3.6 Biological Resources—Aquatic

3.6.1 Introduction

This section describes fisheries resources (i.e., fishes and their aquatic habitats) in the study area and evaluates the potential impacts of the types of projects that would be permitted under the Order. Section 3.5, *Biological Resources—Terrestrial* evaluates impacts to non-fisheries resources such as mammals, amphibians, reptiles, plants, and their habitats, including riparian communities and wetlands.

The environmental setting and impact evaluation for aquatic resources is based on a review of existing published documents and example analyses across the range of project types permitted under the Order. Aquatic resources include all perennial, seasonal, intermittent, and ephemeral marine, estuarine, and freshwater habitats and special-status fish. This section summarizes federal, state, and regional and local regulations related to aquatic biological resources; analyzes the potential impacts of implementing the types of projects permitted under the Order; and presents mitigation measures for impacts determined to be significant or potentially significant. The study area covers aquatic habitats across the entire geographic extent of California, including rivers, streams, lakes, wetlands (e.g., marshes), and bays.

The following comments addressing biological resources were received in response to the notice of preparation (NOP):

- The EIR should assess the impact of restoration projects on existing tidal marshes, tidal flats, subtidal areas, salt ponds, and managed wetlands.
- Establishing wetlands in subtidal or some tidal areas could result in habitat type conversion that could inadvertently eliminate or reduce the numbers of certain populations of fish and wildlife.
- The analysis of cumulative impacts should specifically consider how multiple projects in the same area could affect the distribution of invasive species.
- The EIR should analyze how large-scale earthmoving operations—particularly those within the floodplain—would affect groundwater, and should consider how changes in groundwater patterns could affect mortality of riparian trees.

See Appendix B for the NOP comment letters.

3.6.2 Environmental Setting

This section describes fisheries resources that have the potential to be affected by the types of restoration projects that would be permitted under the Order. The study area covers the entire geographic extent of California and includes numerous aquatic habitats and special-status fish species.

To organize the environmental setting description for aquatic biological resources for the Order, this analysis is organized in the context of “ecoregions.” These ecoregions

encompass geographic areas that have similar patterns of physical and biological characteristics that support similar fish and aquatic communities. As a result, the impacts of the restoration projects permitted under the Order are expected to be similar for all geographic areas in a given ecoregion.

Ecoregion classifications organize the primary environmental variables of ecosystems into an orderly, related set of spatial scales; ecosystem processes and patterns at one level or scale influence or constrain those at lower levels. At broad scales, descriptions and mapping of ecosystems are coarse and typically based on regional factors such as climate, latitude, and major landforms and hydrology. By contrast, those at increasingly finer scales of the same classification systems are more directly correlated with local factors, such as soils, precipitation, vegetation, and land use.

By organizing ecosystems into a hierarchical framework, impacts can be analyzed at an appropriate scale, and the analysis can examine conditions and management issues occurring at finer levels, if needed. Because the Order permits projects that could occur statewide, the ecoregion classification should include multiple hierarchical levels for flexibility.

Although organizing the aquatic biological resources section by ecoregions allows for a program-level analysis, it does not preclude or replace the need for project-level environmental review. Additional project-level biological resources analyses may include field surveys, aerial imagery, and protocol-level or preconstruction surveys for the presence of special-status species. See Section 3.5, *Biological Resources—Terrestrial*, for additional details regarding the ecoregion approach.

Special-Status Species

Special-status species are defined as species that are legally protected or otherwise considered sensitive by federal, state, or local resource agencies. These species may be listed under the federal Endangered Species Act (FESA) or California Endangered Species Act (CESA), or both, or may be identified as Species of Special Concern. Appendix E presents the listing statuses and scientific names of fish species by ecoregion. See Section 3.5, *Biological Resources—Terrestrial*, for details regarding the categories of special-status species.

Sensitive Natural Communities

Sensitive natural communities or habitats are those that are of special concern to resource agencies or are afforded special consideration. This concern may be triggered by the locally or regionally declining extent of these habitats, or because they provide habitat important to common and special-status species. Many of these communities are tracked in the California Natural Diversity Database, maintained by the California Department of Fish and Wildlife (CDFW). Appendix E documents the presence of each sensitive community type by ecoregion.

Critical Habitat

The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) designate critical habitat for fish species. Critical habitat encompasses a

geographic area that is considered essential for the conservation of a threatened or endangered species that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species, but that will be needed for its recovery. A critical habitat designation affects activities performed by federal agencies or that involve a federal permit, license, or funding, and that are not likely to destroy or adversely modify the area of critical habitat.

Ecoregions in the Study Area

The study area—which encompasses the entire state of California—contains 13 ecoregions: Coast Range, Cascades, Sierra Nevada, Central California Foothills and Coastal Mountains, Central California Valley, Southern California Mountains, Eastern Cascades Slopes and Foothills, Central Basin and Range, Mojave Basin and Range, Klamath Mountains/California High North Coast Range, Northern Basin and Range, Sonoran Basin and Range, and Southern California/Northern Baja Coast. The ecoregions are described below and depicted in Figure 3.5-1 (see Section 3.5, *Biological Resources—Terrestrial*).

Coast Range

This ecoregion covers the coastal mountains of California. The entire portion of the Coast Range ecoregion within California lies within 100 kilometers of the coast. Topography is highly variable, with the Coast Ranges and valleys ranging from sea level to more than 3,000 feet in elevation. These relatively low mountains are permitted by highly productive, rain-drenched evergreen forests. Wet forests, lakes, estuarine marshes, and tea-colored (tannic) streams are characteristic features of the landscape. Runoff is rapid and many of the smaller streams are dry by the end of the summer. Notable coastal wetlands within the Coast Range ecoregion include the estuary at the mouth of the Smith River, Lake Talawa, Lake Earl, Klamath River Estuary, Humboldt Bay, the mouth of the Eel River, Bodega Bay, and Big and Stone Lagoons.

The Coast Range ecoregion includes at least 17 known special-status fish species (Appendix E). Among the special-status fish species are California Coast Chinook Salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshawytscha*), Central California Coast Coho Salmon ESU (*O. kisutch*), Central California Coast Steelhead distinct population segment (DPS) (*O. mykiss irideus),* and Tidewater Goby (*Eucyclogobius newberryi*).

Cascades

This mountainous ecoregion includes a disjunct area in Northern California and extends up to western Washington. The west side of the Cascades ecoregion is characterized by long, steep ridges and wide river valleys. Subalpine meadows are present at higher elevations, and alpine glaciers have left till and outwash deposits. The Cascades have a moist temperature climate that supports an extensive, highly productive coniferous forest. This region has a longer summer drought and more intermittent streams than regions to the north in Oregon and Washington.

The Cascades ecoregion includes at least eight known special-status fish species (Appendix E). Among the special-status fish species are Hardhead (*Mylopharodon*

conocephalus), Pit Roach (*Lavinia symmetricus mitrulus*), McCloud River Redband Trout (*Oncorhynchus mykiss gairdneri),* and Rough Sculpin (*Cottus asperrimus*).

Sierra Nevada

The Sierra Nevada is a mountainous, deeply dissected, and westerly tilting fault block. The central and southern part of this ecoregion is composed largely of granitic rock. The Sierra Nevada ecoregion is generally oriented north-south and is essentially defined by the Sierra Nevada physiographic province, which separates California's Central Valley to the west from the Great Basin to the east. The Sierra Nevada range is a granitic batholith, much of which is exposed at higher elevations, with a gradual western slope and a generally steep eastern escarpment. At the highest elevations, moraines, cirques, and small lakes are common, remnants of alpine glaciation dating to the Pleistocene Epoch (the "Ice Age"). On the western slope, most runoff flows to the Tuolumne, Merced, San Joaquin, Kings, Kaweah, Tule, or Kern River.

The Sierra Nevada ecoregion includes at least nine known special-status fish species (Appendix E). Among the special-status fish species are California Golden Trout (*Oncorhynchus mykiss aguabonita*), Kern River Rainbow Trout (*O. mykiss gilberti*), Lahontan Cutthroat Trout (*O. clarkii henshawi),* and Owens Sucker (*Catostomus fumeiventris*).

Central California Foothills and Coastal Mountains

The primary distinguishing characteristics of this ecoregion are its Mediterranean climate of hot dry summers and cool moist winters, and the associated vegetative cover that consists primarily of chaparral and oak woodlands. Grasslands are present at some low elevations and patches of pine are found at high elevations. Surrounding the lower and flatter portions of this ecoregion are open low mountains or foothills; there are also some areas of irregular plains and some narrow valleys. Runoff is often rapid, with smaller ephemeral streams draining to larger perennial rivers in the valleys. All but the larger streams are dry through most of the summer.

