Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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. Examples include the following:*		
			Conduct winter rice flooding and waterfowl pilot project to assess priority locations and flow needs.	Sacto. River Mainstem - Colusa to Delta	Yes
			Encourage reliance on reclaimed water for use in parks, golf courses, large landscaped areas, etc.	North Bay	No
			Consider water acquisition in the Central Valley for all species and life stages, including efforts under the AFRP.	North Bay, Delta, and San Joaquin River system	No
			Develop a water budget for low water years.	North Bay	Yes
			Fund programs to keep needed USGS stream gages, in order to provide necessary data for water management decisions.	North Bay	Yes
			Support local water conservation organizations, water management plans, and water conservation education.	North Bay	Yes
			Conduct a flow enhancement study to evaluate potential for increased flow in the lower river.	Tuolumne River	Yes
			Study in-stream flow needs for smolt survival.	Stanislaus River	Yes
			Assessment, feasibility studies, and/or re-establishment of channel maintenance flows.	Stanislaus River, Clear Creek	Yes
			Evaluate reoperation of New Melones to mimic seasonal flow variability.	Stanislaus River	Yes
			Assess ground water management, water transfers, distribution system efficiency.	San Joaquin, Merced, Tuolumne, and Stanislaus Rivers	No
			Evaluate additional water exchange to ensure passage during critical migration periods.	Deer Creek, Mill Creek	Yes
			Real time flow monitoring.	Mill Creek	Yes
			Extend and expand flow agreement with PG&E into a long-term agreement.	Battle Creek	Yes
			Development and implementation of revised regulatory flow standards.	American River	No
			Development and implementation of flow fluctuation (i.e., ramping) criteria for operation of Folsom and Nimbus dams.	American River	Yes
			Evaluation of dry year pulse flows as a tool to promote outmigration of juvenile salmonids.	American River	Yes
			Water conservation actions.	Delta	Yes

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Alteration of Flows and Other Effects of Water Management, cont.	Hydrograph Alterations, cont.	Continued.	Manipulation of flow timing.	Delta	No
			Study options for operations for the Old River barrier.	Delta	No
			Study flows in the Yolo Bypass and San Joaquin River for potential splittail spawning.	Delta	Yes
			Study the effectiveness of pulse flows in the San Joaquin system and their relation to potential improvements in survival.	Delta	Yes
			Conduct an instream flow study, including all life stages of salmon, for possible anadromous fish use of the lower river.	Calaveras River	Yes
			Evaluate feasibility of establishing anadromous fish on lower reaches.	Calaveras River	Yes
			Study and provide channel maintenance flows, including adequate coarse sediment supply, and fine sediment transport.	Mokelumne and Calaveras rivers.	Yes
			Evaluate conjunctive use possibilities for water supply.	Mokelumne River	No
			Provide adequate flow (> minimum) for spawning habitat and rearing.	Sacto. River Mainstem - RBDD to Chico Landing	No
			Make water exchange program permanent and covert pumps from diesel to electrical power source.	Deer Creek, Mill Creek	Yes
			Establish minimum flows for habitat below Whiskeytown Dam.	Clear Creek	No
			Support investigation of Roseville Reclamation Pipeline as a method for increasing flows in the American River, particularly in dry years.	American River	Yes

