the USDA Forest Service lands adjacent to or near the study area is guided by the LTBMU Forest Plan (USFS 2016). The Forest Plan includes management direction (36 CFR 219.3, 1982), and explanatory material. The management direction is the Forest Plan content that must be followed in planning and implementing management activities and is also referred to as the Plan components. More specific standards and guidelines for biological and other resources are described in detail in the LTBMU Forest Plan (USDA Forest Service 2016). In addition, the LTBMU maintains a list of plants and animals designated as sensitive by the Regional Forester of USFS Region 5 that should be addressed when a project may affect LTBMU land. USDA Forest Service sensitive fish species with the potential to occur in the project area are described below and a full analysis of potential project effects on these species is provided in the Biological Evaluation.

TAHOE REGIONAL PLANNING AGENCY

Thresholds

TRPA thresholds have been established for water quality, air quality, scenic resources, soil conservation, fish, vegetation, wildlife, noise, and recreation. TRPA cannot approve projects that would cause a significant adverse effect on a threshold area without appropriate mitigation. Every 5 years, TRPA conducts a comprehensive evaluation to determine whether each threshold is being achieved and/or maintained, creates specific recommendations to address problem areas, and directs general planning efforts for the next 5-year period. The most recent threshold evaluation was completed in 2019. The adopted TRPA thresholds for aquatic resources are described below (TRPA 2016).

Water Quality – Aquatic Invasive Species

The TRPA aquatic invasive species (AIS) is a management standard under the Water Quality threshold that states that TRPA must "[p]revent the introduction of new aquatic invasive species into the region's waters and reduce the abundance and distribution of known aquatic invasive species" and "[a]bate harmful ecological, economic, social and public health impacts resulting from aquatic invasive species." Other management standards under the Water Quality threshold are addressed in Section 3.6, "Hydrology and Water Quality."

The Lake Tahoe AIS Program is implemented by 40 public and private partner organizations, including federal, state, and local jurisdictions, research partners, public utility districts, and private marinas. The TRPA and the Tahoe Resource Conservation District (TRCD) lead the program in collaboration with the public and private partners. The program's mission is to prevent, detect, and control aquatic invasive species in the region so that future generations can enjoy Lake Tahoe.

Fisheries

The goal of TRPA threshold standards for fisheries resources is to improve aquatic habitat important for the growth, reproduction, and perpetuation of existing and threatened fish resources in the Lake Tahoe Basin. TRPA has adopted four indicator reporting categories in the fisheries threshold category, three numerical standards for stream habitat condition, and one management standard for instream flow and Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) (LCT).

Fisheries – Lake Habitat

The lake habitat threshold standard is a management standard with a numeric target to achieve the equivalent of 5,948 acres of "prime" fish habitat within the nearshore of Lake Tahoe, defined by substrate size. Prime fish habitat includes spawning habitat and feed and cover habitat. The indicator for lake habitat showed that the status is "at or somewhat better" than the adopted management targets with an "unknown" trend. Analysis of remotely sensed data collected in August 2010 and 2015 estimated that there are about 6,135 acres of "prime" fish habitat in Lake Tahoe's nearshore/littoral zone (O'Neil-Dunne et al. 2016), suggesting that TRPA is meeting the adopted management target of 5,948 acres.

Fisheries – Stream Habitat

The stream habitat threshold standard is a management standard with a numeric target to maintain 75 miles of excellent, 105 miles of good, and 38 miles of marginal stream habitat as indicated by the Stream Habitat Quality

Overlay map, amended May 1997, based upon the re-rated stream scores set forth in Appendix C-1 of the 1996 Evaluation Report. Analysis of remotely sensed data estimated that TRPA is meeting the adopted management target for excellent stream habitat but is not meeting the targets for good or marginal stream habitat.

Tahoe Regional Plan

The following goals and policies of the Tahoe Regional Plan (TRPA 2012) relate to protection of aquatic species potentially affected by the project:

GOAL FI-1: seeks to improve aquatic habitat essential for the growth, reproduction, and perpetuation of existing and threatened fish resources in the Lake Tahoe Region.

- Policy FI-1.2: Unnatural blockages and other impediments to fish movement shall be prohibited and removed, wherever appropriate.
- Policy FI-1.4: Standards for boating activity shall be established for the shallow zone of Lake Tahoe.
- Policy FI-1.5: Habitat improvement projects are acceptable practices in streams and lakes.
- Policy FI-1.9: Prohibit the release of nonnative aquatic invasive species in the region in cooperation with public and private entities. Control or eradicate existing populations of these species and take measures to prevent accidental or intentional release of such species.

Code of Ordinances

Chapter 63, “Fish Resources,” of the TRPA Code of Ordinances (TRPA Code), includes provisions to ensure the protection of fish habitat and to provide for the enhancement of degraded habitat. The chapter applies to all projects and activities that could interfere with the health of fish populations in Lake Tahoe, its tributaries, and other lakes in the region. Provisions for the protection or enhancement of fish habitat shall be included for all new uses, projects and activities within fish habitat as identified by TRPA fish habitat maps or a qualified biologist. Fish habitat consists of a complex set of elements, such as spawning and nursery areas, food supply, and escape cover (TRPA 2021a).

Lake habitat is protected in Chapter 63.3.1. Projects and activities conducted in the shorezone may be prohibited, limited, or otherwise regulated in prime habitat areas, or in areas and/or at times found by TRPA to be vulnerable or critical to the needs of fish (TRPA 2021a).

Chapter 63.4, “Aquatic Invasive Species,” includes provisions to prevent the introduction and spread of AIS. Section 63.4.1 prohibits the transport or introduction of AIS into the Tahoe Region; the launching of any watercraft or landing of any seaplane contaminated with AIS into the waters of the region; the launching, or attempting to launch, of any motorized watercraft into the waters of the region without an inspection by TRPA or its designee, to detect the presence, and prevent the introduction of, AIS (non-motorized watercraft and seaplanes are subject to inspection and are included in this provision if determined necessary by TRPA or its designee); the provision of inaccurate or false information to TRPA or persons designated to conduct inspections; and the alteration, modification or unauthorized use of any inspection seal or other device used by TRPA or its designee to indicate that a watercraft or seaplane last entered the waters of the Tahoe Region (TRPA 2021a).

STATE

Section 2301 – Dreissenid Mussel Prevention

California Fish and Game Code Section 2301 allows designated staff (and other authorized state authorities including California Department of Pesticide Regulation [CADPR] peace officers and California Department of Food and Agriculture [CDFA]) to inspect, impound, or quarantine any conveyance (e.g., watercraft) that may carry dreissenid mussels (i.e., quagga and zebra mussels [*Dreissena bugensis* and *D. polymorpha*, respectively]). CDFA is also the lead agency for regulatory activities associated with noxious weeds (CAC Title 3, Sec. 3400).

3.5.2 Environmental Setting

The project area encompasses the mouth of Meeks Creek as it enters Meeks Bay along the west shore of Lake Tahoe in El Dorado County, California. The project area extends westward along the creek channel to 50 feet upstream of the SR 89 bridge. To the east, the project area includes the Lake Tahoe shoreline both to the north and south of the mouth of Meeks Creek. The project is located at the historic wetland, lagoon, and barrier beach of the Meeks Creek watershed. Currently, the lagoon now contains the Meeks Bay Marina. The project area includes approximately 4.9 acres of riverine and stream environment zone and 18.8 acres of open water/lacustrine, which includes nearshore areas of Lake Tahoe and the historic lagoon (now marina). See Section 3.4, "Terrestrial Biological Resources," for additional details regarding land cover types and jurisdictional wetlands (aquatic habitat types).

AQUATIC HABITATS

Meeks Creek

The 11.2-kilometer-long Meeks Creek watershed originates in Desolation Wilderness and covers roughly 2,250 hectares. The upper watershed consists of a network of glacially formed lakes joined by short sections of creek. The middle reaches are characterized by high gradient riffle-pool complexes and small waterfalls that transition to a lower gradient meandering meadow channel as the creek enters a valley floor. The lower portion of Meeks Creek is predominantly low gradient meadow, wetland and lagoon and barrier beach habitat (Swanson H+G 2006).

The hydrology of the watershed is driven by seasonal precipitation patterns (predominantly winter snow and associated runoff). Peak flow coincides with snowmelt, typically from April-June, and flows are lowest during summer. Warm rainstorms can result in flashy, high-discharge events, particularly in spring when snowmelt is accelerated (Swanson H+G 2006).

The reach of Meeks Creek within the project area is characterized by low gradient, modified habitat. The aquatic habitat in the western portion of the project area includes shallow meadow riffles upstream of the SR 89 bridge. Continuing downstream, the channel becomes incised, widens, and deepens, becoming run then pool and eventually a human-made marina as it flows eastward toward the mouth, which is connected to Lake Tahoe via a cut channel with sheet piles bulkheads.

The natural configuration of the lagoon has been manipulated to build the marina. Historical photos show the shoreline of the lagoon was once a complex landform and supported marsh and wetland vegetation communities. The lagoon was deepened when the marina was constructed to allow boat access. Concurrently, the marina shoreline was graded into a rectangular shape and hardened with boulder banks; there is little to no diversity in bank vegetation under current conditions because the steep slopes force an immediate transition from open water to upland communities. Sheet piling at the mouth of Meeks Creek creates a permanent opening through the barrier beach to allow access to the marina. Consequently, the mouth has remained open and has not changed position since the marina was constructed, altering natural processes associated with seasonal beach barrier closures and openings. The marina has been closed since 2014 and the floating pier system has already been removed.

Dominant substrates transition from cobble and gravel to silt to sand downstream through the site from west to east. Dominant riparian vegetation includes willow (*Salix* spp), mountain alder (*Alnus incana*), Jefferey pine (*Pinus jefferyi*), lodgepole pine (*P. contorta*), annual and perennial grasses, and deciduous shrubs (Swanson H+G 2006). Human-made features including box culverts, dredged lagoon channels, sheet pile bulkheads, placement of fill, paved roads, and campgrounds characterize much of the aquatic and riparian habitat within the project area.