Monterey Bay and Morro Bay occur along the coastal portion of this ecoregion. The lower stretches of rivers within this ecoregion often form lagoons, as outflow into the ocean or bay is often blocked by sand dunes – until periods of high winter flows reestablish connectivity. This situation of annual lagoon formation occurs for the ecoregion's largest rivers such as the Salinas River, the Carmel River, the Santa Maria River, and the Santa Ynez River.

The Central California Foothills and Coastal Mountains ecoregion includes at least 22 known special-status fish species (Appendix E). Among the special-status fish species are Arrroyo Chub (*Gila orcuttii)*, Central Valley Spring-Run Chinook Salmon ESU (*Oncorhynchus tshawytscha*), Central California Coast Coho Salmon ESU (*O. kisutch),* and Tidewater Goby (*Eucyclogobius newberryi*).

Central California Valley

Flat, intensively farmed plains with long hot, dry summers and mild winters distinguish the Central California Valley ecoregion from its neighboring ecoregions, which are either

hilly or mountainous, covered with forest or shrub, and generally nonagricultural. The state's two major rivers flow from opposite ends of the Central California Valley ecoregion, entering the Sacramento–San Joaquin Delta (Delta) and San Pablo Bay. Vernal pools are present in some areas. Streams drain mostly to the Sacramento River, with a few in the south draining to the lower San Joaquin River. The seasonal wetlands and flooded agricultural land provide seasonal rearing habitat for native fish species.

The Delta is characterized by numerous sloughs and channels formed where the Sacramento, San Joaquin, Cosumnes, Mokelumne, and Calaveras Rivers enter the region. Water from these rivers commingles in the Delta and is influenced by tidal action, streamflow, and water diversion as it flows toward San Francisco Bay. The western part of the ecoregion includes large areas of brackish and seasonally freshwater marshes and wetlands that surround Grizzly Bay and Suisun Bay.

The Central California Valley ecoregion includes at least 10 known special-status fish species (Appendix E). Among the special-status fish species are Delta Smelt (*Hypomesus transpacificus)*, Sacramento River Winter-Run Chinook Salmon (*Oncorhynchus tshawytscha*), Longfin Smelt (*Spirinchus thaleichthys),* Central Valley Steelhead DPS (*O. mykiss irideus*), and the southern DPS of North American Green Sturgeon (*Acipenser medirostris*).

Southern California Mountains

Like other ecoregions in Central and Southern California, the Southern California Mountains ecoregion has a Mediterranean climate of hot dry summers and moist cool winters. The ecoregion is bounded on the far north by the Sierra Nevada ecoregion, on the east by the Mojave Basin and Range ecoregion, on the southeast by the Sonoran Basin and Range Ecoregion, and on the north by the Central California Valley Ecoregion. All but the larger streams are dry through most of the summer.

The Southern California Mountains ecoregion includes at least six known special-status fish species (Appendix E). Among the special-status fish species are Arroyo Chub (*Gila orcuttii)*, Mohave Tui Chub (*Siphateles bicolor mohavensis*), and Santa Ana Sucker (*Catostomus santaanae*).

Eastern Cascades Slopes and Foothills

This ecoregion is located in the rain shadow of the Cascade Range. It has a more continental climate than ecoregions to the west, with greater temperature extremes, less precipitation, and frequent fires. Precipitation (either rain or snow) falls mostly in the fall, through winter into spring. Several marshland wildlife refuges here are critical to preserving regional biodiversity, particularly at-risk bird and fish species. Most streams and rivers originate in adjacent mountain ecoregions.

The Eastern Cascades Slopes and Foothills ecoregion includes at least 20 known special-status fish species (Appendix E). Among the special-status fish species are Eagle Lake Rainbow Trout (*Oncorhynchus mykiss aquilarum*), Hardhead (*Mylopharodon conocephalus*), and Klamath River Lamprey (*Entosphenus similis*).

Central Basin and Range

This ecoregion is composed of north-trending, fault-block ranges and intervening, drier basins. The Central Basin and Range ecoregion is internally drained by ephemeral streams and once contained ancient Lake Lahontan. Playas occur at the lowest elevations in the Lahontan Basin and are the terminus or "sink" of rivers that flow east from the Sierra Nevada. Three large river systems—the Truckee, Carson, and Walker Rivers—flow eastward through this region from the Sierra Nevada, providing water for agriculture and urban development. The Truckee and Walker Rivers and their tributaries also provide habitat for the threatened Lahontan Cutthroat Trout.

The Central Basin ecoregion includes at least nine known special-status fish species (Appendix E). Among the special-status fish species are Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*), Owens Pupfish (*Cyprinodon radiosus*), and Owens Tui Chub (*Siphateles bicolor snyderi*).

Mojave Basin and Range

Stretching across southeastern California, southern Nevada, southwestern Utah, and northwestern Arizona, this ecoregion is composed of broad basins and scattered mountains that generally are lower, warmer, and drier than those of the Central Basin and Range ecoregion.

The Mohave Basin and Range ecoregion includes at least 12 known special-status fish species (Appendix E). Among the special-status fish species are Arroyo Chub (*Gila orcuttii)*, Mohave Tui Chub (*Siphateles bicolor mohavensis*), and Owens Pupfish (*Cyprinodon radiosus*).

Klamath Mountains/California High North Coast Range

This ecoregion encompasses the highly dissected ridges, foothills, and valleys of the Klamath and Siskiyou Mountains. It extends south into California to include the mixed conifer and montane hardwood forests that occur on mostly mesic soils in the North Coast Ranges. The mild Mediterranean climate of the ecoregion is characterized by hot dry summers and wet winters; the amount of winter moisture in the ecoregion varies, decreasing from west to east. The ecoregion drains to the Klamath, Trinity, Sacramento, Scott, and Shasta Rivers. In much of the ecoregion, all but the larger streams are dry by the end of summer. Natural lakes are absent, but there are a few reservoirs.

The Klamath Mountains/California High North Coast Range ecoregion includes at least 12 known special-status fish species (Appendix E). Among the special-status fish species are Bull Trout (*Salvelinus confluentus*), Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*), and Summer-Run Steelhead Trout (*O. mykiss irideus*).

Northern Basin and Range

The Northern Basin and Range ecoregion is characterized by basin-and-range topography. The ecoregion contains several wide basins bordered by scattered low mountains. Despite regional aridity, natural springs and spring-fed wetlands are scattered around the landscape, sustaining much of the region's wildlife. The western

part of the ecoregion is internally drained; its eastern stream network drains to the Snake River system.

The Northern Basin and Range ecoregion includes one known special-status fish species (Appendix E). The special-status fish species is the Cow Head Tui Chub (*Siphateles bicolor vaccaceps*).

Sonoran Basin and Range

Similar in topography to the Mojave Basin and Range ecoregion to the north, this ecoregion contains scattered low mountains and has large tracts of federally owned land, a large portion of which is used for military training. This ecoregion includes one of the driest and hottest areas of the United States, with annual precipitation of only about 3 inches. The terrain is dissected by dry washes that can flash flood during the infrequent rainfall events.

The Sonoran Basin and Range ecoregion includes at least six known special-status fish species (Appendix E). Among the special-status fish species are Desert Pupfish (*Cyprinodon macularius*), Mohave Tui Chub (*Siphateles bicolor mohavensis*), and Unarmored Threespine Stickleback (*Gasterosteus aculeatus williamsoni*).

Southern California/Northern Baja Coast

This ecoregion includes coastal and alluvial plains, marine terraces, and some low hills in coastal Southern California, and extends more than 200 miles south into Baja California. The Santa Clara River drains a portion of the ecoregion and is perennial. Much of the hydrology of the ecoregion has been greatly modified and channelized. Runoff is rapid except from undissected terraces with vernal pools.

Bays and estuaries in this ecoregion are nestled within an arid region generally fed by smaller, seasonal rivers and streams. As a result, most of these systems are small and more marine in character, dominated by estuarine residents and marine aquatic migrant specie. Bays and estuaries in the region vary greatly in size from numerous small, canyon-mouth estuaries such as Malibu Lagoon to large species such as Anaheim Bay, Newport Bay, and San Diego Bay.

The Southern California/Northern Baja Coast ecoregion includes at least seven known special-status fish species (Appendix E). Among the special-status fish species are Santa Ana Sucker (*Catostomus santaanae*), Mohave Tui Chub (*Siphateles bicolor mohavensis*), and Southern California Steelhead DPS (*Oncorhynchus mykiss irideus*).

3.6.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to hydrology and water quality.

Future permitted restoration projects that would be implemented under the Order may be subject to the laws and regulations listed below, as well as other local or individual restoration projects requirements, depending on the project location.