E-001007

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Alteration of Flows and Other Effects of Water Management, cont.	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 such as consolidation or relocation of points of diversion. Examples of entrainment related actions include:*		
			Assess feasibility, prioritize, install, upgrade, and maintain fish screens in order to decrease entrainment. Possible San Joaquin River system screening projects include El Solyo, West Stanislaus, Banta Carbona, and Patterson.	San Joaquin and Sacramento river systems, Suisun Marsh, and Delta Eastside Tribs	Yes
			Conduct screen options feasibility study (consolidate diversions, construct in-gravel wells).	Sacto. River Mainstem - RBDD to Delta	Yes
			Complete fish screens and ladders at Durham-Mutual Dam, Adams Dam, Gorrill Dam, and other locations.	Butte Creek	Yes
			Site survey and engineering analysis for remaining diversion structures along lower Butte Creek/Sutter Bypass (including White Mallard fish screen and ladder, and Drumheller Slough outfall culvert reconstruction).	Butte Creek	Yes
			Purchase screen for 20 cfs pump for alternative to Little Dry Creek Diversion.	Butte Creek	Yes
			Fish screen and ladder at North Fork diversions below North Battle Feeder and all South Fork diversions.	Battle Creek	Yes
			Options and feasibility analysis for additional fish screens, ladders, and a flow allocation methodology above Eagle Canyon.	Battle Creek	Yes
			Implement the Daguerre Point Dam Project listed in the spring run chinook report (fish screen, fish ladder, and dam modifications).	Yuba River	Yes
			Address problems with unscreened diversions, especially on the Napa River.	North Bay	Yes
			Study the biological significance of the effects of any fish entrainment into marsh.	Suisun Marsh	Yes
			Establish a cooperative effort to study and implement screening of diversions, including consolidation of diversions where appropriate and screen maintenance.	Delta and Delta Eastside Tribs	Yes
			Change operations and physical facilities at the State and Federal pumps to reduce entrainment.	Delta and Delta Eastside Tribs	No

E-001008

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
	Entrainment, cont.	Continued.	Evaluate possible changes and operations of other diversion facilities to reduce entrainment.	Delta and Delta Eastside Tribs	Yes
			Screen and redesign Stockton East diversion.	Calaveras River	Yes
			Rehabilitate and enlarge Woodbridge screen bypass pipe.	Mokelumne River	Yes
Alteration of Flows and Other Effects of Water Management, cont.	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 such as those cited below.*		
			Evaluate operation of ACID diversion and consider structural modifications.	Sacto. River Mainstem - Keswick to RBDD	Yes
			Options for passage and reduction of predation at RBDD.	Sacto. River Mainstem - RBDD to Chico Landing	Yes
			Evaluation of passage options around Englebright Dam and Reservoir.	Yuba River	Yes
			Modify the Lindo Channel headworks for fish passage.	Big Chico Creek	Yes
			Improve fish passage at Saeltzer Dam.	Clear Creek	Yes
			Conduct an options, feasibility, and engineering analysis of fish passage problems and habitat restoration opportunities.	Antelope Creek	Yes
			Evaluate feasibility of reintroduction of steelhead above Folsom Dam.	American River	Yes
			Plan for the removal of barriers on diked bay lands which block movement of smelt.	North Bay	Yes
			Make a plan for the removal of barriers for steelhead passage. (RCD already has documents for this kind of project.)	North Bay	Yes
			Put balls on power lines to alert birds.	North Bay	Yes
			Erect wildlife passage areas on highways.	North Bay	No
			Operate the Delta Cross Channel gates to prevent migration delays of fish.	Delta	No
			Evaluate modifications to Georgianna Slough to prevent migration delays of fish.	Delta	Yes
			Evaluate pulse flow effects on fish migration.	Delta	Yes
			Provide dissolved oxygen migration barrier relief through modifications at the head of Old River or other modifications to reduce magnitude or duration of the D.O. barrier.	Delta	Yes
			Modifications to Clough Dam.	Mill Creek	Yes
			Evaluate feasibility of removing checkdams.	Calaveras and Consumes rivers	Yes
			Evaluate habitat above Barrier Falls at Chimney Rock.	Butte Creek	Yes

