Table 1. Key CALFED action groups for ecosystem restoration in the Bay-Delta and its watershed.

Component	Subcomponent	Key Actions Groups	Ecosystem Function	Limiting Factors	Species Benefited	Indicators / Target Level
Habitat Restoration Aquatic, Wetland, and Terrestrial	**Sacramento River and Tributary**	**Meander - Sacramento River** Allow meander belt to function naturally in upper Sacramento River from Redding downstream to Chico Landing	Restore spawning, rearing, and migration habitat of anadromous fish by allowing natural meander process; also provides riparian and upland habitat for waterfowl, birds and mammals	Reduce occurrence of high water temperatures, improve gravel recruitment and fish, birds, and mammal habitat	anadromous fish, riparian and upland vegetation, birds and mammals.	gravel spawning area, suitable rearing habitat for juvenile salmonids; shaded riparian habitat; water temperature; habitat use by fish, birds, mammals
		Temperature Control Placement of temperature control devices in Shasta and Whiskeytown reservoirs that release water to upper Sacramento River. Alleviate the need to release extra water from lower level outlets	Maintain adequate water temperature for salmon and steelhead Preserve cold water pool in reservoirs	Reduce occurrence of high water temperature during summer spawning season of winter run chinook salmon, reduce the loss of cold water storage volume in Whiskeytown and Shasta reservoirs that may become limiting later in season for juvenile winter run, as well as eggs, young, and adults of spring, fall, and late fall run chinook salmon and steelhead	winter-run chinook salmon, spring and fall run chinook salmon	water temperature from spring through fall in upper Sacramento River , lower Spring Creek, and Clear Creek. Storage levels in Whiskeytown and Shasta reservoirs. Survival of eggs and fry of chinook salmon in upper Sacramento River and Clear Creek. Production of juvenile salmon from upper Sacramento River
		Spawning Gravel Restoration Directly replace spawning gravel below Keswick, RBDD, ACID, and tributary dams that affect gravel recruitment. Reduce gravel mining effects in tributaries Restore natural gravel recruitment processes in Sacramento River and tributaries.	Restore natural sediment transport, recruitment, distribution, and abundance of spawning gravel in upper Sacramento River and tributaries Enhance natural spawning by anadromous fish	Improve spawning gravel in upper Sacramento River and tributaries.	salmon (four races) and steelhead	square yards of spawning beds available in upper Sacramento River and tributaries.
		Setback Levee Mid-Sacramento River Setback flood control levees in the Sacramento River corridor from Chico Landing downstream to Verona.	Restore some natural meander and natural aquatic and riparian habitat corridor.	Improve shaded riparian aquatic habitat, aquatic and terrestrial insect production important as food to juvenile salmonids Improve the amount of riparian and upland habitats limiting waterfowl, bird, and mammal habitat in this portion of the Sacramento River	anadromous fish including four races of salmon, steelhead, sturgeon, and native resident fish including Sacramento splittail; and riparian and upland vegetation, birds and mammals	miles of setback levees; acres of restored riparian habitat; miles of SRA restored Suitable rearing habitat for juvenile salmonids; water temperature; habitat use by fish, birds, mammals

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Table 1 continued. Key CALFED action groups for ecosystem restoration in the Bay-Delta and its watershed.