Federal

Endangered Species Act

FESA Provisions

The FESA applies to proposed federal, state, and local projects that may result in the "take" of a fish or wildlife species that is federally listed as threatened or endangered. The law also applies to actions that are proposed to be authorized, funded, or undertaken by a federal agency and that may jeopardize the continued existence of a federally listed fish, wildlife, or plant species or may adversely modify or destroy designated critical habitat for such species.

Section 9 of the FESA protects listed wildlife species from take, defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct" (U.S. Code Title 16, Section 1532[19] [16 USC 1532(19)]). Federal regulations define "harm" as "an act which actually kills or injures wildlife." This definition includes significant habitat modification or degradation that results—or is reasonably expected to result—in death or injury to wildlife by substantially impairing essential behavioral patterns, including breeding, feeding, sheltering, spawning, rearing, and migrating (Code of Federal Regulations Title 50, Sections 17.3 and 222.102). "Harass" is defined similarly broadly.

If a project could result in take of a federally listed species, either a habitat conservation plan and incidental take permit under FESA Section 10(a) or a federal interagency consultation under FESA Section 7 is required. Under the FESA, USFWS has jurisdiction over all terrestrial and plant species, as well as freshwater fish species and a few marine mammals (such as the California sea otter). NMFS has jurisdiction over anadromous fish species.

NMFS Programmatic Biological Opinions for Restoration

As described in Chapter 2, NMFS has developed programmatic Biological Opinions for restoration projects for the North Coast (NMFS 2012), Central Coast (NMFS 2016), South Coast (NMFS 2015), and Central Valley (NMFS 2018) regions of California (collectively referred to as the NMFS Restoration PBOs).[1] These PBOs provide FESA coverage for several categories of restoration project types, which are similar to those described in this Order. In order for the projects to be eligible for coverage under the PBOs, they must meet the definition of "restoration project," which is defined as one that will result in a net increase in aquatic or riparian resource functions and services. Projects permitted by the PBOs may include multiple benefits, such as flood management, groundwater recharge, recreation, or climate change adaptation, all permitted projects must meet the criteria of a restoration project defined by the PBO and must remain consistent with NMFS' Recovery Plans. Avoidance and minimization measures are also described in the PBOs and must be included in the proposed projects, as applicable. The avoidance and minimization measures included in the PBOs are similar to the general protection measures developed as part of the Order (see **Appendix E**) and species protection measures included as part of the proposed

[1] Note: NMFS PBOs have 10-year permit terms and will be periodically updated.

project for purposes of this PEIR (see Chapter 2 and **Appendix F**) to avoid and/or minimize potential impacts to special-status wildlife, fish and plant species.

Clean Water Act

Under the Federal Water Pollution Control Act Amendments of 1972, better known as the Clean Water Act (CWA), the U.S. Environmental Protection Agency (EPA) regulates discharges of pollutants into the waters of the United States, establishes water quality standards, conducts planning studies, and provides funding for grant projects.

The CWA has been amended by Congress several times since 1972. EPA has provided most states with the authority to administer many of the provisions of the CWA. In California, the State Water Board has been designated by EPA to develop and enforce water quality objectives and implementation plans. The State Water Board has delegated the specific responsibilities for development and enforcement actions to the Regional Boards.

Coastal Zone Management Act

The Coastal Zone Management Act is summarized in Section 3.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978.

Central Valley Project Improvement Act

The Central Valley Project Improvement Act (CVPIA), enacted by Congress in 1992, amended the CVP's authorization to include fish and wildlife protection, restoration, and mitigation as project purposes of the CVP having equal priority with irrigation and domestic uses, and fish and wildlife enhancement as a project purpose equal to power generation. The CVPIA requires the Secretary of the Interior, through the U.S. Bureau of Reclamation and USFWS, "to operate the CVP consistent with the purposes of the act, to meet the federal trust responsibilities to protect the fishery resources of affected federally recognized Indian tribes, and to achieve a reasonable balance among competing demands for the use of CVP water."

The CVPIA mandated the following changes to the CVP:

- Dedicating 800,000 acre-feet annually to fish, wildlife, and habitat restoration (Section 3406[b][2])
- Authorizing water transfers outside the CVP service area (Section 3405)
- Implementing an anadromous fish restoration program (Section 3406[b][1])
- Creating a restoration fund financed by water and power users (Section 3407)
- Providing for the Shasta Temperature Control Device (Section 3406[b][6])
- Implementing fish passage measures at Red Bluff Diversion Dam (Section 3406[b][10])
- Calling for planning to increase the CVP yield (Section 3406[j])

- Mandating firm water supplies for Central Valley wildlife refuges and wildlife habitat areas (Section 3406[d])
- Improving the Tracy Fish Collection Facility (Section 3406[b][4])
- Meeting the federal trust responsibility to protect fishery resources in the Trinity River (Section 3406[b][23])

The CVPIA is being implemented as authorized; CVP operations reflect the provisions of the CVPIA.

The CVPIA included several provisions governing the use of environmental water accounts. Among these were Section 3406(b)(2), which dedicated 800,000 acre-feet to fish, wildlife, and habitat restoration. On May 9, 2003, the U.S. Department of the Interior issued its Decision on Implementation of Section 3406(b)(2) of CVPIA.

Trinity River Mainstem Fishery Restoration

In 1994, USFWS and Trinity County, as lead agencies under the National Environmental Policy Act (NEPA) and CEQA, respectively, began the public process for developing the Trinity River Mainstem Fishery Restoration Environmental Impact Statement/ Environmental Impact Report. In December 2000, the Department of the Interior signed the record of decision for a variable annual flow regime, mechanical channel rehabilitation, sediment management, watershed restoration, and adaptive management. Based on the record of decision, 368,600–815,000 acre-feet per year are allocated for Trinity River flows. This amount is scheduled in coordination with USFWS to best meet habitat, temperature, and sediment transport objectives for the Trinity Basin.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act (Public Law 104-297), requires federal agencies to consult with NMFS on any activity or proposed activity authorized, funded, or undertaken by that agency that may adversely affect essential fish habitat for commercially managed marine and anadromous fish species. “Essential fish habitat” includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growing to maturity. Essential fish habitat also includes all habitats necessary to allow the production of commercially valuable aquatic species, support a long-term sustainable fishery, and contribute to a healthy ecosystem (16 USC 1802[10]).

To protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries such as Pacific salmon, the Pacific Fishery Management Council has designated the Delta, San Francisco Bay, and Suisun Bay as essential fish habitat. Because essential fish habitat applies only to commercial fisheries, habitat for Chinook salmon is included in the designation, but habitat for steelhead is not included.

The Pacific Fishery Management Council has issued three fishery management plans (for Pacific salmon, coastal pelagic species, and groundfish species) that cover the following species occurring in the study area:

- *Starry flounder*: Identified as a "Monitored" species by the Pacific Coast Groundfish Fishery Management Plan (PFMC 2011)
- *Northern anchovy*: Identified as a "Monitored" species by the Pacific Coast Groundfish Fishery Management Plan (PFMC 1998, 2008)
- *Pacific sardine*: Identified as an "Actively Managed" species by the Coastal Pelagic Species Fishery Management Plan (PFMC 1998)
- *Chinook salmon*: Identified as an "Actively Managed" species by the Pacific Coast Salmon Plan (PFMC 2003)

The NMFS Restoration PBOs, described above, also provide Magnuson-Stevens Fishery Conservation and Management Act coverage for the categories of restoration project types described in the PBOs (similar project types to those described in this Order).

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC 651 et seq.), as amended in 1964, was enacted to protect fish and wildlife when federal actions control or modify a natural stream or body of water. The law requires federal agencies to consider the effect of water-related projects on fish and wildlife resources. The agencies must consult and coordinate with USFWS and state fish and game agencies to identify ways to prevent the loss of and damage to fish and wildlife resources, and to further develop and improve these resources.

Marine Mammal Protection Act

The Marine Mammal Protection Act (16 USC 1361–1421h) was enacted in 1972 to protect all marine mammals. The law prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The Marine Mammal Protection Act defines "take" to mean "to hunt, harass, capture, or kill" any marine mammal or attempt to do so. Exceptions to the moratorium can be made by obtaining permits for take incidental to commercial fishing and other nonfishing activities; for scientific research; and for public display at licensed institutions, such as aquaria and science centers.

National Invasive Species Act of 1996

The National Invasive Species Act (Public Law 104-332), reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. The 1996 law mandated regulations to reduce environmental and economic impacts from invasive species and prevent the introduction and spread of aquatic nuisance species, primarily through ballast water.