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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, including the following example actions:*		
			Develop a channel and floodplain maintenance policy.	Stanislaus River	Yes
			Increase size of drains to the marsh lands along highway 37 to improve drainage.	North Bay	Yes
			Conduct Yolo Bypass feasibility of establishing floodplain-like conditions at a lower flow split between the bypass and the river.	Sacto. River Mainstem - Colusa to Delta	Yes
			Manage hydrograph to allow maximum overbank flooding within flow peak potential.	Sacto. River Mainstem - RBDD to Chico Landing	No
			Modify drainage from floodplain or bypass areas to reduce fish stranding.	Delta	Yes
	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. Example actions include the following:*		
			Establish setback levees to create shallow water habitat and other priority habitat types. Consider possible adverse trade-offs between habitat types that may be created with setback levees.	Delta	Yes
			Create a flood bypass in the southern Delta along the Cosumnes River and on the lower Mokelumne River which keeps the river channel and the floodplain directly connected. Refer to the work of the Levee Technical Committee on this action.	Delta	Yes
			Restoration of seasonal and tidal wetlands in the Yolo Bypass.	Delta	Yes
			Increase area of flooded agricultural lands. Combine with no net loss of agricultural wetlands that provide foraging habitat for migratory birds.	Delta	Yes
			Study and implement expansion of setback levees. Mokelumne River in the vicinity of Highway 99 to the Delta.	Cosumnes, Mokelumne, and Calaveras rivers	Yes
			Study the feasibility of reconnecting the incised channel to the floodplain.	Cosumnes River	Yes
			Modify levee maintenance practices to enhance habitat.	System-wide	Yes
			Support Habitat Goals Project, including guidance for land acquisition and pilot study efforts.	North Bay	Yes

E-001010

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Floodplain and Marshplain Changes, cont.	Physical isolation of floodplain or marshplain, cont.	Continued.	Expand refuges in the San Joaquin system, including San Joaquin National Wildlife Refuge on the Tuolumne and San Joaquin rivers, and San Luis NWR on the San Joaquin River.	Tuolumne and San Joaquin rivers	Yes
			Restore tidal wetlands.	Delta, North Bay, Suisun Marsh	Yes
			Restore Shaded Riverine Aquatic (SRA) habitat.	System-wide	Yes
			Restore seasonal floodplain wetlands and managed seasonal wetlands which recreate key values of floodplain wetlands.	System-wide	Yes
			Encourage river corridor planning.	System-wide	Yes
			Reclaim historic floodplain where feasible, within the context of the current flow hydrograph.	Sacto. River Mainstem - Keswick to Colusa	Yes
			Restore floodplain function by moving/removing private levees.	Sacto. River Mainstem - Keswick to Chico Landing	Yes
			Conserve floodplain through land acquisition or easements, and revise floodplain management to maximize habitat benefits.	Sacto. River Mainstem - RBDD to Chico Landing	Yes
			Acquire floodplain easements.	North Bay	Yes
			Work with landowners to establish easements or other mechanisms for seasonal wetland habitat creation, and incentive programs to improve value of existing seasonal wetlands.	Delta	Yes
	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.*		Yes
	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. Example restoration actions related to land use include the following:*		
			Fund incentives to increase area of agricultural lands enhanced to provide foraging and nesting habitat for migratory birds.	Delta	Yes
			Fund projects to restore tidal mudflats in shallow water habitat.	Delta	Yes
			Fund programs to prevent the loss of tidal mudflats and shallow water habitat.	Delta	Yes
			Encourage fish compatible project responses to flood damage.	Butte Creek	Yes
			Create aquatic habitat that will be useful for foraging.	Delta	Yes
			Conduct a post-flood assessment to consider non-structural alternatives when evaluating repairs to flood damaged areas.	San Joaquin River system and Delta Eastside Tribs	Yes

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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. Examples include the following:*		
			Channel restoration and reconfiguration projects, including gravel pit isolation projects.	Merced, Tuolumne, Stanislaus rivers	Yes
			Conduct project levee or other rock removal/relocation projects, beginning with feasibility analysis.	Sacto. River Mainstem - Chico Landing to Delta	Yes
			Evaluate feasibility of reestablishing an interaction between the river and the floodplain.	Butte Creek	Yes
			Plan and restore wetland/slough complexes including changing elevations in areas within the floodplain and implementing revegetation or other actions where necessary.	American River	Yes
			Acquire land on Napa and Petaluma rivers from willing private land owners, restore floodplain or marshplain areas, and convert land to tidal wetlands. Focus on areas with greatest restoration potential and where future opportunities could be precluded.	North Bay	Yes
			Evaluate restoration of riparian vegetation in areas with existing bank protection, including alternative bank protection measures.	American River	Yes
			Site specific actions to restore channel form.	Butte Creek	Yes
			Restore mid-channel island habitat.	Delta	Yes
			Evaluate feasibility of easements and buffer zones in the upper canyons above Hwy. 99.	Butte Creek	Yes