Component	Subcomponent	Key Actions Groups	Ecosystem Function	Limiting Factors	Species Benefited	Indicators / Target Level
		Restoration of floodway corridor habitat Modify existing Yolo and Sutter bypass floodways to provide corridors of aquatic and wetland habitats	Restore natural riverine, slough, riparian, wetland, and upland habitat corridors. Habitat for fish, waterfowl, birds, and mammals Nutrient supply to Bay-Delta Migratory corridors for anadromous fish	Increase amount of riverine, slough, riparian, wetland, and upland habitat Reduce existing stranding problems for anadromous fish in floodways.	Chinook salmon (four races), steelhead, splittail, and other native resident fish; waterfowl, birds and mammals	Acres of slough, wetland, riparian, and upland habitat Reduction in existing stranding of anadromous fish after bypass flooding
		Reduce input of acid mine toxins from Spring Creek Divert Spring Creek around mine, cap mine area; enlarge dam and reservoir	Reduce chronic toxicity of Spring Creek and upper Sacramento River on juvenile salmon and steelhead	Improve quality of water in Spring Creek and upper Sacramento River	Chinook salmon (four races) and steelhead	Levels of toxic heavy metals (copper and zinc) in Spring Creek and upper Sacramento River.
	San Joaquin River and Tributaries	**Meander - San Joaquin River** Restore natural meander in lower San Joaquin upstream of Mossdale.	Restore natural spawning, rearing, and migration habitat of anadromous fish; riparian and upland habitat for waterfowl, birds and mammals.	Reduce occurrence of high water temperatures, improve sediment transport and fish, birds, and mammal habitat	anadromous fish, riparian and upland vegetation, birds and mammals.	suitable rearing habitat for juvenile salmonids; shaded riparian habitat; water temperature; habitat use by fish, birds, mammals
	Bay-Delta	**Conversion of leveed lands to tidal wetlands and shallow aquatic habitat in Suisun Marsh and the Delta** Convert existing (and former) leveed agricultural lands in the Delta to tidal wetlands and aquatic habitat Possibilities include Liberty, Little Holland, and Prospect islands in the north Delta, as well as other islands elsewhere in the Delta	Restore natural tidal-marsh, tidal-slough, and tidal-bay habitat and their associated ecological functions Tidal marsh and bay habitats would provide habitat for resident and anadromous fish, waterfowl naturally adapted to tidal marsh-bay habitat, and carbon production, sediment collection, adjoining fish and invertebrate habitat to Suisun Bay and Montezuma Slough	Increase amount of native tidal brackish and freshwater marsh and associated tidal channels, sloughs, and distributaries	delta smelt, longfin smelt, and splittail (spawning and rearing habitat), winter-run chinook salmon (fingerling and smolt rearing habitat), and other anadromous and estuarine fish rearing habitat, striped bass rearing habitat.	Acres of new tidal marsh in Suisun Marsh and open water habitat; ___ acres of tidal marsh in the Delta, acres of shallow water, linear miles of new riparian habitat, ___ miles of new tidal sloughs and associated riparian habitat, habitat use by fish, birds, mammals
		Restoration of Delta riparian and shallow water habitat along levees. Improve existing and establish new riparian and shallow water habitat along levees	Restore natural riparian habitat and their associated ecological functions provide food supply for fish, provide SRA for fish, enhance habitat for birds and mammals	Increase the amount of riparian and shaded-riverine-aquatic habitat	Anadromous and resident fish; birds and mammals.	Improve conditions on existing acres; new acres; miles of levee along Delta islands, miles along lower Sacramento River; habitat use by fish, birds, mammals
		Protect and enhance riverine habitats on channel islands Loss of existing channel islands from erosion will be reduced through bank stabilization techniques	Restore natural island aquatic and wetland habitats and their associated ecological functions shelter, shallow water refuge, cover, food supply for fish, invertebrates, bird, and mammals	Increase the amount of shallow water rearing habitat for anadromous and resident fish	Anadromous and resident fish; birds and mammals	Protect and restore acres

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Table 1 continued. Key CALFED action groups for ecosystem restoration in the Bay-Delta and its watershed.