Lagoons often function as highly productive habitats, incorporating elements of both riverine and lacustrine ecosystems. They offer potentially valuable rearing habitat for juvenile fish, including native minnows. However, the disturbances present in the Meeks Creek lagoon (conversion to a marina) contribute to a reduction in habitat quality and low aquatic biological function, due to habitat modification and simplification (e.g., relatively deep, homogenous conditions lacking complexity and natural processes, static connection between lagoon marina and Lake Tahoe) relative to creek mouth and wetland habitats elsewhere in the Tahoe Basin, such as the Upper Truckee River Marsh.

Nearshore

Although TRPA defines the nearshore specifically based on depth and distance from the shoreline, no consistent definition of a nearshore fish habitat is readily available (Heyvaert et al. 2013). The generic definition of the nearshore zone or nearshore habitat as it relates to aquatic species is to consider it equivalent to the littoral zone. A littoral zone, as it is typically used in scientific literature, is defined as the shallow area of a lake that supports macrophyte (i.e., aquatic plant) growth with "the deepest extent of the littoral zone considered that depth at which one percent or less of surface light penetrates to the bottom sediments (i.e., photic zone)" (Heyvaert et al. 2013). Due to Lake Tahoe's extreme water clarity, the 1-percent light level is very deep. Conditions in the nearshore fluctuate with precipitation, wind, and lake levels.

Nearshore habitat provides rich spawning, nursery, and rearing habitat for native fish species and is the location of the lake where highest fish densities are found. This narrow strip of lake also receives the greatest concentration of human activity, which includes intense recreation, commercial interests, and private development (Allen and Reuter 1996). Over the past 50 years, a large increase in human population within the Tahoe Basin and a concomitant increase in shoreline development and alterations have occurred.

TRPA has established regulations for shorezone structures and the activities associated with them. TRPA, in coordination with CDFW and the Tahoe Environmental Research Center, also has defined prime fish habitat locations around the lake. Prime habitat maps were originally adopted in 1984 to classify the amount of habitat available to nearshore fish. Since then, the maps have been updated several times. Nearshore areas within the project area have not been defined as prime fish habitat.

TRPA classifies nearshore habitat into three types based primarily on substrate size and characteristics, including (1) marginal habitats that correspond to nearshore areas dominated with sand and silt substrates, (2) feed and cover habitats that are areas dominated with cobble and boulder substrates, and (3) spawning habitats that are limited to areas of gravel (Byron et al. 1989, TRPA 1996). Naturally occurring cobble/boulder and gravel habitats (i.e., "spawning" and "feed and cover") are considered excellent or prime habitat and have been used to judge compliance with the adopted lake threshold standard, which is a no net loss standard (i.e., TRPA's goal is to prevent any loss of prime fish habitat). Nearshore areas within the project area have been defined as mostly marginal with smaller areas of feed and cover. No spawning habitat has been identified. Definitions for these two habitat classifications are provided below.

Feed and Cover

Larger rocky substrates (e.g., cobble, boulder) represent feed and cover habitats and are used by fish as foraging habitat and to provide refuge from predation (TRPA 2016). Overhanging riparian vegetation is also important for providing shade to minimize rapid fluxes in stream and lake temperatures. In addition, some species of larval and postlarval fish often use shallow, sandy portions of the shorezone because high water temperatures provide for optimal growth. The nearshore area within the project analysis area includes portions of feed and cover habitat.

Marginal

Marginal habitats are dominated by sand and silt substrates interspersed with occasional willow thickets that establish during low lake levels (TRPA 2016). When the TRPA Prime Fish Habitat maps were originally produced in 1984, shoreline areas that consisted of sand and silt substrates (less than 2 millimeters in diameter) were designated as marginal habitat. Although that terminology is still used today the term "marginal" habitat may be misleading because it implies that this habitat is of poor quality to fish. However, Beauchamp et al. (1990, 1991) found that these substrates provided important nursery habitat for the underyearling littoral fish. Furthermore, this type of habitat is used for spawning by Lahontan Lake tui chub (*Siphateles bicolor [pectinifer* and *obesa*]). Marginal habitats are characterized by a predominance of sand and silt substrates that often are interspersed with vegetation. The nearshore area within the project analysis area includes portions of marginal habitat.

Aquatic Invasive Plants

There are two known species of nonindigenous aquatic plants in Lake Tahoe: Eurasian watermilfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*). These species adversely affect recreational activities, navigation, and ecosystem dynamics. Eurasian watermilfoil is known to occur in Meeks Bay and has been targeted for removal efforts in recent years using hand-pulling and bottom barriers. Despite these efforts, fragments are still able to enter Meeks Bay from Lake Tahoe proper, resulting in potential re-spread. Though temporarily closed in 2015 (including removal of docks and supporting infrastructure), the Meeks Bay Marina is a partially enclosed structure that reduces water circulation, resulting in elevated water temperatures and poor water quality from a lack of mixing with open water. Additionally, the growth and subsequent senescence of rooted aquatic plants also act as a "pump" to move nutrients from the sediments to the overlying water column where these nutrients are further available for algae growth. These characteristics create optimal habitat for invasive aquatic organisms to thrive. When boats visited or launched from the marina, they served as vector sources for the spread of aquatic invasive species to other parts of Lake Tahoe. Because most Eurasian watermilfoil populations are within marinas or other protected nearshore areas, dispersible fragments can easily be created by boat propellers or from mechanical harvesting (Wittmann and Chandra 2015). Outside of the Tahoe Keys, efforts to control populations of Eurasian watermilfoil have occurred elsewhere in Lake Tahoe, including Emerald Bay, and most recently in Taylor Creek and Tallac Creek marshes.

FISH

Eight native fish species are known to occur in the Tahoe Basin (Murphy and Knopp 2000; Moyle 2002; Dill and Cordone 1997; Schlesinger and Romsos 2000). The general abundance of the native fish community has declined considerably since the arrival of the first Euro-Americans in the Tahoe Basin in the 1840s. Several factors are believed to have contributed to the decline or extinction of native fish and the degradation of fish habitat throughout the Tahoe Basin. Logging, water diversions, grazing, commercial harvest, road building, and the introduction of non-native fish and other aquatic organisms have cumulatively contributed to the change in the Tahoe Basin's fisheries composition and degradation of fish habitat (Murphy and Knopp 2000). At present, 24 fish species occur in Lake Tahoe (Murphy and Knopp 2000; Moyle 2002; Dill and Cordone 1997; Schlesinger and Romsos 2000; USFS LTBMU, unpublished data) (Table 3.5-1).

Fish found in the segment of Meeks Creek in the project study area are identified in Table 3.5-1. Much of the watershed is dominated by non-native salmonids introduced to provide fishing opportunities for recreational anglers. The most widespread fish species in the watershed is the brook trout (*Salvelinus fontinalis*) which is well known as a generalist species that can adapt to a range of habitat conditions. The once ubiquitous LCT (*Oncorhynchus clarkii henshawi*) had been extirpated from the watershed due to over-fishing, loss of habitat, and introduction of non-native fish such as brown trout (*Salmo trutta*), brook trout, and rainbow trout (*Oncorhynchus mykiss*) (see additional discussion below); however, recovery efforts have resulted in reintroduction of LCT into several areas within the Tahoe Basin, including Lake Tahoe proper. The lower gradient segment of Meeks Creek downstream of SR 89 includes backwater areas and connection to Lake Tahoe that allow for minnows, suckers, sculpins, and adfluvial species such as rainbow trout and Kokanee salmon (*Oncorhynchus nerka*) to persist. A passage barrier occurs at the SR 89 culvert crossing that appears to be depth barrier at low flows and a velocity barrier at high flows (Swanson H+G 2006).

Table 3.5-1 Native and Introduced Fish Species Found in Lake Tahoe and Documented in the Project Study Area

Common Name	Scientific Name	Status[1]	Documented Presence in Study Area
Native			
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*	FT	—
Lahontan Redside Shiner	*Richardsonius egregious*	—	X
Lahontan Speckled Dace	*Rhinichthys osculus robustus*	—	X
Lahontan Lake Tui Chub	*Siphateles bicolor (pectinifer* and *obesa*)	SSC, FSS	X
Mountain Whitefish	*Prosopium williamsoni*	SSC	X
Paiute Sculpin	*Cottus beldingi*	—	X
Mountain Sucker	*Catostomus platyrhynchus*	—	—
Tahoe Sucker	*Catostomus tahoensis*	—	X
Introduced			
Black Crappie	*Pomoxis nigromaculatus*	—	—
Bluegill	*Lepomis macrochirus*	—	—
Brook Trout	*Salvelinus fontinalis*	—	X
Brown Bullhead	*Ameiurus nebulosus*	—	—
Black Bullhead	*Ameiurus melas*	—	—
Brown Trout	*Salmo trutta*	—	X
Common Carp	*Cyprinus carpio*	—	—
Goldfish	*Carassius auratus*	—	—
Golden Shiner	*Notemigonus crysoleucas*	—	—
Green Sunfish	*Lepomis cyanellus*	—	—
Kokanee (Sockeye Salmon)	*Oncorhynchus nerka*	—	X
Lake Trout (Mackinaw)	*Salvelinus namaycush*	—	—
Largemouth Bass	*Micropterus salmoides*	—	—
Western Mosquitofish	*Gambusia affinis*	—	—
Rainbow Trout	*Oncorhynchus mykiss*	—	X
Smallmouth Bass	*Micropterus dolomieu*	—	—

[1] Status Codes:

FT = federally listed as threatened
FSS = Forest Service sensitive
SSC = California Department of Fish and Wildlife Species of Special Concern
— = no special-status designation
X = present
— = not present

Sources: Moyle 2002; Dill and Cordone 1997; Schlesinger and Romsos 2000; Swanson H+G 2006 citing unpublished USFS LTBMU data; compiled by Environmental Science Associates 2021.

Special-Status Fish Species

Special-status fish species include LCT, mountain whitefish, and Lahontan Lake tui chub; each are discussed below.