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Channel Form Changes, cont.	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 land use changes, reduction or removal of bank armoring material, setting back levees, increasing channel complexity, or the following example actions.*		
			Establish setback levees.	North Bay	Yes
			Maintain meander belt where presently active, and allow wider meander belt where possible (by land acquisition, discontinuing levee armoring, or other actions).	Sacto. River Mainstem - Keswick to Colusa	Yes
			Endorse/partner with ACOE and Rec. Bd. study on re-evaluation of floodplain protection strategy.	Sacto. River Mainstem - Colusa to Delta	Yes
			Protect mainstream meander belt as a source of gravel.	Sacto. River Mainstem - Keswick to Chico Landing	Yes
			Re-establish meander zone.	Cosumnes River	Yes
	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, reconnection of isolated channels, and/or the following example actions:*		
			Improve rearing habitat by increasing structural complexity.	Sacto. River Mainstem - Keswick to Colusa	Yes
			Focus restoration actions on the American River below Nimbus Dam on designs to improve tailrace habitat, including increased structural complexity.	American River	Yes

E-001013

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Channel Form Changes, cont.	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. Example actions include the following:*		
			Purchase dredger tailings at Merced River Ranch to provide a gravel source for restoration.	Merced River	Yes
			Spawning gravel introduction near LaGrange.	Tuolumne River	Yes
			Identify gravel sources for restoration.	Stanislaus River	Yes
			Coarse sediment deficit/replenishment criteria.	Merced and Stanislaus	Yes
			Identify locations to introduce gravel where natural processes (i.e., river flows) can be used to distribute it.	Merced and Tuolumne rivers	Yes
			Knights Ferry and Goodwin Canyon gravel replenishment and monitoring.	Stanislaus River	Yes
			Take actions to protect gravel sources in tributaries.	Sacto. River Mainstem - Keswick to Chico Landing	Yes
			Evaluate need to replenish spawning gravel on the north fork and mainstem of Battle Creek, using natural processes (i.e., river flows) to distribute any necessary gravel introductions.	Battle Creek	Yes
			Replenish riverine gravels, monitor gravel movement, and schedule Keswick flow for gravel submergence and redistribution.	Sacto. River Mainstem - Keswick to RBDD	Yes
			Develop and implement a gravel management program to improve spawning habitat.	American River	Yes
			Restore and replace spawning gravels and habitat, using natural processes (i.e., river flows) for gravel distribution.	Mokelumne River	Yes
	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	*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. Example actions include the following:*		
			Gasberg Creek sediment control.	Tuolumne River	Yes
			Pilot gravel cleaning project.	Tuolumne River	Yes
			On-farm agricultural drainage treatment (pilot project).	S.J. and Stanislaus	Yes
			Sediment management plan for watershed (identify sources).	Merced River	Yes
			Pilot gravel ripping study on Stanislaus.	Stanislaus River	Yes
			Support and expand existing watershed management efforts by East Stanislaus RCD.	Stanislaus River	Yes