In recent years, EPA has joined the U.S. Coast Guard in regulating discharges of ballast water in the United States. Since February 2009, EPA has regulated ballast water, and other discharges incidental to normal vessel operations, under Section 402 of the CWA. U.S. Coast Guard regulations, developed under the National Invasive Species Act, generally require ballast-water management (i.e., exchange) for vessels entering United States waters from outside of the 200-nautical-mile Exclusive Economic Zone of the U.S. The National Invasive Species Act also authorizes funding for research on prevention and control of aquatic nuisance species in San Francisco Bay and the Delta, along the Pacific coast, and elsewhere in the United States.

Executive Order 13112: Invasive Species

Executive Order 13112 (February 3, 1999) directs federal agencies to prevent and control the introduction and spread of invasive nonnative species in a cost-effective, environmentally sound manner to minimize their effects on economic, ecological, and human health. The executive order was intended to build on existing laws, such as NEPA, the Nonindigenous Aquatic Nuisance Prevention and Control Act, the Lacey Act, the Plant Pest Act, the federal Noxious Weed Act, and the FESA.

Executive Order 11990: Protection of Wetlands

Executive Order 11990 (May 24, 1977) established the protection of wetlands and riparian systems as the official policy of the federal government. The executive order requires federal agencies to consider wetland protection as an important part of their policies, and to act to minimize the destruction, loss, or degradation of wetlands and preserve and enhance their natural and beneficial values.

State

California Endangered Species Act

Sections 2050 through 2115.5 of the California Fish and Game Code—CESA—addresses threats to native fish, wildlife, and plant species. CESA states that these species are in danger of or threatened with extinction because their habitats are threatened with destruction, adverse modification, or severe curtailment, or because of overexploitation, disease, predation, or other factors. These species are of ecological, educational, historical, recreational, esthetic, economic, and scientific value to the people of the state, and the conservation, protection, and enhancement of the species and their habitat is of statewide concern (Fish and Game Code Section 2051).

The Fish and Game Code (Sections 2062 and 2067, respectively) defines “endangered” and “threatened” species as follows:

- *Endangered species:* A native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes including loss of habitat, change in habitat, overexploitation, predation, competition, or disease.
- *Threatened species:* A native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with

extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts.

The California Fish and Game Commission is responsible for listing species under CESA; CDFW implements CESA, enforcing the act and issuing permits.

Similar to the FESA, CESA in Fish and Game Code Section 2080 prohibits "take" and "possession," among other things, of any California native species or subspecies designated (i.e., listed) as an endangered or threatened species, except as authorized under the Fish and Game Code. "Take" for purposes of CESA is defined in Section 86 of the Fish and Game Code to mean hunt, pursue, catch, capture, or kill, or attempt to do so. The Fish and Game Code definition of take does not, in contrast to the FESA, include "harm" or "harass." Further, in contrast to the FESA, the take prohibition under CESA applies to candidate species pursuant to Fish and Game Code Section 2085.

The Fish and Game Code includes a number of different exceptions to CESA take prohibition and permitting mechanisms for CDFW to authorize otherwise prohibited take and possession of species and subspecies protected by CESA. CDFW, for example, pursuant to Fish and Game Code Section 2081(a), may also authorize otherwise prohibited take and possession, by permit or memorandum of understanding, to certain entities for scientific, educational, or management purposes, and subdivision (b), may authorize by permit, take that is incidental to otherwise lawful activity, subject to certain criteria prescribed by the statute. Finally, by way of example, among others, for species protected under both CESA and FESA, CDFW, pursuant to Fish and Game Code Section 2080.1, may determine that a federal incidental take permit or statement is consistent with CESA and that no further authorization is necessary under the Fish and Game Code.

For a discussion of the potential for state-listed wildlife and plant species to be present in areas that could be affected by restoration projects permitted under the Order, see Section 3.5, *Biological Resources—Terrestrial*.

Fish and Game Code Safe Harbor Agreements

Fish and Game Code Sections 2089.2 through 2089.26 allow CDFW to authorize incidental take of a species listed as endangered, threatened, candidate, or a rare plant, through a Safe Harbor Agreement (SHA) if implementation of the agreement is reasonably expected to provide a net conservation benefit to the species, among other provisions. SHAs are intended to encourage landowners to voluntarily manage their lands to benefit CESA-listed species without subjecting those landowners to additional regulatory restrictions as a result of their conservation efforts. In addition, at the end of the agreement period, participants may return the enrolled property to the baseline conditions that existed at the beginning of the SHA.

Fish and Game Code Designated Fully Protected Species

Fish and Game Code Sections 3511, 4700, 5050, and 5515 designate a number of birds, mammals, reptiles and amphibians, and fish, respectively, as fully protected species. Take and possession is prohibited under the Fish and Game Code and may not be authorized by the Department, except in limited circumstances. For example, the

Department may authorize take of a fully protected species by permit for necessary scientific research, including efforts to recover the species.

McAteer-Petris Act

The McAteer-Petris Act was enacted on September 17, 1965, to preserve San Francisco Bay from indiscriminate filling. The law established the San Francisco Bay Conservation and Development Commission as a temporary state agency charged with preparing a plan for long-term use of the bay and regulating development in and around the bay. To this end, the commission prepared the San Francisco Bay Plan.

In August 1969, the McAteer-Petris Act was amended to make the San Francisco Bay Conservation and Development Commission a permanent agency and incorporate the policies of the Bay Plan into state law. The Bay Plan includes findings and policies on San Francisco Bay as a resource and on developing the bay and shoreline. The plan also contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

The San Francisco Bay Conservation and Development Commission conducts the regulatory and permitting process in accordance with the Bay Plan's policies and maps. As discussed in Section 3.11, *Hydrology and Water Quality*, the Bay Plan is a Coastal Zone Management Act coastal management plan.

Porter-Cologne Water Quality Control Act

The State Water Board, through its nine Regional Boards, regulates waters of the state through the Porter-Cologne Water Quality Control Act (Porter-Cologne Act). Waters of the state are defined as any surface water or groundwater, including saline waters, within the boundaries of the state. The Regional Boards may exert jurisdiction over waters of the state regardless of federal jurisdictional status. The Porter-Cologne Act also charges the Water Boards with establishing and protecting beneficial uses of waters of the state. These beneficial uses may include protection for uses of water that support aquatic ecosystems and habitat for special-status species.

State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State

The State Water Board adopted a State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to waters of the state, for inclusion in the forthcoming Water Quality Control Plan for Inland Surface Waters and Enclosed Bays and Estuaries and Ocean Waters of California. The Procedures consist of four major elements: (1) a wetland definition; (2) a framework for determining if a feature that meets the wetland definition is a water of the state; (3) wetland delineation procedures; and (4) procedures for the submittal, review and approval of applications for Water Quality Certifications and Waste Discharge Requirements for dredge or fill activities.

The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act

The Salmon, Steelhead, Trout and Anadromous Fisheries Program Act (Fish and Game Code Sections 6900–6930) was enacted in 1988 after CDFW reported that the natural

production of salmon and steelhead in California had declined dramatically since the 1940s, primarily as a result of lost stream habitat on many of the state's streams.

This law declares that it is the policy of the State of California to increase the state's salmon and steelhead resources, and directs CDFW to develop a plan and program that strives to double the salmon and steelhead resources (Fish and Game Code Section 6902[a]). The law also establishes a state policy that existing natural salmon and steelhead habitat shall not be diminished further without offsetting the impacts of lost habitat (Fish and Game Code Section 6902[c]).

Natural Community Conservation Planning Act

The Natural Community Conservation Planning Act (Fish and Game Code Sections 2800–2835) details the state's policies for the conservation, protection, restoration, and enhancement of the state's natural resources and ecosystems. This law identifies conservation planning as an officially recognized policy that can be used to eliminate conflicts between protection of the state's natural resources and the need for growth and development. The law also promotes conservation planning to enhance coordination and cooperation among private interests, agencies, and landowners, and aid in multispecies, multihabitat management.

Where CDFW approves a natural community conservation plan, it may authorize by permit the otherwise prohibited taking of any covered species whose conservation and management is provided for in the plan, including CESA-listed species and fully protected species. Adopted conservation plans that address the Delta and Suisun Marsh are discussed in both this section and Section 3.5, *Biological Resources—Terrestrial*, of this PEIR.

California Fish and Game Code Section 1600

Fish and Game Code Section 1602 states that it is unlawful for any person to "substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake" without first notifying CDFW of that activity. Thereafter, if CDFW determines and informs the entity that the activity will not substantially adversely affect any existing fish or wildlife resources, the entity may commence the activity. If, however, CDFW determines that the activity may substantially adversely affect an existing fish or wildlife resource, the entity may be required to obtain from CDFW a Streambed Alteration Agreement, which will include reasonable measures necessary to protect the affected resource(s), before the entity may conduct the activity or activities described in the notification. (Fish and Game Code Section 1602.)