Lahontan Cutthroat Trout (*Oncorhynchus clarki henshawi*)

Lahontan cutthroat trout is federally listed as a threatened species. It historically occupied large freshwater and alkaline lakes, small mountain streams and lakes, small tributary streams, and major rivers of the Lahontan Basin of northern Nevada, eastern California, and southern Oregon, including the Truckee, Carson, Walker, Susan, Humboldt, Quinn, Summit Lake/Black Rock Desert, and Coyote Lake watersheds. Within the LTBMU, LCT currently occupy the Upper Truckee River, Lake Tahoe, and Fallen Leaf Lake. Occurrences within the Meeks Creek watershed have not been reported; however, reintroduction efforts in Lake Tahoe demonstrate that this species has access and could be present.

LCT spawn from April through July, depending upon stream flow, elevation, and water temperature. LCT are obligatory stream spawners, sometimes migrating large distances to find adequate spawning areas. Distance traveled to spawning sites varies with stream size and strain of LCT (strain refers to locally adapted populations in a particular area or environment). Populations in Pyramid and Winnemucca Lakes migrated as far as 160 kilometers (km) (100 miles (mi)) up the Truckee River into Lake Tahoe and its tributary streams.

Optimal stream habitat is characterized by clear, cold water with silt-free substrate and a 1:1 pool-riffle ratio. Streams should have a variety of habitats including areas with slow deep water, abundant instream cover (i.e., large woody debris, boulders, undercut banks), and relatively stable streamflow and temperature regimes. Streambanks should be well vegetated to provide cover, shade, and bank stabilization. As described above, the relatively short segment of Meeks Creek in the project area (upstream of the SR 89 bridge) possesses some of these attributes.

Mountain Whitefish (*Prosopium williamsoni*)

Mountain whitefish is a CDFW Species of Special Concern. They are silvery, large-scaled salmonids, a small ventral mouth, a short dorsal fin, a cylindrical body and a forked tail. The body is silvery and olive green to dusky on the back, and scales on the back are often outlined in dark pigment. In Lake Tahoe, they consume snails, a variety of insect larvae, crayfish, and amphipods. Most feeding takes place at dusk or after dark.

Mountain whitefish spawn from October through early December at water temperatures of 1– 11°C (usually 2–6°C). From lakes, whitefish migrate into tributaries to spawn, but some lake spawning may take place in shallow waters as well. Spawning migration is often associated with a fairly rapid drop in water temperature.

Mountain whitefish in California inhabit clear, cold streams and rivers at elevations of 1,400–2,300 m. While they are known to occur in a few natural lakes (e.g., Tahoe), there are few records from reservoirs. In streams, they are generally associated with large pools (over a meter in depth). In lakes, they typically live close to the bottom in fairly deep water, although they will move into shallows during spawning season. Spawning takes place in riffles where depths are greater than 75 cm and substrates are coarse gravel, cobble, and rocks less than 50 cm in diameter. Because of their low tolerance for high water temperatures and poor water quality, they also are a good indicator of 'health' of the Carson, Walker, and Truckee rivers, as well as of Lake Tahoe and other natural lakes (CDFW 2010b). Mountain whitefish have been documented in Meeks Creek (up and downstream of the SR 89 bridge) and the lagoon.

Lahontan Lake Tui Chub (*Siphateles bicolor pectinifer*)

Lahontan Lake tui chub is a Forest Service sensitive species and CDFW Species of Special Concern that can reach lengths of 35 to 41 cm FL. Lahontan Lake tui chub feed mostly on zooplankton, especially cladocerans and copepods, but also consume benthic insects such as chironomid larvae, annelid worms, and winged insects such as ants and beetles. They are primarily mid-water feeders, with gill-raker structure adapted to feeding on plankton. In Lake Tahoe, spawning apparently occurs at night during May and June and possibly later. They are probably serial spawners, capable of reproducing several times during a season. Reproductive adults spawn in near-shore shallow areas over beds of aquatic vegetation and found fertilized eggs adhering to the aquatic vegetation (CDFW 2010a). Lahontan Lake tui chub have been documented in the Meeks Creek lagoon.

Common Native Species

Native minnows, suckers, sculpin, and trout are found in the Meeks Creek and in Lake Tahoe (Swanson H+G 2006 citing unpublished USFS LTBMU data). These native nongame species are important to the function of the stream ecosystem. Juveniles and smaller individuals may be important prey for larger trout. Some of these species have special management status and a high probability of occurrence in the study area based on existing habitat conditions (Table 3.5-2).

Table 3.5-2 Life History of Native Fishes of the Tahoe Basin and Potential for Occurrence in Project Area

Common Name	Scientific Name	Status[1]	Potential for Occurrence	Migration	Spawning	Incubation	Habitat Preference - Fry	Habitat Preference - Juvenile	Habitat Preference - Adults
Minnows									
Lahontan Speckled Dace	*Rhinichthys osculus robustus*		High	May - June	June - July	6 days	Warm shallow waters, between cobbles w/interstitial space	Warm shallows near large rocks	Pools with abundant cover (rocks, vegetation)
Lahontan Redside	*Richardsonius egregius*		High		May - August	3 to 6 days	Along stream margins or in backwater areas	Along stream margins or in backwater areas	High velocity water at the heads of pools
Lahontan Lake Tui Chub	*Gila bicolor pectinifer*	CSC/FSS	High		April - July	3 to 6 days	Near shore sandy bottoms or in mouths of streams with dense vegetation	Near shore sandy bottoms with dense vegetation	Near shore sandy bottoms with dense vegetation
Lahontan Stream Tui Chub	*Gila bicolor obesa*		High		April - July	3 to 6 days	Sandy bottoms or in mouths of streams with dense vegetation	Sandy bottoms with dense vegetation	Sandy bottoms with dense vegetation
Suckers									
Tahoe Sucker	*Catostomus tahoensis*		High	April - May	March – June	3 to 6 days	Gravel riffles with a few large rocks	Shallow areas w/slow currents	Pools and runs
Salmonids									
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*	FT/TRPA	Low	April to May	April - July	6 to 8 weeks	Stream margins with shallow water, low flows	Lake dwelling	Lake dwelling
Mountain Whitefish	*Prosopium williamsoni*		Medium	unknown	October - December	6 to 10 weeks	Shallow backwaters	Rivers and creeks and lake bottom habitats in upper portions of the lake	Benthic habitats in larger rivers and in lakes
Sculpins									
Paiute Sculpin	*Cottus beldingi*		High		May - August, peaks May through July		Gravel bottoms, crevices under rocks	Stream margins, lake margins (algae beds)	Streams (gravel substrate)

[1] Special Status Codes:
FT = Federal Threatened
FSS = Forest Service Sensitive
CSC = California Species of Concern
TRPA = TRPA Threshold Special-Status Species

Sources: Environmental Science Associates 2021, Moyle 2002

Non-native Species

A variety of non-native warmwater game fish species were illegally introduced in the mid-1970s to late- 1970s and again in the late-1980s (Reuter and Miller 1999). More recently, in the Tahoe Keys, Smallmouth Bass (*Micropterus dolomieu*) were discovered in 2011 and Common Carp (*Cyprinus carpio*) were found in 2012 (Wittmann and Chandra

2015). Additionally, warmwater nongame fish species, including Golden Shiner (*Notemigonus crysoleucas*) and Western Mosquitofish (*Gambusia affinis*), also are found in the lake.

The most common non-native warmwater species in Lake Tahoe generally are Largemouth Bass and Bluegill (*Lepomis macrochirus*). Control efforts have been implemented to reduce non-native warmwater fish species, but generally they continue to persist (Wittmann and Chandra 2015). Non-native warmwater fishes primarily occur in the Tahoe Keys lagoons; however, snorkel surveys show satellite populations of Bluegill and Largemouth Bass occur in other areas of the lake (Chandra et al. 2009, Kamerath et al. 2008). The extent of warmwater fishes in areas outside of the Tahoe Keys remains unclear, but research suggests suitable habitat has increased due to warming water temperatures and the expansion of aquatic weed beds (Kamerath et al. 2008; Chandra et al. 2009; Ngai et al. 2013). Although suitable spawning habitat for warmwater fish is available in a number of areas around the lake, the south shore provides the most overall suitable spawning habitat followed by the east shore, north shore, and west shore (Chandra et al. 2009).

Non-native warmwater fish feed on a variety of food types. Top predators such as bass feed on native minnows (family Cyprinidae) and trout. Bass also feed on juvenile tui chub when they are rearing in nearshore areas (Moyle 2002). Brown bullhead are bottom feeders that feed on mollusks, insects, leeches, crustaceans, fish and fish eggs (USFS 2017). Common carp also scavenge bottom sediments, grubbing for zooplankton, crayfish and benthic worms. The diet of black crappie consists of zooplankton, insects, larvae, and small fish (USFS 2017). The diet of bluegill and golden shiner overlaps with native fish species, and they feed primarily on mollusks, plant material, and invertebrates (Chandra et al. 2009). Western mosquitofish also compete with native species for food and are wide spectrum omnivores.

As discussed above, in Meeks Creek, non-native brook trout and brown trout occur in Meeks Creek (up and downstream of the SR 89 bridge), in the project area. In the lower and middle reaches, rainbow trout and Kokanee salmon are present and likely utilize Meeks Creek for their adfluvial (migrating between rivers and streams) spawning behavior; however, Kokanee salmon have not been documented above the SR 89 bridge. Other non-native fish species may also be present; however, recent survey data are lacking.