Component	Subcomponent	Key Actions Groups	Ecosystem Function	Limiting Factors	Species Benefited	Indicators / Target Level
		Protect and enhance existing tidal wetlands Existing tidal wetlands in Suisun Marsh will be protected by purchase from willing landowners Existing wetlands will be enhanced through funding of operations and maintenance costs	Protect natural tidal wetlands and associated aquatic habitats and vegetation and their associated ecological functions habitat for waterfowl, fish, birds, and mammal; nutrient supply to the estuary; sediment collection.	Increase the amount of tidal wetlands and associated aquatic habitats	Anadromous and resident fish; birds and mammals.	Protect and enhance acres.
Fish Protection from Diversions	**Screening Diversions**	**Install Fish Screens on Unscreened Diversion** Install new or upgrade existing screens on water diversions upstream of the Delta, in the Delta, and Suisun Bay/Marsh	Reduce mortality on juvenile fish.	Reduce mortality on juvenile fish at unscreened diversions.	Anadromous and resident riverine fishes.	New screens on high priority diversions. CFS screened.
	Real-time Monitoring and Diversion Management	**Expand existing Real-Time Monitoring Program** Monitor more species and habitat conditions, more locations and higher frequency.	Reduce mortality on juvenile fish.	Reduce mortality on juvenile fish at south Delta pumping plants	Anadromous and resident fishes.	Real-time fish distribution and abundance. Reductions in numbers of fish entrained into south Delta pumping plants.
	Modify fish passage at upstream dams and other barriers	**Barrier Removal** Remove natural and man-made barriers to fish passage.	Restore and enhance natural unhindered migration pathways of anadromous fish.	Migration blockage and hindrance	Anadromous fish.	Lack of blockage or hindrance of anadromous fish movement.
		Install or upgrade fish passage facilities at diversion dams Upgrade fish passage facilities at diversion dams in upper Sacramento River (RHDD, ACID, and floodway weirs) and tributaries.	Restore and enhance natural unhindered migration pathways of anadromous fish	Migration blockage and hindrance	Anadromous fish.	Lack of blockage or hindrance of anadromous fish movement.
Flow Management	**Sacramento River and Tributaries Upstream and Delta Inflow**	**Flow Management** - Supplement flows as needed to enhance habitat and natural processes.	Spawning, rearing, temperature, outmigration, and water quality upstream. Protect and enhance flows to maximize survival of anadromous and resident fish, and their invertebrate food supply. Restore and enhance primary and secondary production in rivers and estuary	Organism transport, migration, food production, physiological tolerance of individual organisms, and the amount of tidal freshwater and brackish water habitat in the estuary	Anadromous and resident fish in Sacramento River and Bay-Delta.	Sacramento River flow below Keswick and at I-Street in city of Sacramento. Also flows in tributaries.

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Table 1 continued. Key CALFED action groups for ecosystem restoration in the Bay-Delta and its watershed.

Component	Subcomponent	Key Actions Groups	Ecosystem Function	Limiting Factors	Species Benefited	Indicators / Target Level
	San Joaquin River and Tributaries Upstream and Delta Inflow	Flow Management - Supplement flows as needed to enhance habitat and natural processes.	Spawning, rearing, temperature, dissolved oxygen, outmigration, and water quality upstream. Protect and enhance flows to maximize survival of anadromous and resident fish, and their invertebrate food supply. Restore and enhance primary and secondary production in rivers and estuary	Organism transport, migration, food production, physiological tolerance of individual organisms, and the amount of tidal freshwater and brackish water habitat in the estuary. Susceptibility of San Joaquin salmon to losses at south Delta pumping plants	Anadromous and resident fish in San Joaquin River and its tributaries, and in Bay-Delta.	San Joaquin River flow at Vernalis, and in tributaries.
	Delta Outflow and Export Level; In-Delta Transport Flows	Outflow - Supplement flows as needed to enhance habitat and natural processes in Delta and Bay. Export - Limit exports as needed to enhance outflow.	X2, transport, Bay hydrodynamics migratory cues Restore and enhance primary and secondary production in rivers and estuary.	Transport of organisms through Delta into Bay. Organism migration, food production, physiological tolerance of individual organisms, and the amount of tidal freshwater and brackish water habitat in the estuary Susceptibility of fish to entrainment into PG&E power plants and south Delta pumping plants	Anadromous and estuarine resident fish.	Chipps Island outflow. Days of X2 or acre/days of X2.
Fisheries Management	Hatcheries	Hatchery Management - Improve operations of state and federal hatcheries; improve genetics; reduce effects on wild fish; reduce benefits to predators	Enhance natural fish production	Reduce negative effects of wild fish populations	Chinook salmon (four races) and steelhead.	Production of wild fish.
	Harvest	Fish Harvest Management - manage harvest of wild salmon and steelhead in sport and commercial fisheries through improved management data and marking of hatchery fish to allow wild fish release in fisheries	Enhance natural fish production	Reduce negative effects of wild fish populations	Chinook salmon (four races) and steelhead.	Production of wild fish.

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