APPENDIX C: ERP Topic Areas, Project Types, Ecosystem Elements, and Water Quality Constituent Descriptions

Note: This appendix is provided to help the applicant fill in Lines numbered 14-17 in Section 1: Summary Information of the ERP Proposal Application Form.

Topic Area

The “primary” choice should reflect the best overall topic area that the project addresses, and if there are other topic areas that the project addresses, then choose those as “secondary.” You can choose only one primary (1) project type, but you can list additional project types as secondary (2) choices. Topic areas are used to sort projects into more descriptive labels that give a better overall view of what the ERP is accomplishing. Topic areas are used in the annual report and program plan to describe our accomplishments. They can also be used to sort proposals for review.

- **At-Risk Species Assessment:** This category includes research and monitoring projects that provide information on the status or life history of at-risk species, including aquatic and terrestrial, plant and animal species. Refer to the Multi-Species Conservation Strategy for list of at-risk species *http://www.dfg.ca.gov/erp/reports_docs.asp*
    - Carcass surveys
    - Monitoring
    - Captive breeding
    - Genetic comparisons
    - Life history studies
    - Effects of stressors on at-risk species (including pumps)
- **Ecosystem Water and Sediment Quality:** This category includes projects that investigate causes and effects of contaminants, sediment or oxygen depleting substances that may affect the aquatic or terrestrial ecosystems or humans. It also includes projects that seek to control sources of contaminants, sediment, or oxygen depleting substances, and projects that investigate constituents of concern for drinking water supplies (organic carbon, salinity, and pathogens).
    - Research to identify sources, or investigate transport or biogeochemical cycling of contaminants
    - Research or monitoring to investigate potential or actual effects of contaminants on humans, aquatic or terrestrial wildlife
    - Development and implementation of best management practices or education to reduce sources of contaminants, including agricultural or urban sources (such as stormwater)
    - Investigation of sources, cycling, effects or monitoring of nutrients and other oxygen depleting substances
    - Projects that investigate the potential impacts of restoration on water quality, including mercury exposure and organic carbon sources and cycling
    - Projects related to fish contamination, including data collection and analysis, fish consumption studies and public outreach and education regarding fish contamination issues
    - Projects that provide interagency or stakeholder collaboration on water quality, sediment quality or fish contamination issues, including workshop or seminar development

    - Projects that investigate sources of sediment and/or implement management practices that reduce sediment loads, such as fine sediments that could clog spawning gravels, or contaminated sediments that may affect aquatic life
- **Environmental Water Management:** This category includes projects that increase in-stream flow of the tributaries to the Sacramento and San Joaquin Rivers to benefit fish and ecological processes.
    - Water acquisition
    - Reimbursing for foregone power
    - Operational changes
    - Groundwater exchange
    - Water use efficiency improvements
    - Research, modeling and monitoring for environmental water management
- **Estuary Foodweb Productivity:** This category includes research and monitoring projects that increase our understanding of foodweb dynamics and the factors that affect the foodweb, particularly the decline in productivity in the estuary.
    - Research on how introduced species have affected foodweb dynamics
    - Monitoring and research to determine effects of decline in productivity (such as contaminants)
    - Monitoring and research to determine effects of organic carbon and nutrient sources both internal and external to the estuary
    - Monitoring and research to understand how hydrodynamics or other environmental factors affect food web dynamics in the estuary
- **Fish Passage:** This category includes projects that investigate, plan, or implement activities related to improving fish passage, including removal of natural or constructed barriers or providing passage over barriers.
    - Removal of natural or constructed barriers to upstream migration
    - Removal of dams
    - Provide passage over barriers, such as fish ladders
    - Monitoring, including pre- and post-project monitoring to determine effectiveness
- **Fish Screens:** This category includes projects that provide research, planning, construction, and monitoring of fish screens.
    - Research related to fish screens and fish screen design
    - Planning, design or construction of fish screens
    - Consolidating or relocating diversions
    - Monitoring, including pre- and post-project monitoring to determine effectiveness
- **Harvestable Species Assessment:** Research and monitoring that provide information on the status or life history of harvestable species, including aquatic and terrestrial species. Refer to manual for list of harvestable species or to the species field in the database.
    - Creel surveys or population studies
    - Carcass surveys
    - Monitoring

    - Captive breeding
    - Life history studies
    - Effects of stressors on harvestable species
- **Hydrodynamics, Sediment Transport and Flow Regimes:** This category includes research, monitoring and modeling projects to increase understanding of flows, hydrodynamics, sediment transport and flow-related factors.
    - Research on sediment transport and modeling
    - Studies of hydrodynamics and geomorphic flow controls
    - Studies of flow regimes and effects of flow regimes
    - Hydrologic studies
    - Studies on gravel augmentation
    - Effects of climate change and modeling
    - Studies about hydrologic/biologic relationships related to flows
    - Research on hydrologic/salinity relationships related to flows
    - Research on hydrologic/temperature relationships related to flows
- **Local Watershed Stewardship:** This category includes projects that are planned or implemented using a community based stakeholder approach. It includes projects that develop or support watershed groups and provide community participation in development, implementation, and monitoring of land management or local restoration projects.
    - Development and support of local watershed groups (capacity building)
    - Education on stewardship and watershed responsibility
    - Supporting local group in the development and implementation of best management practices for land management, local restoration projects
    - Develop and implement local watershed plans
- **Lowland Floodplains and Bypasses:** This category includes actual acquisition, planning, or implementation of floodplains and bypasses, including levee habitat enhancement, levee breaches, and levee setbacks. The main focus of this category is in the lowland areas such as the Delta.
    - Setback levees to create floodplains
    - Levee breaches to create floodplains
    - Acquisition of floodplain land or easements
    - Planning for a specific flood management project
    - Creation of floodplains and bypasses
    - Floodplain restoration
    - Removing choke points for flood management
    - Habitat enhancement of existing levees
    - Monitoring, including pre- and post-project monitoring to determine effectiveness
- **Mine Remediation:** This category includes projects that plan, evaluate, construct, or monitor remediation activities at mine sites affecting water quality in the Bay-Delta. It may also include research or pilot projects to investigate remediation techniques or best management practices.
    - Planning, analysis, or implementation of remediation activities at mine sites