AQUATIC BENTHIC MACROINVERTEBRATES

Aquatic Benthic Macroinvertebrates (BMI) are common inhabitants of the aquatic environment. Insects are the main types present in streams, and commonly include mayflies, stoneflies, caddisflies, and true flies. Non-insect macroinvertebrates include snails, leeches, worms, and scuds, which tend to be more common in aquatic environments with slower moving water and with increased organic materials present (e.g., aquatic vegetation, fine sediments). Aquatic BMI are central to the proper ecological functioning of aquatic environments. They consume decomposing organic matter (e.g., detritus, wood, and leaf debris) and attached algae, and in turn become an important food resource to fish and birds. In addition to their role in the food web, aquatic BMI have varying degrees of ability to withstand environmental degradation; thus, they may be used as indicators of water quality and habitat condition. For example, sediments from erosion and/or pollutants from runoff may decrease the variety of BMI that are able to survive, which may indicate a degradation of biological health. Tolerance/intolerance measures are specific metrics that reflect the relative sensitivity of the community (group of taxa) to aquatic disturbances. Although the taxa used are usually pollutant tolerant or intolerant, they are not specific to the type of stressor. For example, these metric values typically also vary with increasing fine particulate organic matter and sedimentation.

Native aquatic BMI have received special attention in the Tahoe Basin due to marked declines throughout North America. The western pearlshell mussel (*Margaritifera falcata*) is known to be a highly sensitive indicator species (Nedeau, Smith, and Stone 2005) and is known to occur within the lower reaches of the Upper Truckee River (California Tahoe Conservancy 2007); however, there are no known records of occurrences in the Meeks Creek watershed. Further, the soft, fine, organic-rich sediments in the Meeks Creek lagoon/marina do not provide suitable habitat conditions for the mussel.

The Great Basin rams-horn (*Helisoma newberryi*) is a USDA Forest Service sensitive species that is known to occur in Lake Tahoe. These snails utilize areas that have well oxygenated but soft substrate and clear, cold, slowly flowing water in larger lakes and spring-fed streams. Again, the organic-rich sediments in the Meeks Creek lagoon/marina do not provide suitable habitat conditions for the rams-horn; however, the species could be present in other portions of the project area where suitable conditions may exist (i.e., nearshore areas).

The Lake Tahoe benthic stonefly (*Capnia lacustra*) is a USFWS species of concern and is ranked as a species of concern by the Nevada Natural Heritage Program. This species is known to occur in Lake Tahoe at depths of 95 to 400 feet. Meeks Creek lagoon/marina and the adjacent Lake Tahoe shorezone do not provide suitable habitat conditions for the Lake Tahoe benthic stonefly.

Non-native Species

Asian clams (*Corbicula fluminea*) were first discovered along Lake Tahoe's south shore in 2002. Since the initial discovery, these non-native clams have proliferated along the southeast portion of the Lake from Glenbrook to Emerald Bay, reaching densities up to 6000 clams per square meter in some locations. Asian clams are known to adversely affect native invertebrate communities, phytoplankton assemblages, benthic habitats, and nutrient cycling. In order to minimize these impacts and prevent the establishment of new populations, scientists, natural resource managers, and community stakeholders conducted numerous studies in Lake Tahoe to determine if a safe and effective treatment method could be implemented (UC Davis TERC 2021). Asian clams reproduce at very high rates, on the order of nearly 70,000 juveniles per adult (Aldridge and McMahon 1978). Upon release, juveniles (shell length<0.5 mm) are capable of attaching to sediment, filamentous algae, debris, or avian species for further spread (summarized in Sousa et al. 2008 and Prezant and Chalermwat). Attachment occurs using a mucilaginous byssal thread (Kramer-Wilt 2008) that is lost at adulthood; however, a mucilagenous dragline is maintained that also facilitate travel in the water column via currents (Rosa et al. 2012).

With funding from multiple agencies, Tahoe Environmental Research Center (University of California at Davis) researchers explored various types of treatment and found covering clams with EDPM rubber pond liner anchored to the lake bottom to be the most efficient method for controlling new clam populations. These bottom barriers cut off clam access to dissolved oxygen in the water column. Prolonged deprivation of dissolved oxygen resulted in 100% mortality under the barrier in a matter of months. This technology was used to treat a satellite population of Asian clams found at Sand Harbor State Park along Lake Tahoe's northeast shore. There are currently no know Asian clam infestations in the project area.

AQUATIC PLANTS

Aquatic plants provide important structure and function in aquatic ecosystems and have major effects on productivity and biogeochemical cycles in freshwater (Carpenter and Lodge 1986). In particular, nutrient cycling, light availability, temperature, water flow, and substrate. Rooted aquatic plants are the interface between sediment nutrients and overlying water column nutrients that are subsequently available for phytoplankton, hence invertebrates and fish that occupy the food chain. As plants grow, they pull nutrients from the sediment for growth and release these nutrients back to the water column upon senescence (plant death). Their effects on light availability are more readily observed for species that grow either rooted in the sediment with a densely branched canopy across the water surface or in species that are strictly floating and similarly cover the entire water surface. Both growth forms result in greatly diminished light availability with depth. This dense growth pattern can also disrupt wind-mixing patterns, potentially resulting in very high surface water temperatures that can be harmful to other aquatic taxa. High water temperatures also diminish the ability for atmospheric oxygen to dissolve in water to support other aquatic taxa. Dense growth of rooted aquatic plants can also reduce water flow and increase the deposition of fine sediments that may be less beneficial to some aquatic organisms that require coarser sediments to support certain life stages.

At least 15 species of submersed aquatic plants (including macroalgae) are known to occur within Lake Tahoe (TRPA 2014, Singer 2019, S. Jones pers. comm.). A lake-wide survey conducted in 2018 identified five species associated with Meeks Bay (S. Jones pers. comm.). Native aquatic plants reported from that survey included *Chara* spp. (a macroalgae), common bladderwort, elodea, northern milfoil, and aquatic mosses. The only non-native species observed was Eurasian watermilfoil. Elodea and Eurasian watermilfoil were estimated to have the greatest density.

Eurasian watermilfoil (*Myriophyllum spicatum*) is a highly invasive submersed aquatic plant that displaces other native plant species, disrupts navigation and recreation, and impairs water quality. The plant is a CDFA ranked C plant meaning it is a pest of known economic or environmental detriment that is widespread in CA. Eurasian watermilfoil readily spreads by plant fragments that are transported by waves or watercraft and become established in other areas. Curlyleaf pondweed (*Potamogeton crispus*) is another non-native aquatic plant known to occur in Lake Tahoe, particularly the Tahoe Keys Lagoons (TKPOA 2020), but has not been reported in Meeks Bay.

Since the 2018 survey of Meeks Bay, targeted efforts by the LTBMU and their partners have been implemented to manage Eurasian watermilfoil using hand-pulling and bottom barriers (https://tahoercd.org/our-work/aquatic-invasive-species/tahoe-ais-control-monitoring/). Prior to implementing this stream restoration project, TRPA and the LTBMU plan to survey and treat invasive species if they are found in the lagoon.

3.5.3 Environmental Impacts and Mitigation Measures

METHODOLOGY

The impact analysis for aquatic resources examines effects of each alternative in both the short term and the long term. Short-term effects could occur over hours, days, or weeks during the active construction phase Long-term effects are the result of changes to the creek channel, lagoon, nearshore, and associated riparian corridor and include changes to habitat conditions over a period of time after construction has been completed.

Information related to the study area and vicinity, and professional experience on similar projects has been referenced and incorporated into the analysis of the river system history, existing condition, likely future conditions, and conditions expected under each action alternative. The impact analysis for fisheries and aquatic resources incorporates information and analysis provided in other analyses in Section 3.6, “Hydrology and Water Quality.” Significance of a potential impact to aquatic species was evaluated based on anticipated effects on population levels, survival rates, distribution, and habitat use.

THRESHOLDS OF SIGNIFICANCE

The thresholds of significance were developed in consideration of the State CEQA Guidelines, TRPA Thresholds, TRPA Initial Environmental Checklist, LTBMU Forest Plan, and other applicable policies and regulations. Under NEPA the significance of an effect must consider the context and intensity of the environmental effect. The factors that are considered under NEPA to determine the context and intensity of its effects are encompassed by the thresholds of significance. An alternative would have a significant effect on aquatic biological resources if it would:

- result in a net decrease in the amount of TRPA-designated prime fish habitat;
- result in harmful ecological economic, social, or public health impacts from the introduction or spread of invasive species;
- substantially change the diversity or distribution of aquatic species;
- substantially reduce the number or reduce the viability of special-status fish species;
- result in a barrier to fish movement that would block access to spawning habitat;
- substantially reduce the suitability of habitat for native or game fish species;
- have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW and USFWS; or
- interfere substantially with the movement of any native resident or migratory fish species.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact 3.5-1: Short-Term Aquatic Habitat Degradation

Short-term construction activities associated with Alternatives 1, 2, 3, and 4 in Meeks Creek and the Lake Tahoe shorezone could temporarily reduce aquatic habitat quality by increasing suspended sediments and turbidity and through the release and exposure of contaminants, through direct disturbance, including hydrostatic pressures within the construction site during construction associated with restoration of Meeks Creek and marina removal (including bank stabilization), replacement of the SR 89 bridge (and installation of weir structure will be incorporated into the creek channel at or adjacent to the bridge to facilitate control of fish movement), the installation of a pier or non-motorized launch facility, and installation of multi-use bike/pedestrian bridges. However, effective construction-phase site management plans (e.g., BMPs) would be implemented to comply with required permits and to minimize risks of water quality degradation and direct disturbance. Although elevated turbidity may occur, the expected turbidity levels would not substantially reduce the suitability of habitat for native or game fish species, substantially change the diversity or distribution of aquatic species, or substantially reduce the number or reduce the viability of special-status fish species. Therefore, this impact would be less than significant for Alternatives 1 through 4. Implementation of the No Action Alternative would not include restoration of Meeks Creek and lagoon and may contribute to the ongoing degradation of aquatic habitat in Meeks Creek. This would be a potentially significant impact for the No Action Alternative.