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Channel Form Changes, cont.	Channel aggrad. due to fine sediments, cont.	Continued.	Develop local watershed management efforts through appropriate watershed management entities.	Tuolumne and Stanislaus rivers	Yes
			Increase tributary sediment control.	Sacto. River Mainstem - Keswick to Chico Land.	Yes
			Resolve erosion problems identified by watershed planning efforts.	Deer Creek, Mill Creek, and other tributaries	Yes
			Implement road related fixes for erosion problems identified by watershed planning efforts.	Deer Creek, Mill Creek, and other tributaries	Yes
			Provide assistance to the local watershed groups in preparing plans and implementing actions.	Battle, Deer, Mill, & Clear, and other creeks	Yes
			Identify sources of erosion and develop projects and actions for decreasing erosion.	Battle Creek	Yes
			Evaluate flood management practices in Lindo Channel.	Big Chico Creek	Yes
			Develop a watershed plan.	Big Chico Creek	Yes
			Reestablish channel integrity adversely affected by gravel mining or other activities.	Clear Creek	Yes
			Erosion control projects.	Clear Creek	Yes
			Evaluate feasibility of off-channel and sidechannel restoration.	Yuba River	Yes
			Support local watershed analyses, including identification and implementation of restoration actions. Encourage consolidation of local efforts when reasonable.	Antelope, Cow, Cottonwood, and Little Chico creeks	Yes
			Support local watershed groups, erosion control education actions, and landowner education efforts.	North Bay	Yes
			Conduct studies on erosion containment, transport, and flow dynamics.	North Bay	Yes
			Assess and monitor sediment sources and impacts, including sediment source modeling efforts where necessary.	North Bay	Yes
			Strengthen enforcement of best management practices on land development and public and private roads.	North Bay	No
			Fund storm water erosion enforcement.	North Bay	No
			Facilitate public outreach and discussion with regulators, regulatees, and resource specialists.	North Bay	No
			Identify lands that have a high potential for mass landslide potential and take early action to prevent erosion.	North Bay	Yes
			Conduct watershed assessments that evaluate system-wide problems and restoration activities.	Merced and Stanislaus rivers	Yes
			Channel maintenance flow assessment.	Stanislaus River	Yes

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Channel Form Changes, cont.	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. Examples include:*		
			Assist RCDs to do outreach to land owners for riparian fencing and range land management training.	North Bay	Yes
			Fund vegetation and maintenance in riparian urban corridors.	North Bay	Yes
			Develop setbacks for every acquisition.	North Bay	Yes
			Support vineyard disease research on Pierces disease in a riparian friendly way.	North Bay	Yes
			Study the extent of the Napa riparian zone.	North Bay	Yes
			Restore vegetation and complexity to the riparian systems to help cool the water and provide protection for steelhead.	North Bay	Yes
			Purchase and restore land at Basso Bridge.	Tuolumne River	Yes
			Manage post-flood land use for riparian growth.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes
			Riparian restoration and revegetation projects.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes
			Protect, restore, and re-establish SRA where possible.	Sacto. River Mainstem - Keswick to Colusa	Yes
			Conduct feasibility study on revegetation of project levees or rocked levees.	Sacto. River Mainstem - Chico Landing to Delta	Yes
			Protect/restore riparian forest habitats.	Sacto. River Mainstem - Keswick to Chico Land.	Yes
			Protect and restore riparian habitat and reevaluate practice of clearing trees or other cover producing vegetative debris from the river.	American River	Yes
			Restore and increase riparian vegetation by re-establishing and revegetating riparian areas and corridors.	Deer, Mill and Big Chico creeks; Feather and Yuba rivers and Delta Eastside Tribs	Yes
			Initiate a replanting program for cottonwood, valley oak, and other large riparian species.	Delta Eastside Tribs	Yes
			Implement a landowner education program on impacts of land management activities on SRA.	Delta Eastside Tribs	Yes

E-001016

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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. Example actions include the following:*		
			Expand Real-time Water Quality Management Network.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes
			Establish a comprehensive water quality monitoring and assessment program to identify problems and assess the effectiveness of corrective measures.	Delta, Suisun Marsh, North Bay, Delta Eastside Tribs, San Joaquin River system	Yes
			Establish the ecosystem significance of pesticides in the Sacto. and SJ rivers and Delta from surface ag drainage, and undertake actions as appropriate to prevent, treat, or otherwise reduce impacts including public education and similar activities.	Sacramento and San Joaquin river systems, Delta	Yes
			Inventory urban stormwater drains, establish the ecosystem significance of nutrients, salinity, turbidity, oxygen demand, and metals in runoff. Undertake actions as appropriate to prevent, treat, or otherwise reduce impacts including education, etc.	Sacramento and San Joaquin river systems, Delta	Yes
			Establish the ecosystem significance of copper, zinc, and cadmium in the Sacto River above Hamilton City from active or inactive mines, and undertake action as appropriate to prevent, treat, or otherwise reduce impacts.	Sacramento River Mainstem	Yes
			Establish the ecosystem significance of selenium in the San Joaquin River and Delta from subsurface ag drainage in the Grasslands area, and undertake action as appropriate to prevent, treat, or otherwise reduce impacts.	San Joaquin River and Delta	Yes
			Establish the ecosystem significance of mercury from active or inactive mines and gold mining activities, and undertake action as appropriate to prevent, treat, or otherwise reduce impacts.	Sacramento and San Joaquin River systems, Delta Eastside Tribs	Yes
			Coordinate watershed water quality activities related to toxic contaminant reduction, and develop watershed-wide solutions to water quality problems affecting the ecosystem.	System-wide	Yes
			Incorporate Tuolumne model with RTWQMN.	Tuolumne River	Yes
			Non-point source agricultural runoff: use BMPs, expand riparian buffer zone.	Sacto. River Mainstem - RBDD to Delta	Yes
			Establish the ecosystem significance of agricultural chemicals in the Colusa Drain and undertake management actions as appropriate.	Sacto. River Mainstem - Colusa to Delta	Yes