California Aquatic Invasive Species Management Plan

Developed by CDFW's Invasive Species Program, the California Aquatic Invasive Species Management Plan provides information for state agencies and other entities to use when they collaborate to fight aquatic invasive species. The plan proposes management actions for addressing threats posed by aquatic invasive species in California. It focuses on the nonnative algae, crabs, clams, fish, plants, and other

species that continue to invade California's creeks, wetlands, rivers, bays, and coastal waters (CDFG 2008:1).

The California Aquatic Invasive Species Management Plan has the following eight major objectives (CDFG 2008:6):

- Improve coordination and collaboration among the people, agencies, and activities involved with aquatic invasive species.
- Minimize and prevent the introduction and spread of aquatic invasive species into and throughout the waters of California.
- Develop and maintain programs that ensure the early detection of new aquatic invasive species and the monitoring of existing aquatic invasive species.
- Establish and manage systems for rapid response and eradication.
- Control the spread of aquatic invasive species and minimize their impacts on native habitats and species.
- Increase education and outreach efforts to ensure awareness of aquatic invasive species threats and management priorities throughout California.
- Increase research on the baseline biology of aquatic invasive species, the ecological and economic impacts of invasions, and control options to improve management.
- Ensure that state laws and regulations promote the prevention and management of aquatic invasive species introductions.

Each objective is supported by a series of strategic actions. The plan meets federal requirements to develop statewide management plans for nonindigenous aquatic nuisance species under Section 1204 of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (amended as the National Invasive Species Act of 1996). Article 2, Section 64 of the Harbors and Navigation Code authorizes the California Department of Boating and Waterways to manage aquatic weeds that impede the navigation and use of state waterways.

State Wildlife Action Plan

Each state develops a state wildlife action plan to serve as the comprehensive wildlife conservation strategy required for the receipt of federal funds through the State and Tribal Wildlife Grants program. California last updated its plan in 2015 (CDFW 2015). The State Wildlife Action Plan provides a blueprint for the actions necessary to address the highest priorities for conserving California's aquatic, marine, and terrestrial resources. Implementation of this plan relies on making important and helpful conservation information more accessible to resources managers and the public, and on developing lasting partnerships with a broad array of governments, agencies, organizations, businesses, and citizens.

Habitat Restoration and Enhancement Act

The Habitat Restoration and Enhancement Act of 2014 is an expedited permitting process with CDFW for landowners, state and local government agencies, and conservation organizations wanting to implement small-scale, voluntary habitat restoration projects across California. Restoration and enhancement projects approved by CDFW, pursuant to the Act, do not require additional permits from CDFW, such as a Lake or Streambed Alteration agreement or CESA permit.

Habitat restoration or enhancement projects, as defined by the Habitat Restoration and Enhancement Act, are projects with the primary purpose of improving fish and wildlife habitat and meet the eligibility requirements for the State Water Board's Order for Small Habitat Restoration Projects. Projects approved under the Habitat Restoration and Enhancement Act must meet the current size limitations in the State Water Board's Order for Small Habitat Restoration Projects, be consistent with widely recognized restoration practices, and avoid or minimize any incidental impacts.

Regional and Local

The study area encompasses all counties and cities throughout California. Each county and city has local regulations and a general plan with unique goals and policies that guide development and encourage the consideration of aquatic biological resources. County-specific regulations are implemented in accordance with federal and state regulations.

3.6.4 Impacts and Mitigation Measures

Methods of Analysis

Aquatic biological resource impacts from the types of restoration projects permitted under the Order are evaluated in terms of how typical construction and operation of project components could impact existing aquatic resources. However, the precise locations and detailed characteristics of potential future individual restoration projects are yet to be determined. Therefore, this aquatic biological resources analysis focuses on reasonably foreseeable changes from implementation of the types of projects and actions that might be taken in the future consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are considered those that would continue through the life of a project as a result of the environmental conditions caused by restoration projects permitted under the Order (e.g., new infrastructure such as fish screens or cofferdams). Temporary impacts are considered those that would be temporary in nature (e.g., construction-related activities).

The approach to assessing aquatic biological resource impacts was to identify and review existing environmental studies, data, model results, and other information for projects that are consistent with those identified in Section 2.6, *Categories of Restoration Projects in the Order*, and Section 2.7, *Typical Construction, Operation, and Maintenance Activities and Methods*.

Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, an impact related to aquatic biological resources is considered significant if the types of projects that would be permitted under the Order would do either of the following:

- Have a substantial adverse effect, either directly or through habitat modifications, on any fish species identified as a candidate, sensitive, or special-status fish species in local or regional plans, policies, or regulations, or by CDFW or USFWS
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites

Impacts related to the following significance thresholds are addressed in Section 3.5, *Biological Resources—Terrestrial*:

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by CDFW or USFWS
- Have a substantial adverse effect on state and federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan

Impacts and Mitigation Measures

Table 3.6-1 summarizes the impact conclusions presented in this section for easy reference.

As part of the State Water Board or Regional Board's issuance of a NOA for a restoration project under the Order, compliance with the general protection measures and mitigation measures listed below would be required when applicable to a given project. Not all general protection measures and mitigation measures would apply to all restoration projects. The applicability of the general protection measures and mitigation measures would depend on the individual restoration activities, project location, and the potentially significant impacts of the individual restoration project. Implementation of the mitigation measures would be the responsibility of the project proponent(s) under the jurisdiction of the State Water Board, appropriate Regional Board, or other authorizing regulatory agency.

Table 3.6-1
Summary of Impact Conclusions—Biological Resources–Aquatic

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
3.6-1: Implementing future restoration projects permitted under the Order could result in substantial adverse effects to special-status fish species directly, or indirectly through habitat modifications.	SU	LTSG
3.6-2: Implementing future restoration projects permitted under the Order could result in substantial adverse direct effects on the movement of native resident or migratory fish.	LTS	B

SOURCE: Data compiled by Environmental Science Associates in 2019 and 2020

NOTES: B = beneficial; LTS = less than significant; LTSG = less than significant with implementation of general protection measures

Impact 3.6-1: Implementing future restoration projects permitted under the Order could adversely affect special-status fish species directly, or indirectly through habitat modifications.

Effects of Project Construction Activities

Physical Disturbance

In-water aquatic habitat may be physically disturbed during construction of restoration projects permitted under the Order, from activities such as dewatering, excavation, fill, and placement of materials. This disturbance could affect the juvenile and adult life stages of special-status fish species by causing direct injury or mortality, or by displacing fish or disrupting their normal behaviors. The size and extent of in-water construction activities would vary by the restoration objective. However, most of these activities would be discrete, affecting only localized areas.

Juvenile and adult fishes may be able to detect areas of construction disturbance (e.g., changes in sound, pressure, sheer) and move to adjacent areas of suitable habitat, if present and available, as equipment enters the water. The river bottom would only be temporarily disturbed and subject to associated turbidity at a given time by placement or removal of structures (e.g., culverts, bridges, fish screens, ladders, pilings); removal of small dams, tide gates, flood gates, or legacy structures; placement of bioengineered stabilization materials; breaching of tidal habitat; or installation of cofferdams during construction. Therefore, juveniles would be able to move elsewhere in the channel (or upstream or downstream) to avoid direct disturbance and potential injury or death. Juvenile and adult fishes would likely move to adjacent areas of suitable habitat areas before equipment enters the water. In addition, habitat isolation and fish relocation activities would safely remove fish from the area (see *Dewatering and Fish Relocation Activities* below) before the start of other water-disturbing activities. Therefore, construction-related impacts on juvenile and adult fishes are unlikely.

Smaller projects, such as placement or removal of structures and bank stabilization projects, would likely affect only a portion of a stream's or river's width. By contrast, larger restoration efforts with extensive in-water work (e.g., enhancement of spawning

gravels, extensive instream habitat enhancement) may have much larger construction footprints, making them more difficult for special-status fish species to avoid. Instream construction work for larger projects—particularly those involving operation of heavy equipment and removal and placement of materials—would likely cause temporary stress on juvenile and adult special-status fish species, disturbing them and requiring them to avoid and/or relocate from the disturbance area.

Even during construction of projects with a larger footprint, fish that use the locations of proposed habitat modifications should generally be able to avoid these areas, moving away from them either temporarily during construction activities. Fish would be more likely to relocate during lengthier disturbances, such as the repeated addition of gravel to an area or excavation/disturbance of a large area to modify fish habitat. Juvenile fish may experience increased predation risks while they search for new holding/rearing areas.

In-water construction activities would not likely occur as part of multiple other types of project types, such as floodplain and off-channel restoration. Construction work would typically occur during the dry season, when seasonally inundated areas are dry, thus avoiding or minimizing potential in-water impacts for these project types.