No Action Alternative

Under the No Action Alternative, there would be no restoration and the marina would remain in place, with a boat ramp and approximately 120 slips placed in the former lagoon. Currently, some marina infrastructure, including the floating platforms and slips, have been removed from the marina to facilitate AIS control and other management actions. With the No Action Alternative, this infrastructure would be reinstalled, and the marina would continue to operate as it had in the past. Permanent marina infrastructure, including sheet pile bulkheads, a boat ramp, grading, and bank revetments are still in place. The reinstallation of floating docks and slips would be accomplished with land-based or floating equipment (e.g., barge and crane) and would not require dewatering or major disturbance. Reinstallation of the floating marina infrastructure would comply with standard USDA Forest Service and TRPA BMPs, and applicable permit requirements. This impact would be potentially significant.

Alternative 1: Restoration with Boating Pier

The restoration of Meeks Creek and lagoon and marina removal would include substantial grading within the existing creek and marina areas. Soil from the banks and nearby upland areas would be placed in the dredged marina to recreate a shallow lagoon. Native wetland and riparian vegetation would be re-established throughout the restoration area.

Before removal of the marina, a temporary impervious barrier, or barriers, would be placed near the mouth of Meeks Creek to separate the restoration area from Lake Tahoe. During construction, the flow of the creek would be diverted via a temporary diversion dam constructed upstream of the affected areas. The creek's flow would be captured in pipes and diverted into Lake Tahoe downstream of the project area by gravity flow. Water diversion pumping for construction and dewatering in the creek channel and lagoon may also be required; in such cases, pumping could occur continuously for several days. Water pumped from excavation activities would contain suspended sediments and other solids. The suspended sediments would not be discharged into Meeks Creek, Lake Tahoe, stream environment zones unless water quality discharge standards are met (as defined by TRPA), wetlands (as defined by USACE), or storm drains. Water pumped from the construction area would be pumped into trucks and/or disposed of in upland portions of the project area within temporary infiltration basins or dispersed through sprinklers or similar methods. All excavation, filling, or other disturbance of the soil would be limited to the May 1-October 15 timeframe unless a TRPA grading season extension is issued for the project. In-channel restoration work would generally occur in late summer or early fall when water levels in Meeks Creek are lowest.

Construction of a new SR 89 bridge, trail bridge, and fish management structure across Meeks Creek would require dewatering for construction activities that would encounter groundwater, including installation of the bridge and fish management structure footings, and utility replacement and protection. As necessary during construction, water-tight cofferdams would be temporarily installed to prevent scour and to maintain soil- and water-free areas to allow for installation of bridge and fish weir footings. Once the footings are constructed, the cofferdams would be removed, and the remaining portion of the bridge and fish management structure would be constructed from outside Meeks Creek.

The fish management structure (e.g., weir) would be constructed in the creek channel near the SR 89 bridge, trail bridge, or in the channel between the SR 89 and trail bridges. The fish management structure would consist of a weir or similar in-channel structure that could be adjusted to block or allow the movement of fish. This structure would be managed to prevent the movement on non-native fish species into the upper watershed in order to protect and support the recovery of native fish species in the upper watershed.

A new multi-use bridge would be constructed across Meeks Creek channel downstream of SR 89 and upstream of the restored lagoon. The bridge could be constructed at the same time as the creek restoration, or separately after restoration is complete. If constructed concurrent with the restoration, all in-channel work would occur while the creek is diverted, as described above. If constructed separately from the restoration, diversion of creek flows and dewatering or water diversion for construction activities may be required. As described above, water pumped from active construction area would be pumped into trucks and disposed offsite or infiltrated in appropriate portions of the project area.

Construction BMPs would be installed in accordance with all permits and Caltrans requirements. Utility work and bridge footing work within Meeks Creek is anticipated to take several weeks and would be completed during one construction season, primarily in the summer months.

The pier would be constructed by a floating or amphibious barge with pile driver during the winter season (October to May). Piles would be installed by either pile driving or drilling. A caisson would be used to isolate the pile driving or drilling site to protect water quality. A caisson is a watertight retaining structure used to isolate the work area during pier construction. With a caisson, the water can be pumped out to create a dry environment. Turbidity curtains would only be used during pile installation if necessary to minimize water quality impacts from suspended sediment. A turbidity curtain is a floating barrier consisting of relatively impervious fabric, used to prevent fine and coarse suspended sediment transport away from areas of water-based construction activities, in this case the driving of the pier piles.

Suspended Sediments and Turbidity

Construction activities could disturb sediments and soils within and adjacent to waterways. Any construction-related erosion or disturbance of sediments and soils could temporarily increase downstream turbidity and sedimentation throughout the study area if soils were transported in creek flows or stormwater runoff.

The abundance, distribution, and survival of fish populations have been linked to levels of turbidity and silt deposition. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability of fish in aquatic habitats within the study area, leading to reduced feeding and growth rates. Such exposure could also result in a thickening of the gills, potentially causing the loss of respiratory function; in clogging and abrasion of gills; and in increased stress levels, which in turn could reduce tolerance to disease and toxicants (Waters 1995). Silt deposition could also degrade benthic habitats by settling in substrate and reducing oxygenation of eggs in gravels. Turbidity also could result in increased water temperature and decreased dissolved oxygen (DO) levels, especially in low-velocity pools, which can cause stressed respiration.

As stated in Section 2.10, "Construction," all project construction management plans would be reviewed and approved, as required, under TRPA's Code of Ordinances, Lahontan RWQCB requirements, and National Pollutant Discharge Elimination System (NPDES) permits, which would include preparation and implementation of a Stormwater Pollution Prevention Plan. TRPA "Standard Conditions of Approval for Grading Projects" includes standards such as temporary best management practices (BMPs) and erosion control requirements. With the implementation of site management practices sufficient to meet these criteria and adhere to the required permits, including a suite of RPMs described in Appendix A, fisheries or aquatic habitat would not be substantially affected by suspended sediment and turbidity.

Construction-Related Contaminants

Use of heavy equipment and storage of materials is required for many construction activities. If not properly contained and managed, contaminants (e.g., fuels, lubricants, hydraulic fluids) could be introduced into the water, either directly or through surface runoff. Contaminants may be toxic to fish or cause altered oxygen diffusion rates and acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival. However, all project construction management plans would be reviewed and approved, as required, under TRPA's Code of Ordinances, Lahontan RWQCB requirements, and NPDES permits, which would include preparation and implementation of spill prevention plans (see Appendix A), which would avoid and/or minimize the potential for the release and exposure of contaminants.

Direct Disturbance

Fish and other aquatic biota, if present, could be injured or killed during in-water construction activities. As described above, the construction site would be isolated from adjacent habitats with diversions dams and/or cofferdams and dewatering. A separate analysis of potential stranding of aquatic biota from dewatering work sites is provided below under Impact 3.5-2.

If pile driving is required, measures would be implemented to avoid direct physical injury, including pile driving with vibratory hammers and managed (through operational controls) to be less than 206 decibels (dB) peak (dBpeak) and 183 dB (fish less than 2 grams) and 187 dB (fish greater than or equal to 2 grams) sound exposure level (dBSEL) measured at a distance of 10 meters (Fisheries Hydroacoustic Working Group 2008). (Attenuation is assumed at a rate of 4.5 dB per doubling of distance.) As stated above, caissons would be used during pile installation to minimize water quality impacts from suspended sediment. Further, as described above, the pier would be constructed by a floating or amphibious barge with pile driver during the winter season (October to May), which is outside of the summer period when nearshore fish densities are highest and the peak spawning period for many nearshore fish species in Lake Tahoe.

With the implementation of site management practices sufficient to meet and adhere to the required permits, fisheries or aquatic habitat would not be substantially affected. Additionally, resource protection measures (RPMs) described in Appendix A (e.g., use of a caisson), would be taken to substantially reduce impacts of pile driving and construction of the boating pier on fish or aquatic species. Therefore, this impact would be less than significant.

Alternative 2: Restoration with Pedestrian Pier

This impact would be similar to the impact described for Alternative 1. The proposed construction activities under Alternative 2 with the potential to degrade aquatic habitat would include installation of temporary barriers including a diversion dam, dewatering of a portion of Meeks Creek, placement of fill in the existing lagoon, grading of creek and lagoon, replacement of the SR 89 bridge, installation of two multi-use trail bridges, and the installation of the pedestrian pier (albeit smaller than the boat pier under Alternative 1). With the implementation of site management practices sufficient to meet and adhere to the required permits, fisheries or aquatic habitat would not be substantially affected. Therefore, this impact would be less than significant.

Alternative 3: Restoration with No Pier

This impact would be similar to the impact described for Alternative 1. The proposed construction activities under Alternative 3 with the potential to degrade aquatic habitat would include installation of temporary barriers including a diversion dam, dewatering of a portion of Meeks Creek, placement of fill in the existing lagoon, grading of creek and lagoon, installation of a two trail bridges, and replacement of the SR 89 bridge. There would be no pier under this alternative although it would include a non-motorized watercraft launch. With the implementation of site management practices sufficient to meet and adhere to the required permits, fisheries or aquatic habitat would not be substantially affected. Therefore, this impact would be less than significant.

Alternative 4: Preferred Alternative

This impact would be similar to the impact for Alternative 1 with the exception of the boating pier, which is not proposed under Alternative 4. The proposed construction activities under Alternative 4 with the potential to degrade aquatic habitat would include installation of temporary barriers including a diversion dam, dewatering of a portion of Meeks Creek, placement of fill in the existing lagoon, grading of creek and lagoon, installation of a trail bridge and non-motorized watercraft launch, and replacement of the SR 89 bridge. With the implementation of site management practices sufficient to meet and adhere to the required permits, fisheries or aquatic habitat would not be substantially affected. Therefore, this impact would be less than significant.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.5-2: Stranding of Aquatic Biota from Dewatering Worksites

Under Alternatives 1 through 4, certain construction activities—diverting streamflow from sections of Meeks Creek and dewatering the lagoon—could result in stranding and mortality of fish and other aquatic biota, potentially including special-status species such as LCT and Lahontan tui chub. The project would avoid and/or minimize stranding and mortality of species in dewatered areas and not substantially change the diversity or distribution of aquatic species, or substantially reduce the number or reduce the viability of special-status fish species. Therefore, this impact would be less than significant for Alternatives 1 through 4. Under the No Action Alternative, construction activities that involve diverting or dewatering streamflow would not occur and there would be no impact.