    - Monitoring, including pre- and post-project monitoring to determine effectiveness
    - Research or demonstration to develop new remediation or management techniques and test their effectiveness
    - This category would not include general investigation of sources or cycling of contaminants from mines (see Ecosystem Water and Sediment quality), but would include investigation of a specific mine site
- **Non-native Invasive Species:** This category includes projects that develop or implement practices to prevent or eradicate non-native invasive species (NIS). It also includes projects that provide research, surveys, or monitoring that improve the understanding of non-native invasive species, their life histories, and effects on native food webs.
    - Species surveys and research that improve the understanding of non-native invasive species life histories and their effects on the food webs in the Bay-Delta
    - Full-scale, pilot/demonstration projects designed to prevent the introduction or eradicate non-native invasive species
    - Studies focused on the efficiency of management practices and control programs for non-native invasive species
    - Projects that generate information/data on how to manage restoration activities including the differing physical manipulations to prevent colonization of non-native invasive species
    - Monitoring, including pre- and post-project monitoring to determine effectiveness
    - Education projects of general public or specific audiences (i.e. ship captains) designed to prevent the spread of NIS
- **Riparian Habitat:** This category includes projects that enhance or protect riparian areas that are not specifically designed to restore channels or floodplains, including activities such as revegetation and bank stabilization. This category includes terrestrial habitat categories for areas adjacent to waterways such as shaded riverine aquatic habitats, riparian scrub, woodland, and forest habitat in the riparian zones. Projects that are more specifically designed to be floodplains and are in the lower watershed should be categorized as “Lowland Floodplains and Bypasses.”
    - Protection of riparian areas by fee title or easement
    - Protection of riparian areas by implementation of best management practices, such as fencing, erosion control, or riparian setbacks
    - Enhancement of riparian areas by revegetation, management activities, bank stabilization, etc.
    - Research on physical/biological mechanisms of the riparian community
    - Includes terrestrial habitat categories for areas adjacent to waterways, including riparian scrub, woodland, and forest habitat
    - Includes aquatic habitat categories that are directly affected by the riparian vegetation, such as shaded riverine aquatic (SRA) habitat
    - Monitoring, including pre- and post-project monitoring to determine effectiveness

- **River Channel Restoration:** This category includes acquisition, planning, or implementation of actions that enhance or restore river channels to provide anadromous spawning habitat or enhancing river channels to increase fish passage to spawning habitat not involving passage over barriers or barrier removal.
    - Gravel replenishment
    - Woody debris additions
    - Channel and floodplain restoration for spawning habitat
    - Sediment control projects to reduce sediment that might clog spawning gravels
    - Maintaining or protecting meander belts or river channels
    - Channel reconstruction (including land acquisition or planning)
    - Monitoring, including pre- and post-project monitoring to determine effectiveness
- **Shallow Water and Marsh Habitat:** This category includes projects that enhance or protect aquatic and marsh habitats important for fish and waterfowl. This category includes protection, enhancement, or monitoring of tidal and non-tidal shallow water aquatic habitat, tidal and non-tidal wetland habitat, seasonal wetlands that are connected with the waterways, fish habitat, slough habitat and mid-channel islands and shoals.
    - Projects that protect aquatic and wetland habitat through purchase or easement
    - Projects that enhance or restore aquatic or wetland habitat
    - Projects that monitor or assess aquatic or wetland habitat
    - Setback levees or levee breaches to create shallow water or marsh habitat
    - Includes the following aquatic habitat types: tidal perennial aquatic, non-tidal perennial aquatic, delta sloughs (both open-ended and dead-end), mid-channel islands and shoals, freshwater fish, essential fish
    - Includes the following wetland habitat types: saline emergent wetland, fresh emergent wetland, seasonal wetlands that are directly connected to the waterways
    - Monitoring, including pre- and post-project monitoring to determine effectiveness
    - Research on the physical/biological mechanisms of shallow water and marsh habitat
- **Upland Habitat and Wildlife Friendly Agriculture:** This category includes any projects that protect, enhance, or restore terrestrial habitats or seasonal wetlands that are not directly connected with the waterways. Types of habitat included in this category include: agricultural lands, agricultural lands that are seasonal wetlands, perennial grassland, inland dune scrub habitat, upland meadows and vernal pools.
    - Projects that promote or implement wildlife friendly agriculture or best management practices that promote habitat for waterfowl and upland wildlife
    - Projects that protect upland habitat by purchase or easement

    - Projects that monitor or assess upland or wildlife-friendly agriculture habitats
- **X2 (Freshwater-Seawater Interface):** This category includes projects that investigate or monitor the freshwater-seawater interface in the western Delta, known as X2 (where salinity is approx 2,000 mg/l). This includes projects that evaluate physical attributes, hydrodynamics and flows that may affect the position of the interface, as well as projects that further the understanding of ecological impacts of salinity.
    - Projects focused on improving the scientific understanding of the linkages between populations of at-risk species and inflows, especially relative to X2
    - Projects that investigate the physical, biogeochemical, and ecological processes related to freshwater-seawater interface in the bay (X2) and how the variable salinity may affect the ecosystem
    - Projects that develop methodologies to evaluate flow, sediment transport and hydrodynamic patterns related to the freshwater-seawater interface
    - Studies to understand how engineering changes in the Delta and actions in the Bay might affect X2 relationships

Project Type

The “primary” choice should reflect the best overall type choice for this project, and if there are other type choices that reflect what this project will do, then choose those as “secondary.” You can choose only one primary (1) project type, but you can list additional project types as secondary (2) choices.

