Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions
Alteration of Flows and Other Effects of Water Management	Hydrograph Alterations	Inadequate flow, flow variability, seasonal flow distribution, flow timing, stranding due to flow fluctuation, lack of flushing flows, lack of attraction flows, lack of channel forming flows, saltwater intrusion.	*Hydrograph alteration actions could include evaluation of potential water supply sources, evaluation of water needs for fisheries, or assessment/revision of water management operations.*
	Entrainment	Unscreened diversions, impingement, diversions not screened to current standards.	*Actions targeted at reducing entrainment may include new fish screens, screen rehabilitation, screen improvements, or alternatives to screening.*
	Migration Barriers and Straying	Migration barriers or delays caused by physical structures, insufficient flow over shallow areas, inadequate attraction flows, adverse water quality conditions, delayed flooding of marshlands, or other factors.	*Barriers that preclude or delay migration may be physical structures, water quality constraints, or hydrological conditions. Actions to address these barriers could include bypass arrangements, barrier removal, or other actions.*
Floodplain and Marshplain Changes	Hydrological isolation of floodplain or marshplain	Lack of flow over floodplains and marshplains, lack of return flow to main channel.	*Lack of flow functionally isolates the floodplain from the main channel. Reconnection of the hydrological link can be addressed through a variety of physical or hydrological changes.*
	Physical isolation of floodplain or marshplain	Habitat fragmentation, loss of seasonal and tidal wetlands due to levee construction, or other land use changes.	*Restoration of floodplain habitat may involve reconnection of the floodplain to the river channel to allow a more natural inundation cycle, or managed flooding of historic floodplain areas.*
	Elimination of fine sediment replenishment	Loss of floodplain and marshplain fine sediment deposition, decreased food production.	*Loss of floodplain area can result in diminished nutrient cycling due to a lack of fine sediment deposition in vegetated areas. Other example actions that address floodplain or marshplain inundation will also address this stressor.*
	Land use changes in the floodplain or marshplain	Urbanization, agriculture, grazing.	*Actions which encourage habitat friendly changes in the historical floodplain may include land use changes or alterations in land management practices.*
Channel Form Changes	Alteration of channel form	Loss of shallow water habitat, channel deepening, lack of floodplain, degradation of instream habitat conditions, loss of lotic conditions.	*Channel form alterations are generally aimed at restoring natural physical processes within the constraints of a managed system. Projects may include streambed alterations, substrate changes, and floodplain manipulations.*

E-014581

E—014581

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions
	Prevention of channel meander	Channelization, loss of shallow water habitat and channel complexity, reduced gravel recruitment, riparian encroachment, bank armoring.	*Actions which restore channel meander and/or associated natural processes may include protection of existing riparian belts or creation of new riparian areas, increasing channel complexity through structural modification.*
	Isolation or elimination of sidechannels and tributaries	Loss of woody debris recruitment, loss of rearing and spawning habitat, loss of refuge habitat, decreased food production.	*Actions which restore processes associated with tributaries and sidechannels could include main channel changes, structural modifications to habitat in existing channels, and/or reconnection of isolated channels.*
	Reduction of gravel recruitment	Loss of spawning habitat, increased gravel armoring.	*Gravel recruitment actions may include gravel source identification, spawning gravel acquisition, gravel introduction, spawning gravel improvement projects, or measures to increase natural gravel recruitment.*
	Channel aggradation due to fine sediments	Accelerated erosion, changes in channel form caused by deposition of fine sediments due to increased sediment loads or decreased sediment transport capacity.	*Fine sediment management actions could include site-specific or watershed wide efforts to decrease sediment input, mechanically remove existing sediment, or increase sediment transport capacity.*
	Loss of existing riparian zone or lack of regeneration potential	Loss of food supply, loss of Shaded Riverine Aquatic (SRA) habitat, loss of channel complexity.	*Riparian restoration projects could include riparian corridor easements, rehabilitation of riparian areas, riparian protection plans, land use changes, or restoration of adjacent land for buffer zones, foraging, and nesting habitat.*
Water Quality	Increased Contaminants	Acute or chronic toxicity caused by urban runoff, agricultural runoff, mine drainage, refineries, wastewater treatment plants, and other point or non-point pollution sources.	*Contaminant control actions may include identification of pollutant sources, evaluation of effects, remediation, monitoring, or education in order to identify and reduce impacts on salmonids and other resources.*
	Increased Salinity	Increased salinity due to water management, operation of diversions or structures, runoff, etc.	*Actions to decrease salinity in freshwater areas could include revised land use practices, flow alterations, runoff control, or other measures.*
	Increased Nutrient or Carbon Input	Increased input of nutrients from ag runoff, wastewater treatment, and other sources. Includes low dissolved oxygen conditions.	*Actions which limit the deleterious input of large quantities of natural nutrients may include ag runoff control, wastewater treatment, flow management in critical areas, or other measures.*