E-001017

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Water Quality, cont.	Increased Contaminants, cont.	Continued.	Develop a toxic spill contingency plan for highways near sensitive resources.	Deer Creek, other locations	Yes
			Evaluate need to fund pathogen control for private aquacultural facilities.	Battle Creek	Yes
			Negotiate cooperative agreement with refineries to reduce selenium.	Suisun Marsh	Yes
			Expand and broaden BIOS program previously funded under Category III.	Delta, Suisun Marsh, and Delta Eastside Tribs	Yes
	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. Examples include the following:*		
			Encourage farm management actions to reduce irrigation runoff, focusing on high salinity load areas.	Delta, San Joaquin system	Yes
			Determine alternative methods for discharging salts back into bay from salt ponds in order to restore areas to tidal wetlands.	North Bay	Yes
			Develop physical infrastructure to remove salt (if necessary) in order to restore areas to tidal wetlands.	North Bay	Yes
	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 agricultural runoff control, wastewater treatment, flow management in critical areas, or other measures.*		Yes

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Water Quality, cont.	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.*		
			Assess and consider streamlined regulatory process and permit coordination on dredging to facilitate maintenance dredging.	Delta Eastside Tribs	No
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. Examples of actions include the following:*		
			Change water management practices in Grasslands Water District to benefit water temperatures in March and April.	San Joaquin River	Yes
			Take actions to ease water demand from New Melones to dilute agricultural drainage so that additional carryover storage is available for temperature management.	Stanislaus River	Yes
			Temperature management feasibility studies, models, and operations development.	Merced and Stanislaus rivers	Yes
			Install and operate a Folsom Temperature Control Device (TCD) to preserve a coldwater pool for use in downstream water temperature control.	American River	Yes
			Develop Folsom Reservoir Cold Water Pool Management protocol to optimize operations of reconfigured shutters on outlet and Folsom TCD, and provide necessary information on thermal characteristics of Folsom Reservoir and Lake Natoma.	American River	Yes
			Investigate possible utilization of deep pool thermal refugia by juvenile steelhead, and effects of flow fluctuations on these areas.	American River	Yes
			Conduct a pilot flow study to model relationship between flow and water temperature.	Clear Creek	Yes
			Evaluate options for addressing Colusa Drain water temperature effects on the Sacramento River.	Sacto. River Mainstem, Colusa to Delta	Yes
			Evaluate potential temperature benefits of increasing SRA habitat in the Delta.	Delta	Yes
			Evaluate the effect of a water temperature control device at Englebright Dam.	Yuba River	Yes