Juvenile fishes are expected to avoid areas where equipment would place or excavate material or remove or install in-water structures. Still, some juveniles may attempt to find shelter in the substrate and could be injured or killed by equipment. Instream and off-channel enhancement may require applying gravel directly to the riverbed, grading the material, placing river crossings at some sites, and using heavy equipment in the river. These activities would increase the likely exposure of, and chance of adverse impacts on, listed juveniles in the area.

Juvenile special-status fishes of all species practice avoidance behavior, the areas affected by construction would be small at most sites, and the number of juveniles present in construction areas would be limited given the lack of suitable habitat. Therefore, the number of juveniles that would be injured or killed as a result of physical disturbance is expected to be low.

To reduce the impacts of project construction activities during in-water work, the Order includes the following general protection measures (see Appendix E):

- GPM-2: Construction Work Windows
- IWW-2: In-Water Vehicle Selection and Work Access
- IWW-3: In-Water Placement of Materials, Structures, and Operation of Equipment
- IWW-4: In-Water Staging Areas and Use of Barges

Additionally, projects with in-water work would be conducted consistent with the following species protection measures (see Appendix F).

- SPM-3: Species Protection Construction Work Windows
- FISH-1: Habitat Disturbance Avoidance and Minimization.
- FISH-2: Habitat Assessment and Surveys
- FISH-3: Fish Capture and Relocation
- FISH-4: Reporting

Based on the analysis presented above for all special-status fish species and consistent with analyses presented in the NMFS Restoration PBOs for anadromous fish species, by implementing these general protection measures and species protection measures during in-water work, restoration projects would avoid or minimize potential impacts of physical disturbance on special-status fish species.

Release and Exposure of Sediments and Turbidity

All types of restoration projects requiring ground disturbance in or adjacent to streams or wetlands could increase turbidity and levels of suspended sediment within the project worksites and downstream. The resuspension and deposition of instream sediments would be an indirect impact of operating construction equipment and excavating and placing materials in the river. Short-term increases in turbidity and suspended sediment levels during construction may negatively affect fish populations and other aquatic organisms temporarily by reducing the availability of food, reducing feeding efficiency, and increasing the exposure of fishes to sediment released into the water column.

Short-term increases in turbidity could occur during either dewatering or construction, or both. Research with salmonids has shown that high turbidity concentrations can reduce feeding efficiency and food availability, deplete dissolved oxygen in the water column, diminish respiratory function and disease tolerance, and cause fish mortality (Berg and Northcote 1985; Gregory and Northcote 1993; Velagic 1995; Waters 1995). Even small pulses of turbid water could cause multiple species of fish to disperse from established territories (Waters 1995), which could displace fish into less suitable habitat or increase competition and predation, thus reducing their chances of survival.

However, much of this research focused on turbidity levels much higher than those that would likely result from restoration activities permitted under the Order, especially with implementation of the general protection measures. In addition, when small volumes of sediment are added to stream channels infrequently, the streams may not experience dramatic morphological changes (Rogers 2000).

Elevated sediment and turbidity concentrations from the proposed restoration projects would not likely be severe enough to cause the injury or death of listed juvenile fishes. Rather, the anticipated minor levels of turbidity and suspended sediment generated by instream restoration projects permitted under the Order would likely affect fish behavior only temporarily.

Sediment generated by each individual project would likely affect only the immediate footprint of the project site and habitat immediately downstream. For example, studies of sediment impacts from culvert construction determined that the levels of sediment that had accumulated in the streambeds returned to control levels 358–1,442 meters downstream of the culverts (LaChance et al. 2008). Many construction activities for the projects permitted under the Order would be expected to have similar sediment impacts.

Construction-induced turbidity plumes would extend downstream of the in-water activity, affecting the behavior of fish in the area of impact. In-stream activities will have large variation in turbidity concentration and plume size. In-stream construction that may generate the greatest turbidity plumes, such as dredging activities needed for creation

of floodplain habitat or wetlands, could create temporary plumes of total suspended sediment that extend up to 1,500 m at concentrations up to 1,100 mg/L (Wilber and Clarke 2001). However, most restoration projects would create much smaller turbidity plumes at lower turbidity concentrations.

Larger restoration efforts that may involve extensive in-water work (e.g., enhancement of spawning gravels, bank stabilization, or wetland restoration) may result in greater turbidity or sedimentation impacts. However, several in-water general protection measures described below, such as cofferdam construction and sediment containment activities, would minimize these potential impacts during construction.

To reduce the impacts of project construction activities during in-water work to minimize the mobilization of sediment, the Order includes the following general protection measures (see Appendix E):

- IWW-1: Appropriate In-Water Materials
- IWW-3: In-Water Placement of Materials, Structures, and Operation of Equipment
- IWW-5: Cofferdam Construction
- IWW-11: Sediment Containment during In-Water Pile Driving
- IWW-13: Dredging Operations and Dredging Materials Reuse Plan

Additionally, projects with in-water work would be conducted consistent with the following species protection measures (see Appendix F).

- SPM-3: Species Protection Construction Work Windows
- FISH-1: Habitat Disturbance Avoidance and Minimization
- FISH-2: Habitat Assessment and Surveys
- FISH-3: Fish Capture and Relocation
- FISH-4: Reporting

With these general protection measures and species protection measures, downstream sediment impacts of the proposed restoration projects should extend downstream for a distance consistent with the range identified by LaChance et al. (2008) as described above for all special-status fish species and consistent with analyses presented in the NMFS Restoration PBOs for anadromous fish species. In addition, the limited temporal and spatial scale at which many project activities would occur would likely preclude significant sediment-related impacts.

Noise, Motion, and Vibration Disturbance

Several types of restoration projects permitted under the Order could generate noise, motion, and vibration from the use of heavy equipment, including pile driving and/or through the use of explosives for small dam removal.

Hydrostatic pressure waves and vibration generated by pile driving can adversely affect all life stages of fish and other aquatic organisms. Hydrostatic pressure waves may rupture the swim bladders and other internal organs of all life stages of fish, and could permanently injure their inner ears and lateral line organs (Hastings and Popper 2005). These injuries could reduce the ability of fish (including special-status fish species) to

orient in the water column, capture prey, and reduce the ability of fish to avoid predators (California Department of Transportation (Caltrans) 2009).

Heavy equipment would be expected to operate primarily outside the active channel (or in isolated and dewatered areas), and would be present in the wetted channel only infrequently and for short periods. Thus, noise, motion, and vibration disturbance from the use of this equipment would be infrequent and occur over short durations.

For projects where pile driving is required, there could be periods of time when the underwater sound levels exceed injury and harm thresholds established by NMFS. To avoid direct physical injury, pile driving should be conducted using vibratory or non-impact techniques and during periods when special-status species (or their most sensitive life stages) are least likely to be present, and be managed (through operational controls) to be lower than a single-strike sound levels of less than 206 decibels (dB) peak (dB^{peak}) and 183 dB (fish less than 2 grams) and 187 dB (fish greater than or equal to 2 grams) sound exposure level (dB^{SEL}) measured at a distance of 10 meters (Fisheries Hydroacoustic Working Group 2008).

To reduce the impacts of project construction activities during in-water pile driving, the Order includes the following general protection measures (see Appendix E):

- IWW-9: In-Water Pile Driving Plan for Sound Exposure
- IWW-10: In-Water Pile Driving Methods
- IWW-11: Sediment Containment during In-Water Pile Driving
- IWW-12: Pile-Driving Monitoring

Additionally, projects with in-water work would be conducted consistent with the following species protection measures (see Appendix F).

- SPM-3: Species Protection Construction Work Windows
- FISH-1: Habitat Disturbance Avoidance and Minimization
- FISH-2: Habitat Assessment and Surveys
- FISH-3: Fish Capture and Relocation
- FISH-4: Reporting

Consistent with the analyses presented in the NMFS Restoration PBOs, implementing these general protection measures and species protection measures would ensure that restoration projects permitted under the Order would avoid or minimize noise, motion, and vibration impacts on aquatic biological resources. Underwater noise levels would be reduced to below thresholds for injury and the potential for sediment releases would be minimized. Most special-status fish species would be able to avoid interacting with instream machinery by temporarily relocating either upstream or downstream into suitable habitat adjacent to the worksite.

As described in Chapter 2, the use of explosives for removal of a small dam must be justified by site-specific conditions including equipment access difficulties. The use of explosives must occur in dry or dewatered conditions and potential harm to special-status species from the explosives blast and pressure waves must be analyzed. Using explosives is an eligible activity; however, this approach would also require additional review and approval by appropriate regulatory agencies.