- **Acquisition** – Projects that acquire land or right of way, through fee title or easement.
- **Research** – Projects that plan experiments, investigate, assess existing conditions as related to cause and effect relationships. These are projects that test hypotheses and further scientific knowledge. They could also apply to education/outreach projects depending on the scope of the project.
- **Monitoring** – Projects that collect data to determine spatial or temporal patterns or trends.
- **Planning** – Projects that develop plans for restoration, watershed management or other activities. This could also include education/outreach projects depending on the scope of the project.
- **Pilot/Demonstration** – Small-scale projects that are designed to demonstrate a specific technique or determine a particular effect.
- **Full-scale Implementation:** Full-scale projects of various sizes that implement specific restoration, watershed management or other activities.

Ecosystem Element

The “primary” choice should reflect the best overall Ecosystem Element that the project addresses, and if there are other choices that the project addresses, then choose those as “secondary.” Ecosystem Elements are used to sort projects into more descriptive labels that give a better overall view of what the ERP is accomplishing. It includes habitats, processes, and stressors. Each project can have only one primary (1) Ecosystem Element. You can list additional Ecosystem Elements as secondary (2) choices.

PROCESSES	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Bay-Delta Aquatic Foodweb	**Description:** The aquatic foodweb of the Bay-Delta ecosystem is the web of organisms through which energy transfers up though the different trophic levels from the lower level that includes the plants to the highest level that includes the fish, water birds, and marine mammals. **Vision:** The vision for the Bay-Delta aquatic foodweb is to restore primary and secondary production to levels comparable to those during the 1960s and early 1970s by enhancing productivity and reducing loss of productivity as a result of water export from the system, and in seeking to reduce or eliminate the adverse effects of introduced aquatic species. **Approaches:** • Initiate targeted research on major restoration issues, such as: 1. How to control problem invasive species such as the Asian clam (*Potamocorbula amurensis*) 2. Factors limiting the abundance of high-priority endangered species 3. Design of habitats for shallow-water tidal marsh and bypasses **Reference:** ERPP Vol. 1, pp. 100-105
Bay-Delta Hydrodynamics	**Description:** Hydrodynamic processes refer to the seasonal and daily direction and velocity of flows in Bay-Delta channels. **Vision:** The vision for hydraulic processes in the Sacramento-San Joaquin Delta is to restore channel hydraulics to conditions more like those that occurred during the mid-1960s to provide migratory cues for aquatic species, transport flows for eggs, larvae, and juvenile fish, and transport of sediment and nutrients. **Approaches:** • Restore or simulate a more natural hydrodynamic regime • Modifications to Delta inflow patterns and export operations • Restore tidal action to areas within the Bay-Delta **Reference:** ERPP Volume 1, pp. 95-99

PROCESSES	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Central Valley Streamflows	**Description:** Streamflow refers to the amount of fresh water flowing in rivers and Bay-Delta channels. Central Valley streamflows are a combination of natural discharges from surface water and groundwater and managed releases from reservoirs. **Vision:** The vision for Central Valley streamflows is to protect and enhance the ecological functions that are achieved through the physical and biological processes that operate within the stream channel and associated riparian and floodplain areas in order to assist in the recovery of at-risk species, harvested species, biotic communities, and the overall health of the Bay-Delta. **Approaches:** • Restore and protect the stream channel and floodplain processes • Develop and implement watershed management strategies and programs to protect the health of the upper watersheds • Mimic natural flow regimes **Reference:** ERPP Volume 1, pp. 53-61
Central Valley Stream Temperatures	**Description:** Water temperatures in Central Valley rivers and streams and in the Bay-Delta are determined by the natural heating and cooling process of water bodies. Water temperature is controlled by water source (i.e., dam releases, runoff, and discharges), surface water and groundwater inflow, geomorphology (e.g., depth), tides, riparian shading, water clarity, and ambient air temperature. **Vision:** The vision for Central Valley stream temperatures is to restore natural seasonal patterns of water temperature in streams, rivers, and the Delta to benefit aquatic species by protecting and improving ecological processes that regulate water temperature and reducing stressors that change water temperature. **Approaches:** • Develop stream temperature targets within the existing multipurpose water resource management framework for each watershed • Estimate the relative ecological value of streamflow and temperature for each tributary stream • Accurately monitor and rapidly evaluate streamflow and temperature for both short-term and long-term management decisions **Reference:** ERPP Vol. 1, pp. 62-70

