June 21, 1999

To: Lester Snow

From: Dick Daniel, Wendy Halverson Martin, and Stein Buer SMB

Subject: CALFED Actions Potentially Beneficial to Delta Smelt

As you requested we have reviewed potential CALFED program actions which are already underway or planned as part of the Ecosystem Roundtable process, planned as part of the Early Implementation Actions scheduled for initiation in the next two fiscal years, and as part of the long-term Program Implementation.

The attached documentation is organized into three sections according to this general time frame. We have identified those actions which are expected to have direct beneficial effects on delta smelt by extending appropriate habitat extent, improving habitat quality, improving water quality, or reducing stressors such as unscreened diversions. We have also identified CALFED program actions which can indirectly benefit delta smelt. These may be taken anywhere within the Bay-Delta watershed or service area to improve water management, thus providing operational flexibility, flow regimes, and water quality which are incrementally beneficial to delta smelt.

The summary sheets for the three sets of tables follows immediately after this cover memorandum. The supporting documentation is provided in the subsequent tables:

- Groundwater Storage

- CMARP

Restoration Coordination Program
Projects which benefit Delta Smelt

The CALFED Ecosystem Restoration Program (ERP) identifies delta smelt as a high-priority at risk species. The ERP vision for contributing to the recovery of this species can be realized through habitat restoration accompanied by reductions in stressors. Potential actions include improvements in streamflow, spawning and rearing habitat restoration, and reducing the level of contaminants in the system.

CALFED has funded a number of projects which benefit delta smelt from species life history studies, habitat restoration projects and other water quality and watershed actions. To date, 54 projects totaling almost 91 million dollars have been funded which benefit delta smelt. Overall, CALFED has funded 195 projects for $228 million dollars which either directly or indirectly benefit the Bay-Delta.

A summary of projects with direct benefits to delta smelt in the delta, east side tributaries and north bay are listed below by topic area.

TYPE OF ACTION	Number of Projects	Amount
Fish Screen	7	6,908,850
Floodplain/Habitat Restoration/River Geomorphology	34	70,873,300
Population Management	2	450,870
Water Quality	6	11,129,457
Introduced Species	2	483,715
Watershed Management	3	962,688
Total	**54**	**90,808,880**

.2 fps Δ smelt screen

Liberty prospect

Additional projects have been conditionally approved for funding in 1999. These include a project under the Flood Control Bypass Habitat program which will expand and enhance shallow-water habitat in the Yolo Bypass, and projects under the Non-native Invasive Species Program to address issues such as zebra mussels, introduced clams and other invasive species which affect the Bay-Delta. Of the projects recommended under the Proposal Solicitation Package, nine projects totaling approximately 8 million dollars will also benefit delta smelt.

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D-012067

Draft Early Implementation Actions with Direct or Indirect Potential Benefits to Delta Smelt

The draft early implementation actions, which are considered for initiation in fiscal years 2000 or 2001 or are already in the planning stages, include numerous entries with direct or indirect potential benefits to delta smelt. The Early Implementation Actions table which has been widely circulated as part of the draft Bundles documentation has been filtered and sorted according to whether a specific action would have a direct or indirect potential benefit on delta smelt. Direct actions are those which improve habitat extent or quality, including water quality, or reduce stressors within Delta smelt critical habitat..

Direct actions primarily include development of improved Delta smelt habitat (often in coordination with regional flood control measures), screening of SWP and CVP export pumps, improving SWP and CVP operational flexibility (including facilities and implementation of the Environmental Water Account), screening of Delta agricultural intakes according to an appropriate priority system, and improving Delta water quality. 28 Direct actions are tabulated.

Indirect actions are those which can be taken anywhere within the Bay-Delta watershed or service area to improve water management, thus providing operational flexibility, flow regimes, and water quality which are incrementally beneficial to delta smelt. 60 Indirect actions were identified. The number is, to some extent, an artifact of the organization of the original table, which, for example, included 13 entries under the Water Transfers Program. In general, the Water Use Efficiency Program, the Water Transfers Program, the Watershed Management Program, the Integrated Storage Program, the Levee Integrity Program, and the Conveyance Program elements within the CALFED Program all have the potential to improve water management through improving operational flexibility, reducing growth in demands for water, and improving water quality, and thus can help efforts to aid delta smelt recovery. There is, of course, also the potential for exacerbating delta smelt decline through improper implementation of these programs and thus thoughtful, balanced, and well integrated implementation is essential.