No Action Alternative

In the absence of restoration activities, the existing degraded habitat conditions in Meeks Creek and lagoon would persist. However, the No Action Alternative would not include construction activities that could temporarily cause stranding or mortality of aquatic species. Consequently, no impact would occur.

Alternative 1: Restoration with Boating Pier

Alternative 1 would involve dewatering Meeks Creek and lagoon. The dewatering could cause stranding and mortality of fish and other aquatic biota. Several special-status species, including LCT (federally listed as threatened) and the Lahontan tui chub (a California Species of Special Concern) could be affected.

If fish are present during the installation of the cofferdams (which will be needed for the SR 89 bridge replacement (that includes a multi-use path), channel and lagoon restoration, fish management structure construction, and construction of a separated multi-use path trail bridge), they could be injured by the in-water construction activity itself, and/or become trapped behind the cofferdam. If any fish become trapped behind the cofferdam, they would be subject to water quality degradation (e.g., increased temperatures, decrease dissolved oxygen), become entrained in or impinged on pumps used for dewatering, or become stranded after dewatering is complete.

To minimize the stranding of fish and aquatic biota, the project would retain a qualified biologist(s) to oversee rescue and relocate fish, and other important native aquatic species when flows are diverted from in-channel construction sites. Organisms would be removed from these sites and transported and released into suitable sites (i.e., Lake Tahoe or sites on Meeks Creek upstream of the affected area). All equipment used for dewatering and fish rescue would be properly decontaminated to kill or remove all potential invasive aquatic species (i.e., Eurasian watermilfoil). All pump intakes would be screened to limit entrainment of fish and aquatic weeds (i.e., Eurasian watermilfoil). All activities would occur in compliance with TRPA's Lake Tahoe Region Aquatic Invasive Species Management Plan.

Implementing the RPMS and standard BMPs would avoid and/or minimize stranding and mortality of aquatic biota in the project area. Therefore, this impact would be less than significant.

<u>Alternative 2: Restoration with Pedestrian Pier</u>

This impact would be similar to the impact for Alternative 1; however, two multi-use path trail bridges would be installed rather than one, requiring an additional cofferdam and diversion. Alternative 2 would involve dewatering Meeks Creek and lagoon as well. The dewatering could cause stranding and mortality of fish and other aquatic biota.

Implementing the RPMS and standard BMPs would minimize stranding and mortality of aquatic biota in the project area. Therefore, this impact would be less than significant.

<u>Alternative 3: Restoration with No Pier</u>

This impact would be similar to the impacts for Alternative 2, because this alternative would also include replacement of the SR 89 bridge and construction of two multi-use path trail bridges. Alternative 3 would involve dewatering Meeks Creek and lagoon as well. The dewatering could cause stranding and mortality of fish and other aquatic biota.

Implementing the RPMS and standard BMPs would minimize stranding and mortality of aquatic biota in the project area. Therefore, this impact would be less than significant.

<u>Alternative 4: Preferred Alternative</u>

This impact would be the same as the impacts for Alternative 1, because this alternative would also include replacement of the SR 89 bridge (that would include a multi-use path) and one separated multi-use path trail bridge. Alternative 4 would involve dewatering Meeks Creek and lagoon as well. The dewatering could cause stranding and mortality of fish and other aquatic biota. All activities would occur in compliance with TRPA's Lake Tahoe Region Aquatic Invasive Species Management Plan.

Implementing the RPMS and standard BMPs would minimize stranding and mortality of aquatic biota in the project area. Therefore, this impact would be less than significant.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.5-3: Short-Term Disruption of Fish Passage/Migration

Construction of restoration improvements associated with Alternatives 1 through 4 may result in short-term disruption of fish passage between Meeks Creek and Lake Tahoe or in-creek seasonal migration. The temporary fish barriers would be in place for construction for a relatively short time period that would not encompass all of the spawning season for any of the fish species. This impact would not result in a barrier to fish movement that would block access to spawning habitat or interfere substantially with the movement of any native resident or migratory fish species and would be less than significant for Alternatives 1 through 4. With the No Action Alternative, no new disruptions to passage would occur and there would be no impact.

<u>No Action Alternative</u>

No restoration, recreation infrastructure, or public access features would be constructed under the No Action Alternative; therefore, this alternative would not disrupt fish passage. No impact would occur.

<u>Alternative 1: Restoration with Boating Pier</u>

As stated in Section 2.10.1, "Restoration of Meeks Creek and Removal of Meeks Bay Marina," a temporary impervious barrier, or barriers, would be placed near the mouth of Meeks Creek to separate the restoration area from Lake Tahoe. During construction of the SR 89 bridge replacement (with multi-use path), fish management structure, restoration improvements, marina removal, and separate multi-use path trail bridge, the flow of the creek would be diverted via a temporary diversion dam constructed upstream of the affected areas. These actions would result in temporary barriers to fish passage. Several species of native minnows move locally from the lake into streams for spawning in spring, and mountain suckers move locally within the stream for spawning in midsummer. The primary spawning periods for rainbow trout and Lahontan redsides—spring and early summer—coincide with snowmelt runoff. Mountain suckers are late spring and summer spawners. Mountain whitefish migrate upstream for spawning in the fall (October–December). The project could block fish passage during some of these time periods, but not all of them.

Construction would occur during low-flow conditions, and diversions would occur between July and mid-October. The temporary fish barriers would be in place for dewatering and diversions for a relatively short time period that would not encompass all of the spawning season for any of the fish species; therefore, the construction-phase impact would be less than significant.

<u>Alternative 2: Restoration with Pedestrian Pier</u>

This impact would be similar to the impact for Alternative 1; however, two multi-use path trail bridges would be installed rather than one over the creek. During construction, the flow of the creek would be diverted via a temporary diversion dam that would result in temporary barriers to fish passage. This alternative would include an additional diversion for construction of the additional multi-use path trail bridge over the creek. As described under Alternative 1, the project could block fish passage during portions of spawning periods for some fish species.

Construction would occur during low-flow conditions, and diversions would occur between July and mid-October. The temporary fish barriers would be in place for dewatering and diversions for a relatively short time period that would not encompass all of the spawning season for any of the fish species; therefore, the construction-phase impact would be less than significant.

<u>Alternative 3: Restoration with No Pier</u>

This impact would be similar to the impact for Alternative 2, because this alternative would also include replacement of the SR 89 bridge and construction of two multi-use path trail bridges. During construction, the flow of the creek would be diverted via a temporary diversion dam that would result in temporary barriers to fish passage. This alternative would include an additional diversion for construction of the additional multi-use path trail bridge over the creek. As described under Alternative 1, the project could block fish passage during portions of spawning periods for some fish species.

Construction would occur during low-flow conditions, and diversions would occur between August and mid-October. The temporary fish barriers would be in place for dewatering and diversions for a relatively short time period that would not encompass all of the spawning season for any of the fish species; therefore, the construction-phase impact would be less than significant.

<u>Alternative 4: Preferred Alternative</u>

This impact would be similar to the impact for Alternative 1, because this alternative would also include replacement of the SR 89 bridge (that would include a multi-use path) and one separated multi-use path trail bridge. During construction, the flow of the creek would be diverted via a temporary diversion dam that would result in temporary barriers to fish passage. As described under Alternative 1, the project could block fish passage during portions of spawning periods for some fish species.

Construction would occur during low-flow conditions, and diversions would occur between August and mid-October. The temporary fish barriers would be in place for dewatering and diversions for a relatively short time period that would not encompass all of the spawning season for any of the fish species; therefore, the construction-phase impact would be less than significant.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.5-4: Long-Term Disruption of Fish Passage/Migration

Alternatives 1, 2, 3, and 4 would not result in any long-term change to fish passage or migration because the depth of flow in the restored channel would be improved and the connection between the lake and Meeks Creek would be sustained. This impact would be beneficial for Alternatives 1 through 4. Under the No Action Alternative, existing barriers to fish passage/migration at the SR 89 bridge would remain and would potentially worsen over time. Therefore, this impact would be potentially significant for the No Action Alternative.

No Action Alternative

No restoration, recreation infrastructure, or public access features would be constructed under the No Action Alternative. The SR 89 bridge currently creates a barrier to fish passage during portions of the year due to the approximately four-foot vertical drop from the culvert bottom to the water surface. This barrier would remain under the No Action Alternative and would potentially worsen over time. Therefore, the impact of the No Action Alternative would be potentially significant.

Alternative 1: Restoration with Boating Pier

Restoration included in Alternative 1, specifically replacing box culverts at the SR 89 bridge, raising the creek bed, and improving lagoon connectivity with Lake Tahoe would result in a long-term improvement of fish passage and migration conditions in the project area. This would remove the existing barrier at the SR 89 bridge and provide access to approximately 6.5 miles of habitat for aquatic species in the Meeks Creek watershed. As described under Section 2.5.3, "Resource Enhancement," a fish management structure would be constructed in the creek channel near the SR 89 bridge, trail bridge, or in the channel between the SR 89 and trail bridges. The fish management structure would consist of a weir or similar in-channel structure that could be adjusted to block or allow the movement of fish. This structure would be managed to prevent the movement on non-native fish species into the upper watershed in order to protect and support the recovery of native fish species in the upper watershed. The structure could allow the passage of fish when it is consistent with management goals. Therefore, this would be a beneficial effect with regard to fish passage.

Alternative 2: Restoration with Pedestrian Pier

This impact would be similar to the impact for Alternative 1. It is expected that restoration, specifically replacing box culverts at the SR 89 bridge, raising the creek bed, and improving lagoon connectivity with Lake Tahoe would result in a long-term improvement of fish passage and migration conditions in the project area. A fish management structure would be constructed that could block passage for non-native species as an intentional management action when it would be beneficial to the recovery of native special status aquatic species. This would be a beneficial effect with regard to fish passage.