PROCESSES	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Coarse Sediment Supply	**Description:** Natural sediments of streams, rivers, and estuaries consist of mineral and organic silts, sands, gravel, cobble, and woody debris. **Vision:** The vision for coarse sediment supply is to provide a sustained supply of alluvial sediments that are transported by rivers and streams and distributed to riverine bed deposits, floodplains, channel bars, riffles, shallow shoals, and mudflats, throughout the Sacramento-San Joaquin Valley, Delta, and Bay regions to contribute to habitat structure, function, and foodweb production throughout the ecosystem. **Approaches:** • Artificial importation of gravel and sand • Explore the feasibility of passing sediment through small reservoirs • Remove nonessential or low-value dams • Eliminate instream gravel mining on channels downstream of reservoirs, and limit extraction on unregulated channels to 50% of estimated bedload supply or less (or to levels determined not to negatively impact fish and other ecological resources) • Develop incentives to discourage mining gravel from river channels and adjacent floodplain sites • Develop programs for comprehensive sediment management in each watershed **Reference:** ERPP Vol. 1, pp. 71-79
Natural Floodplain and Flood Processes	**Description:** The term floodplain as used here means the generally flat area adjoining rivers and sloughs that is flooded by peak flows every 1.5-2 years and exceed the capacity of the channel ("bankfull discharge"). Healthy floodplains are morphologically complex, including backwaters, wetlands, sloughs, and distributaries that carry and store floodwater. **Vision:** The vision for natural floodplains and flood processes is to conserve existing intact floodplains and modify or remove barriers to overbank flooding to reestablish aquatic wetland, and riparian floodplain habitats. **Approaches:** • Widen flood bypasses or create new ones • Set levees back • Create backup levee systems, or deauthorize specific levee reaches • Construct armored notch weirs in levees and purchase flood easements to restore flood basin storage functions • Increase the frequency and duration of overbank flow onto existing floodplains **Reference:** ERPP Volume 1, pp. 87-94

PROCESSES	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Stream Meander	**Description:** Stream meander is a term used to describe the shape of the river as a sinuous or bending wave form. **Vision:** The visions for stream meander is to conserve and reestablish areas of active stream meander, where feasible, by implementing stream conservation programs, setting levees back, and reestablishing natural sediment supply to restore riverine and floodplain habitats for fish, wildlife, and plant communities. **Approaches:** • Conserve existing migration zones • Expand of stream meander corridors • Conserve upstream and bank sediment supplies • Incorporate simulated flood peaks into dam water release schedules during wet years **Reference:** ERPP Volume 1, pp. 80-86

HABITATS	
Ecosystem Element	**Description, Vision, Approaches, Reference, and Habitat Equivalents**
	General Approaches for Habitats: • Enhance • Restore • Protect
Agricultural Lands	**Description:** Agricultural Lands are included in two MSCS habitat categories: upland cropland and seasonally flood agricultural lands. Upland cropland habitat, includes agricultural lands farmed for grain and for field, truck, and other crops that are not seasonally flooded. Seasonally flooded agricultural land habitat included agricultural lands farmed for grain and rice and for field, truck, and other crops that require seasonal flooding for durations of at least 1 week as a management practice (e.g., pest control and irrigation) or are purposefully flooded seasonally to enhance habitat values for specific wildlife species (e.g., waterfowl). Upland cropland and seasonally flooded agricultural land are included in the ERP as agricultural lands (Multi-Species Conservation Strategy 2000). **Vision:** The vision for agricultural lands is to improve associated wildlife habitat values to support special-status wildlife populations and other wildlife dependent on the Bay Delta. Protecting and enhancing agricultural lands for wildlife would focus on encouraging production of crop types that provide high wildlife habitat value agricultural land and water management practices that increase wildlife habitat value and discouraging development of ecologically important agricultural lands for urban or industrial uses in the Sacramento-San Joaquin Delta and Suisun Marsh/North San Francisco Bay Ecological Management Zones. **Reference:** ERPP Vol. 1, pp. 176-179

HABITATS	
Ecosystem Element	**Description, Vision, Approaches, Reference, and Habitat Equivalents**
Delta Sloughs	**Description:** Delta sloughs are defined in the MSCS as a component of tidal perennial aquatic habitat that includes deepwater slough areas (greater than 3 meters deep from mean low low tide) and shallow slough areas (less that or equal to 3 meters deep from mean low low tide) Multi-Species Conservation Strategy 2000). Dead-end sloughs include Beaver, Hog, and Sycamore sloughs. These quiet backwaters provide essential habitat for native resident fish. Open-ended sloughs provide unique, generally low-velocity habitats and migratory pathways for many species. In addition, the adjacent riparian corridors provide habitat for wildlife and waterfowl. **Vision:** The vision for Delta sloughs is to increase the area and improve the quality of interconnected dead-end and open-ended Delta sloughs. Achieving this vision will assist in the recovery of special-status fish and wildlife populations, provide shallow water habitats for fish spawning and rearing, and provide aquatic, wetland, and riparian habitat for wildlife. Existing sloughs would be protected and enhanced and the area of tidal slough habitat would be increased. **Reference:** ERPP Vol. 1, pp. 124-127
Essential Fish Habitats	**Description:** Essential Fish Habitat (EFH) is the aquatic habitat necessary to allow for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. The salmon fishery EFH includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon. In the estuarine and marine areas, salmon EFH extends from the nearshore and tidal submerged environments to 60 km offshore. Salmon EFH excludes areas upstream of longstanding naturally impassible barriers (i.e., natural waterfalls in existence for several hundred years) (National Marine Fisheries Service 1998a). EFH is an integration of two major subdivisions: freshwater essential habitat and marine essential habitat. **Vision:** The vision for essential fish habitats is to maintain and improve the quality of existing habitats and to restore former habitats in order to support self-sustaining population: of chinook salmon. **Reference:** ERPP Vol. 1, pp. 164-167