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long term

Ecosystem Restoration Program Plan

The Multi Species Conservation Strategy identifies delta smelt as a species for which CALFED will implement actions and programs that will achieve its recovery. Targets and programmatic actions presented in the Ecosystem Restoration Program Plan are designed to achieve the goal of recovery. Nearly one hundred programmatic actions have been identified for further refinement and implementation in the Sacramento-San Joaquin Delta Ecological Management Zone and in the Suisun Marsh\North San Francisco Bay Ecological Management Zone that are directly or indirectly linked to delta smelt or its habitat.

Many of the programmatic actions address restoration of aquatic and shallow water habitats upon which delta smelt depend for spawning and rearing. Other actions seek to improve the Bay-Delta aquatic food chain and improve hydraulic conditions (patterns and direction of flow in Delta channels) to improve the survival of delta smelt. Still other actions are proposed to reduce or eliminate stressors which impair ecological processes, aquatic habitats, and delta smelt directly. Examples include reducing the adverse effect of contaminants, water diversion, and predation and competition.

Many of these programmatic actions are included in the Restoration Coordination Program for early implementation and others are included in the Stage 1A bundles of actions.

Type of Action	Number of Programmatic Actions in Delta	Number of Programmatic Actions in Suisun Marsh
Restore habitat	24	8
Improve ecological process	22	4
Reduce or eliminate stressors	23	11
Total	**69**	**23**

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Table 1. Projects Approved for Funding, including 2/99 Directed Actions

Stressor/Type of Action Summary by Region

Project Description	Applicant/Administrator	Watershed	Funded
??? Region ???			
Water management			
Water Acquisition from various Delta-Mendota Canal users (1547 af)	USFWS	??? Watershed???	
Water Acquisition from Semitropic Water Storage Districts (5200 af), 130,000, (6802 af), 151,715	USFWS	??? Watershed???	$281,175
Water Acquisition from San Joaquin River Exchange Contractors	USFWS	??? Watershed???	$4,165,566
Water Acquisition from Sacramento River Water Right Settlement Contractors (52,380 af) FY 1995	USFWS	??? Watershed???	
			$4,446,741
			$4,446,741
Delta/Suisun Marsh			
Education			
Water Hyacinth Education Program	Sacramento Regional County Sanitation District	Delta	$9,600
Discover the Flyway	Yolo Basin Foundation	Delta	$49,000
The Virtual Science Center and Hands-on Learning Programs	The Delta Science Center at Big Break	Delta	$42,000
			$100,600
Entrainment			
Hastings Tract Fish Screen Phase II: Construction	Hastings Island Land Company	Delta	$271,250
Selected fish screens - Suisun Marsh	Department of Fish and Game	Suisun Marsh and Bay	$2,935,600
Hastings Tract fish screen feasibility study	Hastings Island Land Company	Delta	$27,000
Developing a Methodology to Accurately Simulate the Entrainment of Fish...	Department of Fish and Game	Delta	$200,000
Suisun Marsh Screening Project -Phase 2	Suisun Resources Conservation District	Suisun Marsh and Bay	$1,000,000
Suisun Marsh Screening Project	Suisun Resources Conservation District	Suisun Marsh and Bay	$900,000

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Project Description	Applicant/Administrator	Watershed	Funded
			$5,333,850
Floodplain/Marsh restoration			
Prospect Island Restoration	DWR	Delta	$9,150,000
Prospect Island Monitoring Project	DWR	Northern Sacramento-San Joaquin Delta	$915,000
Fern-Headreach Tidal Perennial Aquatic and Shaded River Aquatic Conservation Project	Thomas Luckey (L & L Farms, LLC)	Delta	$425,000
Rhode Island Floodplain Management and Habitat Restoration	Department of Fish and Game	Delta	$25,000
Cache Slough Habitat Enhancement	Reclamation District 2060	Delta	$85,000
Hill Slough West Habitat Demonstration Project	Department of Fish and Game, Bay-Delta and Special Water Project Division	Suisun Marsh and Bay	$200,000
Prospect Island Monitoring Plan	DWR	Delta	$35,000
			$10,835,000
Introduced species			
Introduced species research program	San Francisco Estuary Institute	Delta	$197,000
			$197,000
Population management			
Coded-wire tagged (CWT) late-fall-run chinook salmon survival studies in the Delta	CVPIA: To be determined	Delta	$34,000
Juvenile American shad monitoring in the Delta	CVPIA: To be determined	Delta	$27,000
Salmon and Steelhead Otolith Study	CVPIA: To be determined	Delta	$12,500
Yolo Bypass Habitat Restoration Study	DWR	Delta	$256,000
Culture of Delta smelt	UC Davis	Delta	$194,870
North Delta area - survey of rearing habitat for juv. salmon	CSU Sacramento	Delta	$24,500
Evaluate survival of CWT fall-run chinook juveniles entering the Delta during April and May 1997	CVPIA: To be determined	Delta	$34,000
			$582,870