Alternative 3: Restoration with No Pier

This impact would be similar to the impact for Alternative 1. It is expected that restoration, specifically replacing box culverts at the SR 89 bridge, raising the creek bed, and improving lagoon connectivity with Lake Tahoe would result in a long-term improvement of fish passage and migration conditions in the project area. A fish management structure would be constructed that could block passage for non-native species as an intentional management action when it would be beneficial to the recovery of native special status aquatic species. This would be a beneficial effect with regard to fish passage.

Alternative 4: Preferred Alternative

This impact would be similar to the impact for Alternative 1. It is expected that restoration, specifically replacing box culverts at the SR 89 bridge, raising the creek bed, and improving lagoon connectivity with Lake Tahoe would result in a long-term improvement of fish passage and migration conditions in the project area. A fish management structure would be constructed that could block passage for non-native species as an intentional management action when it would be beneficial to the recovery of native special status aquatic species. This would be a beneficial effect with regard to fish passage.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.5-5: Introduction and Spread of Aquatic Invasive Species by Construction Activities

Eurasian watermilfoil is known to occur in Meeks Bay and has been targeted for removal efforts in recent years using hand-pulling and bottom barriers. Despite these efforts, fragments are still able to enter Meeks Bay from Lake Tahoe proper, resulting in potential re-spread and could potentially be introduced and spread to the creek or the lake during construction activities. Implementation of invasive species management RPMs would substantially reduce the potential for existing aquatic invasive species to spread and result in harmful ecological economic, social, or public health impacts from the introduction or spread of invasive species. Therefore, this impact would be less than significant for Alternatives 1 through 4. Under the No Action Alternative, management and controls would be expected to continue with ongoing operations. Therefore, this impact would be less than significant for the No Action Alternative.

<u>No Action Alternative</u>

Currently, some marina infrastructure, including the floating platforms and slips, have been removed from the marina to facilitate AIS control and other management actions. With the No Action Alternative, this infrastructure would be reinstalled and the marina would continue to operate as it had in the past. The marina would be operational during navigable, high lake levels and would not be operational during periods of low lake levels. Other activities that could occur under this alternative would be retrofits to the marina for health and safety purposes (e.g., if sheet piling is unsafe), typical maintenance activities, and ongoing AIS control measures, such as bottom barrier treatments within the marina, would continue. No other resource enhancement measures would be implemented. However, the No Action Alternative would not include newly proposed construction activities that could result in the introduction and spread of aquatic invasive species, as described for Alternatives 1–4. Consequently, this impact would be less than significant.

<u>Alternative 1: Restoration with Boating Pier</u>

AIS have been introduced into the Meeks Creek watershed ecosystem primarily through operation of the Meeks Bay Marina and associated boat access. The Meeks Bay Marina is a partially enclosed structure that reduces water circulation, resulting in elevated water temperatures and poor water quality from a lack of mixing with open water. These characteristics have created optimal habitat for non-native warmwater invasive fish, and invasive aquatic plants such as Eurasian milfoil. When boats visit or launch, they serve as vectors for the spread of AIS species to other parts of the lake.

An ongoing AIS control project is already occurring within the Meeks Bay Marina with the objective of AIS eradication prior to the start of restoration activities. This is being accomplished through manual control mechanisms such as the placement of bottom barrier mats to smother AIS, and not use of pesticides.

Channel construction activities, including direct actions and aquatic species rescue and relocation, present a risk of introducing and spreading invasive species like Eurasian watermilfoil in Meeks Creek or nearshores areas of Lake Tahoe through disturbance and transport/relocation of aquatic organisms. However, additional AIS control measures would be implemented prior to and during construction of restoration features to prevent the spread of AIS during construction and reduce the risk of AIS re-establishment after construction.

- AIS infestations are treated prior to ground-disturbing activities and prior to any activities that would generate AIS weed fragments (note AIS treatments have been recently completed, but may be revisited prior to construction, as necessary);
- lagoon soil containing AIS particles would be over-excavated and removed from site or buried by clean fill material to a sufficient depth to prevent propagation of AIS; and
- non-native warmwater fish collected during dewatering and aquatic species rescue and relocation efforts will be eradicated.

The construction of piers invites an increase in boating activity and subsequent potential for introducing non-native plant and animal species to the area. Potential introductions could result from the transport of aquatic weeds such as Eurasian watermilfoil and curlyleaf pondweed (not currently known to occur in Meeks Bay) entangled on boat propellers leaving infested sites around Lake Tahoe or the Tahoe Keys. Increased transport of aquatic plants (native or non-native) offers an increase in potential transport of attached juvenile Asian clams. However, implementation of continued invasive species management would substantially reduce the potential for existing aquatic invasive species to spread.

All restoration and pier construction activities would occur in compliance with TRPA's Lake Tahoe Region Aquatic Invasive Species Management Plan. Resource protection measures (see Appendix A) would be implemented to substantially reduce the risk of introduction and spread of aquatic invasive species, such as the invasive plant Eurasian milfoil. Therefore, this impact would be less than significant.

Alternative 2: Restoration with Pedestrian Pier

This impact would be similar to the impact for Alternative 1. Alternative 2 includes the construction of a pedestrian pier, which could alter habitat conditions for native fish, although to a lesser extent than Alternative 1 due to the smaller size of the pedestrian pier. Through compliance with TRPA's Lake Tahoe Region Aquatic Invasive Species Management Plan and implementation of resource protection measures (see Appendix A), the risk of introduction and spread of aquatic invasive species would be substantially reduced. Therefore, this impact would be less than significant.

Alternative 3: Restoration with No Pier

Under Alternative 3, no pier would be constructed; however, a small (up to 20 by 30 feet) non-motorized watercraft launch would be placed in the nearshore near the south end of the project area. This structure would be floating and would function similar to a floating pier. The effects of this structure would be similar to but less than that of the floating pier in Alternative 2. Similar to Alternatives 1 and 2, through compliance with TRPA's Lake Tahoe Region Aquatic Invasive Species Management Plan and implementation of resource protection measures (see Appendix A), the risk of introduction and spread of aquatic invasive species would be substantially reduced. Therefore, this impact would be less than significant.

Alternative 4: Preferred Alternative

Alternative 4 would include the same non-motorized watercraft launch as Alternative 3; therefore, the risk of introduction and spread of aquatic invasive species would be the same as Alternative 3. For the reasons described above, this impact would be less than significant.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.5-6: Long-Term Disruption of Nearshore Aquatic Habitat

Under Alternatives 1 and 2, construction of a pier could alter the nearshore habitat. Similarly, under Alternatives 3 and 4, installation of a non-motorized launch platform could alter nearshore habitat albeit to a lesser extent than a pier (see Chapter 2). Adding an unnatural feature to the shoreline could adversely alter habitat for native species. However, due to existing conditions (no prime spawning habitat present) coupled with the habitat restoration and enhancement in Meeks Creek, and aquatic invasive species eradication measures proposed by the project, it is unlikely that both sufficient populations of such fish and suitable habitat connectivity would be present nearby to create a noticeable adverse effect on native fishes. Further, replacement of existing concrete and rock gabion shoreline revetments on the northern end of the project area with more-natural boulder and vegetation shoreline protection would benefit nearshore habitat. Therefore, this impact would not substantially reduce the suitability of habitat for native or game fish species and would be less than significant for Alternatives 1 through 4. Under the No Action Alternative, no new shoreline structures would be constructed, and existing disruption of shoreline habitat associated with the marina and sheetpile creek mouth would continue in its current form. This impact would be less than significant for the No Action Alternative.

No Action Alternative

Under the No Action Alternative, the shoreline habitat in Meeks Bay would remain as is. The existing disruption of shoreline habitat associated with the marina and sheetpile at the creek mouth would continue in its current form. This impact would be less than significant for the No Action Alternative.

Alternative 1: Restoration with Boating Pier

Alternative 1 includes the construction of an approximately 300-foot boating pier which could adversely alter habitat for native species. It also includes replacement of existing concrete and rock gabion shoreline revetments on the northern end of the project area with more-natural boulder and vegetation shoreline protection, which would benefit nearshore habitat. Based on concerns that increasing boating and presence of structures (i.e., piers) were affecting fish habitat in Lake Tahoe, a multi-phased fish study investigated the distribution of fish communities, as well as their interactions with littoral structures and habitat features, the results of which are generally described below (Byron et al. 1989; Beauchamp et al. 1991, 1994; Allen and Reuter 1996).

Nearshore fish densities are highest during the summer and then decrease during fall as fish move to deeper parts of the lake. This occurs, in part, due to thermal stratification that restricts many fish to shallower depths (Byron et al. 1989). In addition to the permanent inhabitants of nearshore environments, young-of-year or underyearling, fish younger than a year of age, of most other fish species also utilize the nearshore zone. In general, shallow (i.e., less than 30 feet deep) areas with large boulders or other complex environments support substantially more fish than simple (i.e., sandy substrate) littoral zone habitats (Byron et al. 1989). Yearling and older littoral fish generally do not use shallow, nearshore sandy substrate unless is it is less than 7 feet from complex rocky cover (Beauchamp et al. 1991). Rocky habitat is thought to provide important refuge from predation (Beauchamp et al. 1994) and is considered good spawning habitat for many lake-dwelling species by TRPA. Allen and Reuter (1996) found nearly every gravel substrate location surveyed showed evidence of spawning. In contrast, higher densities of underyearling littoral fishes are associated with sandy substrates, likely because they take advantage of the warmest available temperatures located in shallow waters and their small size and transparency protect them from predators (Beauchamp et al. 1991). As underyearlings grow and gain more pigment they form schools to protect themselves from predation. Large aggregations of juveniles are prevalent along the marshy shore where they are able to take refuge in emergent aquatic vegetation (Moyle 2002).