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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. Example restoration actions include the following:*		
			Establish education programs regarding existing exotic species problems and the need to prevent future exotic species introductions.	System-wide	Yes
			Implement a program to prevent introduction of exotic species into areas that are currently supporting native species.	System-wide	Yes
			Provide additional resources to increase the enforcement of ballast discharge regulations in areas where introduction of exotic species is a risk.	Delta	No
			Provide additional zebra mussel control (refer to the California Task Force for zebra mussel control).	Delta	Yes
			Establish exotic species control programs in tidal and seasonal wetlands.	Suisun Marsh	Yes
	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. Example actions include the following:*		
			Investigate potential for physical removal of predators from gravel pits, including an assessment of impacts on salmon production.	Merced, Tuolumne, and Stanislaus rivers	Yes
			Evaluate the magnitude of predation problems and potential restoration actions to decrease predation in areas with unnaturally high predation mortality.	Sacto. River Mainstem - RBDD to Delta	Yes
			Fund studies to better understand the biology of exotic species in order to support control or eradication efforts.	Delta	Yes
			Fund additional study of the effects of striped bass on salmonid species.	Delta	Yes
			Form a group of cooperating entities into an exotic species "SWAT" team who can target individual species for control efforts over a broad geographical area.	Delta and Suisun Marsh	Yes
			Study the effects of inland silverside predation on delta smelt.	Delta	Yes
			Prioritize and implement programs for Asian clams, Chinese mitten crabs, and all other exotic species.	Suisun Marsh	Yes
			Establish control program for inland silversides and yellow perch (see similar Delta actions).	Suisun Marsh	Yes

E-001020

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Undesirable Species Interactions, cont.	Elevated predation/ competition losses, cont.	Continued.	Conduct research to determine effects, distribution, and best control methods for introduced exotic species.	North Bay	Yes
			Fund pilot exotic species eradication programs.	North Bay	Yes
			Community education and manuals to help homeowners to identify and remove exotic species.	North Bay	Yes
			Develop a control strategy for red fox.	North Bay	Yes
			Establish a trapping program for brown headed cowbirds and starlings which compete with native species in riparian areas.	Delta	Yes
	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 . Example actions include the following:*		
			Remove non-native plants from the riparian zone, re-establish natives.	Sacto. River Mainstem	Yes
			Implement projects to reclaim priority habitats from exotic plant species.	Delta	Yes
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. Example actions include:*		
			Implement a programmatic approach to strategically increasing law enforcement and assessing the effectiveness of the efforts.	San Joaquin River system and Sacto. River tributaries	Yes
			Modify angling regulations.	San Joaquin (below Merced), Merced, Tuolumne, and Stanislaus rivers	No
			Develop feasible, cost-effective techniques to decrease effects of ocean harvest on wild stocks.	Ocean	Yes
			Estimate rate of repeat hookings, in order to better estimate hooking mortality effects at the population level for salmon subject to harvest management.	Ocean	Yes
			Using genetic technology, estimate ocean and freshwater distribution of spring-run, winter run, and Klamath River chinook to assist with ocean harvest management.	Ocean	Yes
			Evaluate cost effective mass marking techniques.	System wide	Yes
			Evaluate and/or revise angling regulations.	American River	No

E-001021

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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. Example actions include the following:*		
			Eliminate inappropriate attraction flow.	Sacto. River Mainstem - Keswick to Chico Landing	Yes
			Evaluate need to establish founding population of spring run.	Battle Creek, Clear Creek	Yes
			Provide input to genetic monitoring of the fish population.	Big Chico Creek	Yes
			Evaluate potential for creating more separation of fall and spring-run spawning habitat to reduce or eliminate hybridization.	Yuba River	Yes
			Improve estimation of number of returning adult salmon through use of counting structures, hydroacoustics, or other methods.	San Joaquin (below Merced), Merced, Tuolumne, Stanislaus	Yes
			Scale analysis and otolith evaluation for racial and age composition of chinook salmon.	San Joaquin (below Merced), Merced, Tuolumne, and Stanislaus rivers	Yes
			Smolt mortality study.	Stanislaus River	Yes
			Verification and calibration of screw-trap estimates of Stan. River outmigrants: Feasibility of using hydroacoustics for smolt survival.	Stanislaus River	Yes
			Develop techniques and equipment to sample outmigrants at high flows.	System wide	Yes
			Evaluate relative survival rates for smolts and fry during outmigration.	System wide	Yes
			Purchase Hills Ferry Barrier land to ensure access and reduce straying.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes

E-001022

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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.*		Yes
	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.*		Yes
	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. Example actions include the following:*		
			Educate local governments on the value of natural habitat and improved planning to protect these areas. Help local governments develop appropriate tools for protecting important habitat areas.	System-wide	Yes
			Identify ways to preserve habitat values on land, but maintain private ownership.	System-wide	Yes
			Present riparian core areas as amenities and educate developers to their value.	System-wide	Yes
			Evaluate feasibility and appropriateness of restoration/enhancement opportunities which could complement any mitigation for other projects such as bank protection work by SAFCA.	American River	Yes
			Develop a monitoring plan for enhancement measures in the American River, including biological and physical/chemical sampling.	American River	Yes
			Establish a consultation and technical assistance team of fisheries and water resources experts to identify, guide, and oversee restoration actions and enhancement measures on the American River.	American River	Yes

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
Land Use, cont.	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. Example actions include:*		
			Encourage USFS, CDF, and BLM to be part of the overall CALFED effort on a programmatic level.	Deer and Mill creeks	No
			Improve agency and public education on forestry issues on a programmatic level.	Deer and Mill creeks	No
			Coordinate forestry agency management plans with other agencies and conservancies.	Deer and Mill creeks	Yes
			Fund local conservancy or other planning efforts to develop watershed plans to improve watershed health.	Deer, Mill, Butte Creeks	Yes
			Encourage continued outreach activities with agricultural interests.	Butte Creek	Yes
			Fund watershed plan and conservation easements.	Butte Creek	Yes
			Encourage coordination between local groups, Park Service, BLM, and USFS.	Clear Creek	Yes
			Provide buffer zones around habitat restoration areas.	North Bay	Yes
			Public education on Best Management Practices (BMP) approach to development.	System-wide	Yes
			Support local efforts for sustainable agriculture.	North Bay	Yes
			Match funding for private landowner actions (for example, "Partners for Wildlife").	North Bay	Yes
			Support demonstration farm sites.	North Bay	Yes
			Develop a GIS database of habitat and fluvial elements for Stanislaus.	Stanislaus River	Yes
			Prioritize areas for use of dredge material or other mechanisms on subsided islands (refer to the work of the Levee Technical Committee).	Delta	Yes
			Fund a cooperative effort with landowners to restore areas adjacent to Suisun Bay entrapment zone to tidal action. This action would address subsidence issues.	Suisun Marsh	Yes
			Analyze potential changes in the maintenance of Suisun Marsh to provide habitat for fish species. The project would also address land subsidence issues. This would be a cooperative pilot project with a monitoring component.	Suisun Marsh	Yes

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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	*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. Example actions include the following:*		
			Implement an interim artificial propagation program to provide smolts for study or research purposes.	San Joaquin (below Merced), Merced, Tuolumne, and Stanislaus rivers	Yes
			Hatchery fish marking program.	Merced River	Yes
			Develop a hatchery strategy for the SJR.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes
			Review and revise operation plan for Merced River Fish Facility.	Merced River	Yes
			Tuolumne River Hatchery Plan.	Tuolumne River	No
			Hatchery operation modification.	Sacto. River Mainstem - Keswick to Chico Landing	Yes
			Evaluate options to provide an isolated water supply for Coleman National Fish Hatchery.	Battle Creek	Yes
			Develop Battle Creek restoration implementation plan consistent with the AFRP.	Battle Creek	Yes
			Evaluate hatchery practices at Feather River Hatchery.	Feather River	Yes
			Increase artificial production and evaluate hatchery management practices.	American River	Yes

E-001025

Stressors and Example Restoration Actions

Stressor Categories	Stressor Subcategories	Description of Stressors	Example Restoration Actions	Example Locations	Consistent with 1997 Category III Funding?
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.*		No
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. Example actions include the following:*		
			Resources education program.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes
			Public and angler education programs.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes
			Educate public and enforce boat speed in critical areas to prevent bank erosion.	North Bay	Yes
			Apply biotechnology techniques to prevent bank erosion.	North Bay	Yes
			Information sharing network for the San Joaquin watershed.	San Joaquin, Merced, Tuolumne, and Stanislaus rivers	Yes
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).*		
			Fire management along the parkway to decrease loss of riparian vegetation due to human-caused fires.	American River	Yes

E-001026