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Project Description	Applicant/Administrator	Watershed	Funded
River geomorphology			
Martinez Regional shoreline restoration	East Bay Regional Park District	Suisun Marsh and Bay	$392,375
Twitchell Island restoration	Department of Water Resources	Delta	$3,500,000
Sherman Island Levee Habitat Demonstration	DWR	Delta	$960,000
Sedimentation movement and availability and monitoring in the Delta	USGS	Delta	$1,047,010
Tyler Island levee protection and habitat restoration pilot project	Habitat Assessment & Restoration Team, Inc.	Delta	$885,202
Franks Tract wetlands habitat restoration	Moffatt and Nichol Engineers, DPR, DWR	Delta	$601,500
In-channel island restoration/demonstration project	Association of Bay Area Governments	Delta	$361,270
Jepson Prairie restoration of SRA and perennial grasslands	Solano County Farmlands, Open Space Foundation	Delta	$244,801
Liberty Island acquisition	USFWS	Delta	$8,577,000
Decker Island Tidal wetland enhancement	Port of Sacramento	Delta	$399,000
Predict evolution of ecological functions of diked wetlands	University of Washington	Delta	$475,000
Bay Point shoreline restoration plan	East Bay Regional Park District	Suisun Marsh and Bay	$238,900
			$17,682,058
Water quality			
Effects of wetlands restoration on methyl mercury levels	UC Davis	Delta	$546,171
Impacts of Pesticides on Aquatic Invertebrates in the Delta Program	To be determined	Delta	$1,500,000
Contaminant effects on smelt	UC Davis	Delta	$437,000
Evaluation of selenium sources, levels and consequences in the Delta	USGS	Delta	$2,779,655
Monitoring of Delta contaminants	San Francisco Baykeeper	Delta	$120,000
Integrated Pest Management in Suisun Bay Project	USBR	Suisun Marsh and Bay	$266,000
			$5,648,826
Watershed management			

	Project Description	Applicant/Administrator	Watershed	Funded
	Watershed Restoration Strategy for the Yolo Bypass	Yolo Basin Foundation, Inc.	Yolo Bypass	$244,188
	Alhambra Creek Watershed CRMP Program	Contra Costa Resource Conservation District	Alhambra Creek	$138,500
	Barker Slough Watershed Management Project	Solano County Water Agency	Barker Slough	$580,000
				$962,688
				$41,342,892

East Side Tributaries

Entrainment

	Woodbridge fish screen and passage	Woodbridge Irrigation District	Mokelumne River	$1,575,000
				$1,575,000

Fish passage

	Cosumnes River Salmonid Barrier Program	Fishery Foundation or California	Cosumnes River	$188,255
				$188,255

Floodplain/Marsh restoration

	Stone Lakes NWR Land Acquisitions	US Fish and Wildlife Service, Sacramento Realty Office	Cosumnes River	$1,900,000
	Cosumnes River Acquisition, Restoration, Planning and Demonstration	The Nature Conservancy	Cosumnes River	$750,000
	Cosumnes Preserve (Valensin Acquisition)	TNC	Cosumnes River	$12,000,000
	McCormack-Williamson Tract's Wildlife-Friendly Levee Management Program	The Nature Conservancy	Mokelumne River	$860,000
	Cosumnes floodplain acquisition and restoration	Wildlife Conservation Board, The Nature Conservancy	Cosumnes River	$18,508,300
	East Delta Corridor Habitat Study - Mokelumne River Feasibility Study	The Nature Conservancy and East Bay Municipal Utility District	Mokelumne River	$400,000
	East Delta Corridor Habitat Study - Cosumnes River Feasibility Study	The Nature Conservancy and East Bay Municipal Utility District	Cosumnes River	$400,000
				$34,818,300

Population management

	Cosumnes River Preserve fish distribution and habitat use assessment	CVPIA: To be determined	Cosumnes River	$30,000