HABITATS	
Ecosystem Element	**Description, Vision, Approaches, Reference, and Habitat Equivalents**
Freshwater Fish Habitats	**Description:** Freshwater fish habitats complement the other habitats described in ERPP Volume 1. In general, the freshwater fish habitat designations are based on a hierarchical classification system (Moyle and Ellison 1991) developed to provide a structure for conservation efforts and is based on fish distribution and endemism. This classification system has additional utility as it assumes that observations of fishes are representative of less well-known aquatic organisms such as insects and amphibians. **Vision:** The vision for freshwater fish habitats is to protect existing habitat from degradation or loss, to restore degraded habitats, and restore areas to a more natural state. Freshwater fish habitat will be increased to assist in the recovery of special-status plant, fish, and wildlife populations. Restoration will provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta. **Reference:** ERPP Vol. 1, pp. 159-163
Fresh Emergent Wetland	**Description:** Fresh Emergent Wetland Habitat is included in the MSCS description of tidal freshwater emergent habitat and nontidal freshwater permanent emergent habitat. The MSCS tidal freshwater emergent habitat includes portions of the intertidal zones of the Delta that support emergent wetland plant species that are not tolerant of saline or brackish conditions. Tidal freshwater emergent habitat includes portions of the ERP delta slough, midchannel island, and fresh emergent wetland habitats. The MSCS nontidal freshwater permanent emergent habitat included permanent (natural and managed) wetlands, including meadows, dominated by wetland plant species that are not tolerant of saline or brackish conditions. Nontidal freshwater permanent emergent habitat included portions of the ERP fresh emergent wetland habitat (Multi-Species Conservation Strategy 2000). **Vision:** The vision is to increase the area and improve the quality of existing fresh emergent wetlands from degradation or loss and increase wetland habitat. Achieving this vision will assist in the recovery of special-status plant, fish, and wildlife populations, and provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta. **Reference:** ERPP Vol. 1, pp. 140-145
Inland Dune Scrub Habitat	**Description:** Inland dune scrub is associated with inland sand dunes and is limited in the ERPP focus area to the vicinity of the Antioch Dunes National Wildlife Refuge. Inland Dune Scrub Habitat is defined in the MSCS as habitat comprised of vegetated stabilized sand dunes associated with river and estuarine systems. Inland dune scrub includes the entire ERP inland dune scrub habitat (Multi-Species Conservation Strategy 2000). **Vision:** The vision for inland dune scrub habitat is to protect and enhance existing areas and restore former habitat areas. Achieving this vision will provide high-quality habitat for associated special-status plant and animal populations. **Reference:** ERPP Vol. 1, pp. 168-171

HABITATS	
Ecosystem Element	**Description, Vision, Approaches, Reference, and Habitat Equivalents**
Midchannel Islands and Shoals	**Description:** Midchannel islands and shoals are defined in the MSCS as a component of both tidal perennial aquatic and tidal freshwater emergent habitats. Tidal perennial aquatic habitat is defined as deepwater aquatic (greater than 3 meters deep from mean low low tide), shallow aquatic (less than or equal to 3 meters deep from mean low low tide), and unvegetated intertidal zone of estuarine bays, river channels and slough. Tidal freshwater emergent habitat includes portions of the intertidal zones of the Delta that support emergent wetland plant species that are not tolerant of saline or brackish conditions (Multi-Species Conservation Strategy 2000). **Vision:** The vision for midchannel islands and shoals is to increase and enhance the area and protect the quality of existing habitat for fish and wildlife dependent on the Bay and Delta. **Reference:** ERPP Vol. 1, pp. 128-132
Nontidal Perennial Aquatic Habitat	**Description:** Nontidal perennial aquatic habitat is defined as lacustrine habitat by the MSCS. This habitat includes portions of permanent bodies of water that do not support emergent vegetation and that are not subject to tidal exchange, including lakes, ponds, oxbows, gravel pits, and flooded islands (Multi-Species Conservation Strategy 2000). **Vision:** The vision for non-tidal perennial aquatic habitat is to increase the area and improve the quality of existing open-water areas to provide high-quality habitat for waterfowl and other water birds. This vision can be achieved as a component of saline and freshwater emergent wetland restorations. **Reference:** ERPP Vol. 1, pp. 119-123
Perennial Grassland	**Description:** Perennial grasslands are described in the MSCS as grasslands. Grassland is defined to include upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, including non-irrigated and irrigated pasturelands. Grassland habitat includes all of the ERP perennial grassland habitat and much more extensive annual grassland vegetation that is not addressed in the ERP (Multi-Species Conservation Strategy 2000). **Vision:** The vision is to protect and improve existing perennial grasslands and increase perennial grassland area. This vision is a component of restoring wetland and riparian habitats. Achieving this vision will provide high-quality habitat for special-status plant and wildlife populations and other wildlife dependent on the Bay-Delta. **Reference:** ERPP Vol. 1, pp. 172-175

HABITATS	
Ecosystem Element	**Description, Vision, Approaches, Reference, and Habitat Equivalents**
Riparian and Riverine Aquatic Habitats	**Description:** Riparian and riverine aquatic habitats are included in the MSCS description of valley/foothill riparian habitat. Valley/foothill riparian habitat includes all successional stages of woody vegetation generally dominated by willow, Fremont cottonwood, valley oak, or sycamore within the active and historical floodplains of low-gradient reaches of streams and rivers generally below an elevation of 300 feet. Valley/foothill riparian habitat includes portions of the ERP riparian and riverine aquatic habitat (Multi-Species Conservation Strategy 2000). **Vision:** The vision for riparian and riverine aquatic habitats is to increase their area and protect and improve their quality. Achieving this vision will assist in the recovery of special status fish and wildlife populations and provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta. The vision includes restoring native riparian communities ranging from valley oak woodland associated with higher, less frequently inundated floodplain elevations to willow scrub associated with low, frequently inundated floodplain elevation sites such as streambanks, point bars, and inchannel bars. **Reference:** ERPP Vol. 1, pp. 151-158 **Ecological Management Zones:** Sacramento-San Joaquin Delta, Suisun Marsh/North San Francisco Bay, Sacramento River, North Sacramento Valley, Cottonwood Creek, Colusa Basin, Butte Basin, Feather River/Sutter Basin, American River Basin, Eastside Delta Tributaries, San Joaquin River, East San Joaquin Basin, and West San Joaquin River. ERPP Vol. 1, p. 111
Saline Emergent Wetland	**Description:** Saline emergent wetland habitat is defined in the MSCS as saline emergent habitat. It includes portions of San Francisco, San Pablo, and Suisun bays and the Delta that support emergent wetland plant species that are tolerant of saline or brackish conditions within the intertidal zone or on lands that historically were subject to tidal exchange (i.e., diked wetlands) (Multi-Species Conservation Strategy 2000). **Vision:** The vision is to increase the area and protect the quality of existing saline emergent wetlands from degradation or loss. Wetland habitat will be increased to assist in the recovery of special-status plant, fish, and wildlife populations. Restoration will provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta. **Reference:** ERPP Vol. 1 pp. 133-139