E-014582

E—014582

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions
	Increased Mobilization of Contaminants due to Dredging	Increased turbidity, contaminant mobilization, dredge spoil disposal.	*Dredging related actions may address methods for controlling turbidity effects, preventing mobilization of toxic compounds, facilitating safe dredge spoil disposal, developing beneficial uses for dredge spoil, or improving associated regulatory processes.*
Water Temperature		High water temperatures due to lack of riparian shade, lack of flow, increased surface area, warm water inflow, or other factors.	*Water temperature related actions not included in other restoration categories may include increased modeling or monitoring work, and evaluation of additional temperature management options.*
Undesirable Species Interactions	Introduction of new exotic species	Introduction of exotic species from ballast water, inadvertent release of exotic species, intentional introduction of species for other reasons.	*Actions which address introduction of exotic species may be regulatory or educational in nature, and may include specific actions aimed at preventing new exotic species introductions.*
	Elevated predation/ competition losses	Striped bass predation, other introduced predatory species, competition for nest sites by introduced bird species, competition for food resources by introduced fish or mollusk species, etc.	*Predator or competitor control actions may include control or eradication programs, habitat modifications to decrease unnaturally high predation, or research projects related to exotic species control.*
	Competition from introduced plants	Invasive aquatic plants such as Hydrilla, invasive riparian zone plants such as Arundo, invasive salt marsh plants.	*Minimizing deleterious impacts from exotic plant species may involve control efforts, eradication programs, education programs, or other measures .*
Adverse Fish and Wildlife Harvest Impacts		Ocean and freshwater overharvest, poaching, inadequate fishing regulations,	*Potential restoration actions may be related to either legal or illegal harvest, and could include research projects, increased law enforcement, modified angling regulations, or improved management tools or techniques.*
Population Management		Migratory pathway changes, inadequate reproductive capacity due to small or non-existent spawning populations.	*Population management actions could include genetic investigations related to wild stocks; actions to improve monitoring, sampling, or management of stocks; and establishing or supplementing salmon populations.*
Land Use	Grazing	Loss of riparian habitat, increased erosion, decreased water quality.	*Actions addressing problems related to grazing may include land use changes, fencing, erosion control projects, development of easements, water quality control actions, watershed planning and management, or other measures.*
	Gravel mining	Decreased gravel recruitment, increased fine sediments, channel instability,	*Actions addressing impacts associated with gravel mining could include channel stabilization measures, spawning gravel augmentation, erosion control measures, land use changes, alteration of mining practices, preventing gravel pit capture, etc.*

E-014583

E—014583

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions
	Urbanization	Urbanization of the watershed that leads to loss of riparian habitat, habitat fragmentation, wetland drainage, and other impacts.	*Restoration measures aimed at urbanization impacts may be regulatory, educational, planning oriented, or related to land acquisition .*
	Forestry and agricultural practices	Forestry and agricultural practices in the watershed that lead to conversion of floodplain to ag use, subsidence, increased erosion, loss of habitat complexity, and water quality degradation.	*Restoration actions related to these processes may be site-specific or watershed wide, and may include planning efforts, educational programs, acquiring easements or buffer zones, or developing technical management practices.*
Artificial Propagation of Fish		Genetic changes due to hatchery management, hybridization, altered timing of runs, effects of smolt releases on wild populations, introduction of pathogens, incidental spring run mortality, increased striped bass populations, and other factors.	*Restoration actions related to artificial propagation could include evaluation of existing hatchery operations, assessment of new hatchery needs, or studies of hatchery impacts and benefits.*
Climate		Global warming and ocean conditions.	*Actions related to climate change or ocean conditions may include development of resource management responses to minimize adverse impacts on fish and wildlife resources, or development of other predictive or response tools.*
Human Disturbance		Direct disturbance of fish and wildlife populations or habitat by anglers, boaters, and other recreational users.	*Restoration actions can be made more effective by implementing associated education projects to increase overall public awareness or to target particular audiences to modify behavior.*
Wildfire		Habitat management through use of fire; increased frequency of fire near urban areas.	*Restoration actions related to fire management may include development of alternatives to use of fire for levee maintenance, and control of fire within riparian corridors (particularly in urban areas).*

E-014584

E—014584