Disturbance of Riparian Vegetation

Riparian forest and scrub is an important component of the land/water interface between aquatic and terrestrial ecosystems, contributing to the quality of aquatic habitat for native fish species by providing shade, instream cover, and food to fishes. Potential construction activities (e.g., removing or adding structures, modifying the morphology and topography of streams and banks) may alter bank and riparian habitat through removal of native and nonnative vegetation, excavation, and grading. Numerous other project types, such as restoring off-channel, floodplain, wetland, or riparian habitat, would create additional riparian vegetation that would enhance fish habitat.

To avoid and/or minimize potential impacts on riparian vegetation during project construction activities, the Order includes the following general protection measures (see Appendix E):

- VHDR-1: Avoidance of Vegetation Disturbance
- VHDR-2: Native and Invasive Vegetation Removal Materials and Methods
- VHDR-3: Revegetation Materials and Methods
- VHDR-4: Revegetation Erosion Control Materials and Methods
- VHDR-5: Revegetation Monitoring and Reporting
- VHDR-6: Herbicide Use
- VHDR-7: Herbicide Application Planning
- VHDR-8: Herbicide Application Reporting

The general protecting measures identified above, would ensure, to the extent feasible, that disturbed riparian areas would be revegetated with native plant species and mulched with certified weed-free hay. Revegetation and mulching would be timed to maximize survival, but would occur within a year after completion of construction work. Restoration projects would result in both the indirect and direct loss of riparian vegetation. An indirect impact would result from creating and maintaining temporary access points to the river and covering vegetation with gravel; the temporary removal of vegetation to enhance floodplains and side channels would result in a direct impact.

Most restoration projects are expected to avoid and/or minimize disturbing riparian vegetation by implementing the proposed general protection measures. In general, the goal of these projects would be to improve habitat conditions for fishes; thus, the projects would be expected to avoid riparian vegetation as practicable. However, there may be limited situations in which avoidance is not possible to meet the restoration objectives. Any loss of streamside riparian vegetation is expected to be small and temporary, given the general protection measures. Removal would be mostly limited to shrubs and smaller trees.

Using herbicides to remove invasive plant species could cause short-term impacts on special-status fish species. These potential indirect impacts include the short-term loss of shading and habitat provided by the invasive plants. To minimize these potential impacts, restoration projects would implement general protection measures that require the use of best practices (e.g., spraying practices) and herbicides and/or surfactants containing labels approving their use within or adjacent to waterways.

Based on the analysis presented above for all special-status fish species, which is consistent with analyses presented in the NMFS Restoration PBOs for anadromous fish species, by implementing the general protection measures above, impacts to riparian vegetation would be avoided and/or minimized.

Release and Exposure of Construction-Related Contaminants

Heavy equipment and construction materials would be required for the construction of several types of restoration projects. Equipment refueling, fluid leakage, and maintenance activities in and near stream channels pose some risk of contamination by toxic chemicals and potential take.

In addition, water that comes into contact with wet cement and other construction materials during project construction could adversely affect water quality and may harm special-status fish species. If not properly contained, contaminants (e.g., fuels, lubricants, hydraulic fluids, construction materials) could be introduced into the water system, 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.

To reduce the impacts of project construction activities, the Order includes the following general protection measures (see Appendix E):

- WQHM-1: Staging Areas and Stockpiling of Materials and Equipment
- WQHM-2: Storm Water Pollution Prevention Plan
- WQHM-3: Erosion Control Plans
- WQHM-4: Hazardous Materials Management and Spill Response Plan
- WQHM-5: In-Water Concrete Use
- WQHM-6: Accidental Discharge of Hazardous Materials

Consistent with analyses presented in the NMFS Restoration PBOs, these general protection measures would address and minimize the risk of release of pollutants into receiving waters during project construction. Implementing these measures would minimize potential degradation of aquatic habitat and the resulting harm to all special-status fish species. Therefore, the potential impacts of projects permitted under the Order related to the release and exposure of construction-related contaminants would be minimal.

Dewatering and Fish Relocation Activities

Dewatering entails placing a temporary barrier, such as a cofferdam, to isolate the work area; rerouting streamflow around the dewatered area; pumping water out of the isolated work area; relocating fish from the work area; and restoring the project site upon project completion. The life stage of fishes most likely to be exposed to the potential impacts of dewatering would be juveniles. However, the number of juvenile fish present at a given project site may be low. Migrating adult fish may be present, but in most cases, their mobility would enable them to avoid construction areas.

Any fish present during installation of a cofferdam could be injured by the in-water construction activity itself or could become trapped behind the cofferdam. Fish trapped

behind a cofferdam would experience degraded water quality (e.g., higher temperatures, less dissolved oxygen). They would also become entrained in or impinged on the pumps used for dewatering, or would become stranded after dewatering is complete.

Consistent with analyses presented in the NMFS Restoration PBOs, restoration projects permitted under the Order would minimize the potential impacts of dewatering and relocating fish by implementing the following general protection measures (Appendix E) and species protection measures (Appendix F), which require best practices for dewatering and fish relocation:

protection measures:

- IWW-5: Cofferdam Construction
- IWW-6: Dewatering/Diversion Restrictions
- IWW-7: Fish and Aquatic Species Exclusion while Installing Diversion Structures
- IWW-8: Removal of Diversion and Barriers to Flow

Species protection measures:

- SPM-3: Species Protection Construction Work Windows
- FISH-1: Habitat Disturbance Avoidance and Minimization.
- FISH-2: Habitat Assessment and Surveys
- FISH-3: Fish Capture and Relocation
- FISH-4: Reporting

Populations of benthic (i.e., bottom-dwelling) aquatic macroinvertebrates may be temporarily lost or their abundance reduced when creek habitat is dewatered (Cushman 1985). However, the impacts of streamflow diversions and dewatering on aquatic macroinvertebrates would be temporary. Construction would be relatively short-lived, and macroinvertebrates would be expected to recolonize disturbed areas rapidly after re-watering (in about 1–2 months) (Cushman 1985; Thomas 1985; Harvey 1986). In addition, the project-related loss of macroinvertebrates would likely have only a negligible effect on listed fishes; streamflows would be maintained around project worksites, so food from upstream sources (via drift) would be available downstream of the dewatered areas.

Streamflow diversions and dewatering of project work areas are expected to cause the temporary loss, alteration, and reduction of aquatic habitat for juvenile fishes. These sites would be restored before project completion with implementation of general protection measure IWW-8 (Removal of Diversion and Barriers to Flow) and would ultimately be enhanced by the restoration projects. Project-related flow fluctuations outside of dewatered areas should be small, gradual, and short-term, and are not expected to harm special-status fish species.

Impact Conclusion

Special-status fish species may be present in the study area, and the construction of restoration projects permitted under the Order has the potential to disturb habitat for these species. Therefore, this impact would be **potentially significant**.

However, to be eligible for the Order, restoration projects would be required to include all applicable general protection measures (see Appendix E).

As described above, implementing the following general protection measures would avoid and/or minimize construction impacts on special-status fish species:

- GPM-2: Construction Work Windows
- GPM-3: Construction Hours
- GPM-4: Environmental Awareness Training
- GPM-5: Environmental Monitoring

In addition, as identified in the preceding impact discussions, general protection measures and species protection measures would be implemented to minimize the following specific impacts on listed fishes:

- *Physical disturbance:* IWW-2 through IWW-4, SPM-1, FISH-1 through FISH-5
- *Mobilization of sediment:* IWW-1, IWW-3, IWW-5, IWW-11, and IW-13, SPM-1, FISH-1 through FISH-5
- *Noise, motion, and vibration disturbance:* IWW-9 through IWW-12, SPM-1, FISH-1 through FISH-5
- *Disturbance of riparian vegetation:* VHDR-1 through VHDR-13
- *Chemical contamination from equipment fluids:* WQHM-1 through WQHM-6
- *Dewatering and fish relocation:* IWW-5 through IWW-8, SPM-1, FISH-1 through FISH-5

Implementing restoration projects permitted under the Order could result in construction-related disturbance and associated impacts on special-status fish species. However, the general protection measures and species protection measures identified above would avoid and/or reduce potential impacts to a **less-than-significant** level.