HABITATS	
Ecosystem Element	**Description, Vision, Approaches, Reference, and Habitat Equivalents**
Seasonal Wetlands	**Description:** Seasonal wetlands are included in two MSCS habitat descriptions: natural seasonal wetland and managed seasonal wetland. Natural seasonal wetland habitat includes vernal pools and other non-managed seasonal wetlands with natural hydrologic conditions that are dominated by herbaceous vegetation and annually pond surface water or maintain saturated soils at the ground surface for a portion of the year of sufficient duration to support facultative or obligate wetland plant species. Alkaline and saline seasonal wetlands that were not historically part of a tidal regime are included in natural seasonal wetlands. Natural seasonal wetland habitat includes portions of the ERP seasonal wetlands habitat. Managed seasonal wetland habitat includes wetlands dominated by native or non-native herbaceous plants, excluding croplands farmed for profit (e.g., corn and rice), that land managers flood and drain during specific periods to enhance habitat values for specific wildlife species. Ditches and drains associated with managed seasonal wetlands are included in this habitat type. Managed seasonal wetland habitat includes portions of the ERP seasonal wetlands habitat (Multi-Species Conservation Strategy 2000). **Vision:** The vision is to increase the area and improve the quality of seasonal wetlands by restoring ecosystem processes that sustain them and reduce the effect of stressors that can degrade the quality of seasonal wetlands in order to assist in the recovery of special-status plant and animal populations and provide high-quality habitat for waterfowl, water birds, and other wildlife dependent on the Bay-Delta. **Reference:** ERPP Vol. 1, pp. 146-150
Tidal Perennial Aquatic Habitat	**Description:** Tidal perennial aquatic habitat is defined as deepwater aquatic (greater than 3 meters deep from mean low low tide), shallow aquatic (less than or equal to 3 meters deep from mean low low tide), and unvegetated intertidal (i.e., tideflats) zones of estuarine bays, river channels, and sloughs. Tidal perennial aquatic includes all or portions of the ERP tidal perennial aquatic, tidal and Delta slough, and midchannel island and shoal habitats (Multi-Species Conservation Strategy 2000). **Vision:** The vision for tidal perennial aquatic habitats is to increase the area and improve the quality of existing connecting waters associated with tidal emergent wetlands and their supporting ecosystem processes. Achieving this vision will assist in the recovery of special-status fish and plant populations and provide high-quality aquatic habitat for other fish, wildlife, and plant communities dependent on the Bay-Delta. Restoring tidal perennial aquatic habitat would also result in higher water quality and increase the amount of shallow-water and mudflat habitats; foraging and resting habitats and escape cover for water birds; and rearing and foraging habitats, and escape cover for fish. **Reference:** ERPP Vol. 1, pp. 114-118

STRESSORS	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Artificial Fish Propagation	**Description:** Five hatcheries currently produce Chinook salmon in the Central Valley. Hatchery production makes a significant contribution to commercial and sport fisheries as well as their role in providing mitigation of loss of habitats from construction large dams. However, release of large numbers of hatchery fish can pose a threat to wild Chinook stocks. **Vision:** The vision for the artificial propagation of fish is to modify existing hatcheries and hatchery practices in ways to augment salmon and steelhead populations without having detrimental effects on naturally spawning populations of salmon and steelhead. **Approaches:** • Modify existing hatchery practices **Reference:** ERPP Volume 1, pp. 519-523
Contaminants	**Description:** There are four types of contaminants, inorganic, organic, biological, and toxicity of unknown origin present in the Bay-Delta ecosystem. **Vision:** The vision for contaminants is to ensure that all waters of mainstem rivers and tributaries entering the Bay-Delta, and all waters of the Bay-Delta, are free of deleterious concentrations of toxic substances. **Approaches:** • Remediate mine wastes • Minimize boat discharges and dredging effects • Manage flows and watersheds • Restore habitats • Support existing programs for controlling agricultural and urban point and nonpoint sources **Reference:** ERPP Volume 1, pp. 504-510
Dams and Other Structures	**Description:** Dams and other human-made structures come in various forms, from the largest dam (Shasta), to small weirs on tributary streams. **Vision:** The vision for dams and other structures is to reduce their adverse effects by improving fish passage and enhancing downstream fish habitat. **Approaches:** • Remove barriers • Consolidate diversion weirs • Constructing state-of-the-art fish passage structures • Modify, remove, or reoperate structures in a manner that greatly lessens adverse affects on aquatic organisms **Reference:** ERPP Volume 1, p. 440-445