The warm spring and summer months are the peak spawning period for many nearshore fish species in Lake Tahoe. The peak recreational boating period, which occurs from approximately May 1 to September 30, corresponds with utilization of nearshore habitat by native fishes (Beauchamp et al. 1991) and warmwater game species; however, most native fish spawn during the night hours when shorezone activities decrease (Allen and Reuter 1996). Beauchamp et al. (1991) found that underyearlings, which generally use shallow areas did not occupy areas deep enough to be frequently disturbed by normal boat traffic. Nevertheless, boat traffic in marinas and around piers caused fish schools (i.e., yearlings and older fish) to retreat to cover, although they usually returned to normal activity patterns within 30 seconds (Beauchamp et al. 1991). Due to the short disturbance period, the study concluded that, even frequent encounters (e.g., 100 boat passages) would not impinge on foraging time enough to affect growth.

To further investigate potential anthropogenic impacts on nearshore fishes, Allen and Reuter (1996) studied boating impacts on spawning. The researchers reported that boating occurring during maximum night spawning activities had no negative impact on spawning behavior. Further, artificial lighting associated with boating and other nearshore activities did not affect spawning behavior.

The most common anthropogenic alteration to Lake Tahoe's nearshore is the construction of piling-supported piers (piers) and rock crib piers (cribs) (Beauchamp et al. 1994). Piers provide simple submerged structures that lack habitat complexity. Beauchamp et al. (1994) studied piers and cribs to determine if these structures affected fish densities. The researchers reported that piers had no significant effect on littoral fish density, but piers may positively affect fish abundance when the lake level is higher because some species may utilize the shaded areas under docks as cover. Allen and Reuter (1996) conducted another study to determine if piers and/or cribs affected fish spawning success. The researchers reported that substrate was more important than pier presence for littoral fish spawning success (Allen and Reuter 1996).

Existing conditions consist of marginal habitat and/or feed and cover habitat with no prime spawning habitat present. Due to the lack of prime habitat and for the reasons described above, fish would not be adversely affected with the new boating pier. Furthermore, habitat restoration and enhancement, and invasive species eradication efforts proposed as part of Alternative 1 would benefit fish habitat. Therefore, this impact would be less than significant.

<u>Alternative 2: Restoration with Pedestrian Pier</u>

This impact would be similar to the impact for Alternative 1. Alternative 2 includes the construction of a pedestrian pier that could alter habitat conditions for native fish, although to a lesser extent than Alternative 1 due to the smaller size of the pedestrian pier. Existing conditions consist of marginal habitat and/or feed and cover habitat with no prime spawning habitat present and it is not expected that populations of these fish would be adversely affected by the new pedestrian pier, based on available literature/applicable studies, especially after habitat restoration and enhancement, and invasive species eradication efforts are complete. Therefore, this impact would be less than significant.

<u>Alternative 3: Restoration with No Pier</u>

Under Alternative 3, no pier would be constructed, however a small (up to 20 by 30 feet) non-motorized watercraft launch would be placed in the nearshore near the south end of the project area. This structure would be floating and would function similar to a floating pier. The effects of this structure would be similar to but less than that of the floating pier in Alternative 2. While the non-motorized launch would be placed near boulders in the nearshore, the area does not contain prime spawning habitat. For the reasons described for Alternative 1, Alternative 3 would not substantially affect fish habitat. Therefore, this impact would be less than significant.

<u>Alternative 4: Preferred Alternative</u>

Alternative 4 would include the same non-motorized watercraft launch as Alternative 3; therefore, the effects on fish habitat would be the same as Alternative 3. For the reasons described above, this impact would be less than significant.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.5-7: Long-Term Change in in Habitat Conditions Associated with Restoration and Enhancement

Restoration and enhancement activities included in Alternatives 1, 2, 3, and 4, would involve removal of the marina and boat launch infrastructure to allow for full restoration of Meeks Creek, lagoon, and barrier beach along the reach of the creek from SR 89 to Lake Tahoe. Restoration and enhancement associated with Alternatives 1 through 4 would restore ecological process, resulting improved habitat conditions for aquatic resources. This would be a beneficial effect related to implementation of Alternative 1, 2, 3, and 4. Implementation of the No Action Alternative would not include restoration and enhancement activities. The current degraded condition of the Creek would persist and may worsen over time. This would be a potentially significant impact for the No Action Alternative.

<u>No Action Alternative</u>

Under the No Action Alternative, there would be no restoration and the marina would remain in place, with a boat ramp and approximately 120 slips placed in the lagoon. Currently, some marina infrastructure, including the floating platforms and slips, have been removed from the marina to facilitate AIS control and other management actions. With the No Action Alternative, this infrastructure would be reinstalled, and the marina would continue to operate as it had in the past. Under existing conditions, Meeks Creek is degraded and lacks the creek, lagoon, and barrier beach habitat that historically existed in the project area. Additionally, continued maintenance of the marina would require ongoing dredging to remove accumulated sediment and aquatic invasive plant species and would involve the use of heavy equipment in Meeks Creek. These degraded conditions would continue and may worsen under the No Action Alternative, ultimately resulting in reduced creek function, continued incision and disconnection of the creek from the floodplain, interference with lagoon and barrier beach processes. This impact would be potentially significant.

<u>Alternative 1: Restoration with Boating Pier</u>

Alternative 1 would involve removal of the marina and boat launch infrastructure to allow for full restoration of Meeks Creek, lagoon, and barrier beach along the reach of the creek from SR 89 to Lake Tahoe. To accomplish restoration goals, the existing marina infrastructure, including the concrete boat launch, steel and concrete retaining walls that form the perimeter of the marina, boulder riprap, marina office, and other ancillary infrastructure would be entirely removed.

Restoration would occur upstream of and within the footprint of the existing marina infrastructure. Upon removal of Meeks Bay Marina, the natural stream channel, floodplain, lagoon, and barrier beach of Meeks Creek would be restored. Anthropogenic fill surrounding Meeks Creek in the vicinity of the marina would be removed or regraded as necessary to recreate a shallow lagoon and to restore channel and floodplain topography along Meeks Creek from SR 89 to Lake Tahoe. Following grading, the channel banks and lagoon would be revegetated with native emergent lagoon and riparian plant species. Additional restoration design and engineering would occur to establish detailed design parameters to achieve performance standards and incorporate the resource protection measures described in the project description. Further, resource enhancement would be conducted associated with aquatic invasive species control and shoreline stabilization, which would involve removal of the existing gabion wall and replacement with more natural stabilization techniques. Replacement of the SR 89 bridge would address a passage barrier and provide access to approximately 6.5 miles of habitat for aquatic species in the Meeks Creek watershed and a fish management structure would be constructed that could block passage for non-native species as an intentional management action when it would be beneficial to the recovery of native special status aquatic species, including LCT.

Restoration and enhancement associated with Alternative 1 would restore ecological process, resulting improved habitat conditions for aquatic resources. This impact would be beneficial.

<u>Alternative 2: Restoration with Pedestrian Pier</u>
This impact would be very similar to the effects of Alternative 1. Restoration would occur upstream of and within the footprint of the existing marina infrastructure. With the removal of Meeks Bay Marina and restoration of the natural stream channel, floodplain, lagoon, and barrier beach of Meeks Creek, habitat conditions would be improved. This impact would be beneficial.

<u>Alternative 3: Restoration with No Pier</u>
Habitat conditions under Alternative 3 would be very similar to the effects of Alternative 1, although no pier would be constructed. Restoration would occur upstream of and within the footprint of the existing marina infrastructure. With the removal of Meeks Bay Marina and restoration of the natural stream channel, floodplain, lagoon, and barrier beach of Meeks Creek, habitat conditions would be improved. This impact would be beneficial.

<u>Alternative 4: Preferred Alternative</u>
The effects of Alternative 4 on habitat conditions would be very similar to Alternative 1. Restoration would occur upstream of and within the footprint of the existing marina infrastructure. With the removal of Meeks Bay Marina and restoration of the natural stream channel, floodplain, lagoon, and barrier beach of Meeks Creek, habitat conditions would be improved. This impact would be beneficial.

Mitigation Measures

No mitigation is required for this impact.

CUMULATIVE IMPACTS

Cumulative impacts on aquatic biological resources are considered in the context of Lake Tahoe, the range of affected special-status species, as well as Meeks Creek. Past, present, and future development, recreation, and fuels management projects, including the projects listed in Table 3-2, have resulted and likely would continue to result in cumulative impacts on special-status aquatic species and habitat. In the distant past, development occurred absent environmental regulation and habitat conversion, degradation, and indirect effects (e.g., noise, air, and light pollution) occurred with little or no mitigation. In recent decades, however, development has continued, but in a regulatory context that required compensatory actions for adverse effects. Also in recent years, restoration projects have restored habitat and natural areas resulting in benefits to regional aquatic ecosystems. Recreation projects, such as the Tahoe Trail, while not without their impacts, serve to focus recreational use in specific areas, preventing impacts to more pristine areas. Fuels reduction projects may result in temporary impacts to aquatic habitat and introduce noise, vibration, and other disturbance, but their objectives to reduce the risk of catastrophic wildfire is ultimately beneficial to aquatic resources.

All action alternatives would require active construction in Meeks Creek and Lake Tahoe. RPMs (see Appendix A) would be implemented, which would reduce impacts on aquatic species and habitat. Additionally, the action alternatives would improve long-term fish passage while minimizing short-term construction related effects on aquatic species movement. Project construction and restoration activities under all action alternatives would result in a short-term period of high-intensity disturbance during restoration activities. Overall, project actions would not result in a net loss of aquatic habitat and would ultimately result in a functional lift in ecosystem functions and an increase in aquatic habitat from current conditions. Additionally, the project would remove a potential source for AIS introductions by removing the marina and would reduce suitable habitat for AIS by restoring the creek and lagoon to habitat conditions that favor native species.

Land uses in the project area are regulated by the Tahoe Regional Plan and Code of Ordinances, which include policies to protect aquatic resources. Design criteria would be implemented to minimize impacts on aquatic resources. Additionally, compliance with the TRPA Code of Ordinances is a regulatory requirement for project approval and permitting. Therefore, implementation of the approved project would not conflict with local policies protecting these resources.

For the reasons described above, the alternatives would have a less than cumulatively considerable impact related to aquatic biological resources.

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