The only exception would be for the use of explosives for small dam removal. As described in Chapter 2 and above, in order to be considered a project eligible for the Order, the use of explosives for small dam removal would have to be justified due to site-specific conditions, including equipment access difficulties. Further, the use of explosives must be conducted in dry or dewatered conditions and potential harm to fish from the explosives blast and pressure waves would need to be analyzed. Incorporation of general protection measures and species protection measures identified above would avoid and/or reduce in most cases, however, because the exact details of blasting is yet to be determined for a given project, analysis this type of activity is not possible at this time. As a result, the use of explosives for small dam removal would be a **significant and unavoidable impact**.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Most long-term impacts on aquatic biological resources of implementing the restoration projects permitted under the Order should be beneficial, because the specific purpose of these projects would be to restore or enhance existing conditions. Overall, completing

the activities permitted under the Order would be expected to increase the quality and quantity of habitat for special-status fish species:

- Constructing fish passage facilities and/or removing legacy structures would enhance migratory habitat for adult and juvenile fishes.
- Completing bioengineered bank stabilization projects and revegetating with native plants would enhance riparian habitat important for juvenile rearing and food production.
- Enhancing or creating floodplain, wetland, off-channel, instream, and riparian habitat would increase the complexity of habitat on project sites and serve to enhance the habitat available for a range of life stages of special-status fish species.

However, some restoration projects could result in adverse long-term impacts on aquatic biological resources. The beneficial impacts of the restoration projects are described in detail below, followed by a discussion of the potential adverse impacts.

Beneficial Impacts of Restoration Projects

For all types of restoration projects permitted under the Order, the resulting restored and/or enhanced habitat is expected to have beneficial impacts on aquatic resources. The following sections describe the anticipated benefits for each project type.

Stream Crossing and Fish Passage Improvements

Modifying instream barriers for fish passage improvement projects would improve fish passage and increase access to suitable habitat. These projects would result in long-term beneficial impacts by improving passage at sites that are partial barriers, or providing passage at sites that are total barriers. In both instances, the project work would improve fish passage and increase access to available habitat.

Reestablishing linkages between migratory habitat in mainstem waters and spawning/rearing habitat in headwaters, including tributaries, would greatly facilitate the recovery of fishes in many regions throughout the study area. Reintroducing special-status fish species into previously unavailable upstream habitat would also likely increase the species' reproductive success, ultimately helping to increase fish population sizes in watersheds where the amount of quality freshwater habitat may be a limiting factor.

Removal of Small Dams, Tide Gates, Flood Gates, and Legacy Structures

Similar to stream crossing and fish passage improvement projects, projects to remove legacy structures would improve fish passage and increase their access to suitable habitat. These projects would result in long-term beneficial impacts by improving movement at sites that are partial barriers, or providing passage at sites that are total barriers. Removing man-made structures may also reduce the habitat available for predators, potentially lessening the predation risk for listed fish species.

Bioengineered Bank Stabilization

Bioengineered streambank stabilization projects would reduce ongoing sedimentation from bank erosion, lessen turbidity levels, and improve long-term water quality for fishes. Reducing the amount of sediment delivered to streams would improve fish habitat and survival by increasing the survival of fish embryos and alevins in spawning gravels/ beds, reducing injury to juveniles from high concentrations of suspended sediment, and minimizing the loss of quality and quantity of pools from excessive sediment deposition.

Restoration and Enhancement of Off-Channel/Side-Channel Habitat

Instream habitat structure and improvement projects would enable fish to escape from predators. These projects would provide resting cover, increase spawning habitat, improve upstream and downstream migration corridors, improve pool-to-riffle ratios, and add habitat complexity and diversity. Some structures would be designed to reduce sedimentation, protect unstable banks, stabilize existing slides, provide shade, and create scour pools. Instream habitat structures such as woody material and boulders contribute to habitat diversity and create and maintain foraging, cover, and resting habitat for both adult and juvenile anadromous and resident special-status fish species. Placing instream woody material on the banks of the active channel would create instantly available habitat by creating diverse cover for juvenile rearing.

Restoration activities would improve the quality of spawning habitat over the long term. Spawning habitat would be improved because various types of erosion control would reduce the amount of sediment that would enter the stream in the long term. In addition, augmenting gravels would increase the amount of spawning habitat available.

Water Conservation Projects

Water conservation projects such as offstream storage tanks and ponds, including projects with necessary off-channel infrastructure to reduce low-flow stream diversions, would provide benefits to fish that experience habitat limitations during low-flow periods.

Floodplain Restoration

Projects to restore floodplains would enhance the availability of food and habitat for many species of rearing juvenile fishes. The water that resides in and flows from Central Valley floodplains is rich in plankton, coarse organic matter, and other sources of food for riverine and estuarine fishes and insects. Therefore, floodplains improve the productivity of rivers, promoting healthy and abundant fish populations.

Removal of Pilings and Other In-Water Structures

Like removal of legacy structures, removal of artificial structures may improve fish passage and access to suitable habitat, and may reduce the habitat available for predators, potentially lessening the predation risk for special-status fish species.

Removal of Nonnative Invasive Species and Revegetation with Native Plants

Removing nonnative terrestrial and aquatic invasive species and revegetating with native plants improves aquatic, riparian, and wetland habitat for fish and wildlife in a variety of ways. These types of projects would improve the composition, structure, and

abundance of native biological communities important for bank stability, stream shading, the riparian canopy, and understory establishment and diversity; input of large wood and other organic material into streams; and other ecological benefits, all of which are important elements of species habitat and water quality.

This project type also includes removal and/or management of nonnative predatory fish and other nonnative fish and wildlife, as long as the activity is associated with a restoration project. These activities would have the potential to increase the survival of native special-status species, especially in cases where predatory fish and predation are an important stressor to special-status species.

Establishment, Restoration, and Enhancement of Tidal, Subtidal, and Freshwater Wetlands

Like floodplain restoration projects, wetland restoration projects would provide enhanced food and habitat for rearing juvenile fishes. Wetlands are nurseries for juvenile fish and provide habitat for small fishes that use the edges of wetlands to feed and avoid predation by larger fish.

Establishment, Restoration, and Enhancement of Stream and Riparian Habitats

Like native plant revegetation project types, stream and riparian restoration projects would enhance native riparian forests or communities, provide increased cover (large wood, boulders, vegetation, and bank protection structures), and provide a long-term source of all sizes of instream wood.

Adverse Impacts of Operations and Maintenance

As described above, most impacts of constructed facilities and operations and maintenance for restoration projects permitted under the Order would be beneficial. However, temporary impacts could occur during maintenance activities for projects that would leave infrastructure at project sites after construction (e.g., stream crossings and fish passage improvements and water conservation projects) would require operations and maintenance of those structures, which could lead to limited, ongoing adverse impacts on special-status fish species. Such maintenance activities could result in impacts similar to those described above in the *Effects of Project Construction* section, although they would be reduced in magnitude and duration relative to the impacts of project construction. Maintenance activities could include sediment removal within or near the facilities, vegetation removal, and inspection and maintenance of facilities. These activities may lead to temporary mobilization of sediment, ground disturbance, chemical contamination, or vegetation removal. Overall, this impact would be **potentially significant**.

Implementing the general protection measures described in the *Project Construction* section above would reduce or further reduce potential impacts to a **less-than-significant** level.

Impact 3.6-2: Implementing future restoration projects permitted under the Order could result in adverse direct effects on the movement of native resident or migratory fish.

Effects of Project Construction Activities

Project construction activities could temporarily affect fish movement. For example, installing a cofferdam to facilitate construction would have the potential to temporarily impede or delay migrating adults, limiting their ability to reach spawning and/or rearing areas. Installing a cofferdam could also hinder migration of juveniles, potentially exposing them to increased predation and unsuitable aquatic habitat conditions.

Instream construction activities also could impede upstream passage of fishes by causing altered hydrologic conditions, such as temporarily increased velocities. However, because cofferdams typically do not block the entire width of affected waterways, the movement of juvenile or adult fishes are unlikely to be substantially affected.

Riparian corridors and rivers often serve as the main routes for movement and migration of numerous fish and wildlife species. Thus, the loss, fragmentation, or alteration of riparian and riverine habitats could limit access to habitats for breeding (e.g., seasonal spawning areas for fish), rearing, foraging, and other needs. However, impacts on riparian vegetation from construction activities are expected to be temporary, limiting the impact on fish movement.

Implementing restoration projects permitted under the Order could result in construction-related impacts on fish movement, but the impacts are expected to be minimal and temporary. Therefore, the impact of project construction activities on fish movement would be **less than significant**. The Order does not include any general protection measures applicable to this impact.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

The long-term effects of restoration projects permitted under the Order on fish movement are expected to be beneficial or neutral. The specific purpose of all project types would be to restore and enhance existing conditions that contribute to degradation of fish habitat. Removing artificial structures, improving fish passage, restoring habitat, and revegetating with native plants would all provide benefits for the migration of native fishes, either by directly creating new passage or by indirectly creating more suitable habitat, thus providing an improved migratory corridor for fish.

Therefore, impacts on fish movement from construction of facilities and operations and maintenance of restoration projects permitted under the Order would be **beneficial**. The Order does not include any general protection measures applicable to this impact.