STRESSORS	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Disturbance	**Description:** Disturbance resulting from human activities can adversely affect habitat for a substantial variety of fish, wildlife, and plant communities including many special-status species and plant communities. **Vision:** The vision for disturbance is to reduce the adverse effects of boating and other recreational activities, temporary habitat disturbances, and other human activities on wildlife and their habitats in the Bay-Delta. **Approaches:** • Ensure that the locations of restored habitat takes into account adjacent land uses • Adequately buffer areas to protect against disturbance • Manage recreational activities avoid or minimize conflicts with fish and wildlife habitat **Reference:** ERPP Volume 1, pp. 530-532
Dredging and Sediment Disposal	**Description:** Dredging is a necessary activity that is conducted to maintain shipping channels and channel capacity during flood flow events. Dredge material disposal poses potential environmental problems, particularly when it contains potentially harmful constituents. **Vision:** The vision for dredging and sediment disposal in the Bay-Delta is to maintain adequate channel depth for navigation, flood control, and water conveyance while reducing the adverse effects of dredging activities on the Bay-Delta ecosystem. **Approaches:** • Support the interagency long-term management strategy for dredged materials in the San Francisco Bay • Use approximately half of the dredged material from the Bay-Delta to restore habitats and strengthen levees **Reference:** ERPP Volume 1, p. 452-454
Fish and Wildlife Harvest	**Description:** Fish and wildlife harvest includes the following categories: salmon harvest, steelhead trout harvest, striped bass harvest, white sturgeon harvest, harvest of wildlife, and illegal harvest of fish and wildlife. **Vision:** The vision for fish and wildlife harvest is to support strategies that maintain a sustainable commercial and recreational chinook salmon fishery in a manner consistent with the recovery of individual stocks; steelhead trout harvest strategies that fully protect naturally spawning stocks while redirecting harvest to hatchery-produced-stocks; the continued legal harvest of striped bass and reduction of illegal harvest, and the present white sturgeon harvest strategy, which protects the species from overexploitation while providing a sustainable trophy fishery. **Approaches:** • Increase enforcement efforts • Public education **Reference:** ERPP Volume 1, pp. 511-518

STRESSORS	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Gravel Mining	**Description:** Development throughout the Central Valley has increased the demand for aggregate used in construction. Sand and gravel mining is a valued commercial activity, but it has impaired sediment transport, gravel recruitment, and stream channel meander processes. **Vision:** The vision for gravel mining is to improve gravel transport and cleansing by reducing the adverse effects of instream gravel mining. **Approaches:** • Reduce or eliminate instream gravel extraction by relocating gravel mining operations to alluvial deposits outside active stream channels and riparian zones • Introduce gravel in deficient areas in streams until natural processes are restored to a level that will provide sufficient quantities. **Reference:** ERPP Volume 1, p. 455-460
Invasive Aquatic Organisms	**Description:** Invasive aquatic organisms are those non-native fish and invertebrates that have invaded the Bay-Delta at the expense of native species. **Vision:** The vision for invasive aquatic organisms is to reduce their adverse effects on the foodweb and on native species resulting from competition for food, habitat, and direct predation. **Approaches:** • Prevent or reduce additional introductions, • Developing a better understanding of how non-native species affect ecological processes and biological interactions • Develop effective control and eradication programs • Establish habitat conditions that favor native over non-native species **Reference:** ERPP Vol. 1, pp. 469-477
Invasive Aquatic Plants	**Description:** Weeds, or invasive plant species, are types of vegetation capable of exploiting opportunities afforded by natural or human-related disturbances in the landscape, as well as those provided by relatively undisturbed habitats. **Vision:** The vision for invasive aquatic plants is to reduce their adverse effects on native species, ecological processes, water quality, conveyance and major rivers and their tributaries. **Approaches:** • Research • Monitoring • Mapping • Control **Reference:** ERPP Volume 1, pp.461-468

STRESSORS	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Invasive Riparian and Marsh Plants	**Description:** Weeds, or invasive plant species, are organisms capable of invading relatively undisturbed habitats and exploiting opportunities provided by natural or human-related disturbances in the landscape. **Vision:** The vision for invasive aquatic organisms is to reduce their adverse effects on the foodweb and on native species resulting from competition for food, habitat, and direct predation. **Approaches:** • Prevent or reduce additional introductions • Develop a better understanding of how non-native species affect ecological processes and biological interactions • Develop effective control and eradication programs • Establishing habitat conditions that favor native over non-native species **Reference:** ERPP Vol. 1, p. 477-486
Levees, Bridges, and Bank Protection	**Description:** Levees, bridges, and bank protection structures inhibit overland flow and erosion and depositional processes that develop and maintain floodplains, and allow stream channels to meander. **Vision:** The vision for levees, bridges, and bank protection is to reduce the adverse effects of these structures in order to improve riverine and floodplain habitat conditions to assist in the recovery of State and federally listed fish species, and other fish and wildlife. **Approaches:** • Development of setback levees • Breach or remove levees so that the floodplain is setback to the natural shoreline • Modification or removal of structures in a manner that will greatly lessen adverse affects on ecological processes, habitats, and aquatic organisms **Reference:** ERPP Volume 1, p. 446-451
Non-native Wildlife	**Description:** Non-native wildlife species, such as red fox, Norway rat, and feral cat, have been sighted throughout the Sacramento and San Joaquin valleys. Non-native wildlife can greatly alter the ecosystem processes, functions, habitats, species diversity, and abundance of native plants, fish, and wildlife. **Vision:** The vision for non-native wildlife species is to implement a program to reduce the numbers of harmful non-native wildlife species (i.e., those that threaten the diversity or abundance of native species or the ecological stability of an area). **Approaches:** • Restore ecosystem processes and functions • Restore native habitats • Reduce or eliminate stressors that suppress native species **Reference:** ERPP Volume 1, pp. 491-494

STRESSORS	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Predation and Competition	**Description:** Predation and competition are natural ecological functions; however, unnatural levels of each can result in adverse effects to important sport and commercial fisheries and species of concern such as winter-run Chinook salmon. **Vision:** The vision for predation and competition is to reduce unnatural levels to restore fish populations by removing, redesigning, or reoperating in-water structures, diversion dams, and hatchery practices. **Approaches:** • Increase the area and quality of shallow water habitat to provide ecological components to lessen species interactions and the potential for predation • Recreate or restore a more complex mosaic of instream habitats • Remove, redesign, or reoperate inwater structures, diversion dams, and hatchery practices **Reference:** ERPP Volume 1, pp.495-503
Stranding	**Description:** Stranding of juvenile and adult fish is a natural part of a healthy ecosystem. Trapped fish provide a valuable source of protein and nutrients to several levels of the food chain. Although stranding was historically a natural event, today it is generally considered a stressor that contributes to the loss of important aquatic resources including adults and juvenile special status fish species. **Vision:** The vision for stranding is to reduce the magnitude of the number of aquatic organisms lost when rivers recede or overflow into flood bypasses and to reconnect areas that become isolated with flowing water and to reduce the frequency by which low-lying areas are inundated. **Approaches:** • Remove or fill gravel and borrow ponds that connect to the main channel during high water years • Construct year-round low flow channels for drainage and fish passage • Construct fish ladders to permit upstream passage of adult fish • Recontour poorly-drained areas heavily impacted by historical mining activities • Improve or construct levees to keep borrow ponds separated from the active channel **Reference:** ERPP Volume 1, pp. 524-529

STRESSORS	
Ecosystem Element	**Description, Vision, Approaches, and Reference**
Water Diversions	**Description:** Water diversions are found throughout Central Valley rivers and their tributaries, the Bay and Delta. Water is diverted for irrigated agriculture, municipal and industrial use, and managed wetlands. The two largest diversions in the south Delta are the State Water Project (SWP) and the federal Central Valley Project (CVP). **Vision:** The vision for water diversions is to reduce the adverse effects of water diversions, including entrainment of all life stages of aquatic species, by installing fish screens, consolidating or moving diversions to less sensitive locations, removing diversions, or reducing the volume of water diverted. **Approaches:** • Install positive-barrier fish screens • Remove or relocate high impact diversions • Alter the timing of some diversions **Reference:** ERPP Volume 1, pp.434-439
Zebra Mussel	**Description:** Zebra mussels are a highly invasive exotic bivalve first discovered in the Great Lakes region in 1988. Although the zebra mussel is not currently known to occur in California, its introduction into the Bay-Delta watershed would be an environmental and economic catastrophe. **Vision:** The vision for zebra mussel is to establish procedures to prevent or delay their introduction and to set up protocols to swiftly treat and eliminate any introduction. **Approaches:** • Interdict potential sources of zebra mussels at all border check stations and other potential sources of introduction • Initiate an emergency response strategy to quickly contain and eradicate any suspected or proven mussel colonies • Prevent ballast water introductions **Reference:** ERPP Volume 1, p. 487-490

Water Quality Constituent

The “primary” choice should reflect the best overall water quality constituent choice for this project, and if there are other water quality constituents that this project addresses, then choose those as “secondary.” Each project can have only one primary (1) water quality constituent. You can list additional choices as secondary (2) choices. The CALFED Science Program developed the following Water Quality Constituent Descriptions.

- **Mercury:** Projects that address mercury contamination, including monitoring and public outreach and education. May also include mine remediation projects.
- **Nutrients and Oxygen Depleting Substances:** This may include projects that address nitrogen, phosphorous, algae growth, flow, or temperature that may be related to oxygen depletion, biological oxygen demand (BOD), chemical oxygen demand (COD), or dissolved oxygen levels. This may include projects that control sources such as stormwater, agricultural runoff, or confined animal facilities.
- **Organic Carbon and Disinfection Byproduct Precursors:** Projects that address organic carbon, natural organic matter (NOM), dissolved organic carbon (DOC), total organic carbon (TOC), disinfection byproduct precursors (DBP), Trihalomethanes (THM). In addition, projects which address carbon and carbon cycling as it relates to food web productivity.
- **Persistent Organic Contaminants:** This may include polychlorinated biphenyls (PCBs), organochlorine pesticides (OC pesticides), polyaromatic hydrocarbons (PAH), dioxins and furans, and any other organic contaminants that persist in sediments and may bioaccumulate in fish.
- **Pesticides:** Projects that address current-use pesticides including organophosphate pesticides (OP Pesticides), chlorpyrifos, diazinon, pyrethroids. Also includes projects that may control agricultural practices that may reduce pesticide use or pesticide impacts, including integrated pest management (IPM), outreach and education activities, research or demonstration of new agricultural techniques, development and outreach of best management practices (BMP).
- **Salinity:** Projects that address salinity, total dissolved solids, electrical conductivity, flow that may be related to salinity intrusion, modeling that may be related to salinity intrusion in the Delta.
- **Selenium:** Projects that address selenium sources, cycling and effects. May include projects that address agricultural drainage, particularly in the San Joaquin Valley.
- **Toxicity of Unknown Origin and Contaminants:** This may include contaminants that are not covered by other categories – such as endocrine disruptors, generalized studies of contaminant effects or biomarkers, and studies of toxicity or other effects where the constituent causing the effect has not been identified.
- **Trace metals:** Projects that address metals other than mercury, including copper, cadmium, nickel, zinc.

- **Turbidity and Sedimentation:** Projects that address sediment transport, effects of sedimentation, erosion control, land use that affects sediment runoff. This may include projects that protect riparian zones from erosion, bank stabilization, wetlands to trap sediment runoff, etc.
- **Other:** Projects that are not specific to a particular constituent or set of constituents as described above but are still related to water quality. This may include projects that address multiple constituents, education and outreach, stormwater runoff, watershed stewardship, etc.