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	Project Description	Applicant/Administrator	Watershed	Funded
	Biol. Integrated Orchard Systems Program	Community Alliance with Family Farmers Foundation	Landscape	$660,000
	Assessment of Ecological and Human Health Impacts of Mercury in the Bay-Delta Watershed	Department of Fish and Game	Landscape	$3,800,000
				$11,155,239
	Watershed management			
	Watershed Leader funding for "Working at a Watershed Level"	CVPIA: To be determined	Landscape	$63,500
				$63,500
				$34,265,879
	North Bay			
	Floodplain/Marsh restoration			
	Hamilton wetland restoration	San Francisco BCDC & California Coastal Conservancy	North Bay	$2,324,015
	San Francisco Bay Area wetlands ecosystem goals project	US EPA	North Bay	$276,000
	Petaluma Marsh Expansion Project - Marin County	Marin Audubon Society	Petaluma Marsh	$352,135
	South Napa River Wetlands Acquisition and Restoration Program	Napa County Land Trust	Napa River	$431,000
	Benicia Waterfront Marsh Restoration	City Of Benicia	North Bay	$59,000
	Cullinan Ranch restoration	Ducks Unlimited	North Bay	$1,030,500
	Biological Restoration and Monitoring in the Suisun Marsh/North San Francisco Bay Ecological Zone	California State University Hayward	North Bay	$772,667
	South Napa River Tidal Slough and Floodplain Restoration Project	City of American Canyon	North Bay	$1,455,000
	Tolay Creek restoration	Ducks Unlimited	Tolay Creek	$705,000
	South Napa River wetlands acquisition and restoration	Napa County Land Trust	Napa River	$1,000,000
				$8,405,317
	Introduced species			
	Preventing exotic introductions from ballast water	UC Sea Grant Extension Program	North Bay	$286,715

Project Description	Applicant/Administrator	Watershed	Funded
Molecular genetic identification of chinook salmon runs	UC Davis, Bodega Marine Lab	Landscape	$1,050,000
Innovative fish screen for small unscreened diversions	Buell and Assoc.	Landscape	$90,000
			$2,740,000
River geomorphology			
Sediment Management Program	To be determined	Landscape	$500,000
			$500,000
Water management			
Instream flow studies in the Sacramento River, American River, and Merced River	CVPIA: To be determined	Sacramento, American, and Merced River	$600,000
Basis Development for Water Acquisition Program	CVPIA: To be determined	Landscape	$150,000
Sacramento, American, & Merced River flow studies: (Cont.)	CVPIA: To be determined	Sacramento, American, & Merced Rivers	$500,000
Water Acquisition Program	To be determined	Landscape	$14,500,000
Sacramento, American, & Merced River flow studies: (Cont.)	CVPIA: To be determined	Sacramento, American, & Merced Rivers	$430,000
			$16,180,000
Water quality			
Evaluation of alternative pesticide use reduction practices for diazinon and chlorpyrifos	UC Davis	Landscape	$1,704,608
Assessment of organic matter in the habitat and its relationship to the food chain	USGS	Landscape	$1,400,000
Effects of toxics on Central Valley chinook salmon	Fox Environmental Management	Landscape	$110,000
Water Quality Criteria for Chlorpyrifos Program	DFG	Landscape	$100,000
Chronic Fish Impairment Studies Program	To be determined	Landscape	$700,000
Algal Toxicity Program	To be determined	Landscape	$500,000
Biologically Integrated Orchard Systems (BIOS) - pesticide and fertilizer reduction	Community Alliance with Family Farmers	Sacramento and San Joaquin River	$1,680,631
Baseline Pesticide Monitoring Program	To be determined	Landscape	$500,000

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Table 2.

1999 Proposals Recommended For Funding

	Prop. No.	Project Title	Applicant Organization	Recommended Amt.
	99-A105	Fish Passage Improvement Project at the Red Bluff Diversion Dam	Tehama-Colusa Canal Authority	$1,000,000
*	99-A109	Fish Treadmill Developed Fish Screen Criteria for Native Sacramento-San Joaquin Watershed Fishes	Wildlife, Fish, & Conservation Biology, UC Davis	$1,036,821
	99-A117	Improve the Upstream Ladder & Barrier Weir @ Coleman Nat'l Fish Hatch. in Battle Creek	US Fish & Wildlife Service	$1,663,400
*	99-B106	East Delta Habitat Corridor (Georgianna Slough)	Habitat Assessment & Restoration Team, Inc.	$1,100,000
	99-B124	Lake Red Bluff Riparian Area Restoration & Education Support Project	The California Conservation Corps	$29,114
	99-B127	Reintroduction of Endangered Soft Bird's Beak to Restored Habitat - Suisun	University of California at Davis, Dept of Environmental Science & Policy, Wetland Research Lab	$148,627
	99-B130	Development of an Implementation Plan for Lower Yuba River Anadromous Fish Habitat Restoration	Surface Water Resources, Inc	$171,100
	99-B131	YUBA TOOLS: Collaborative Watershed Mgmt for Flood Control	Yuba Watershed Council & SYRCL	$216,150
	99-B146	Species and Community Profiles of the San Francisco Bay Area Wetlands Ecosystem Goals Project	Friends of the San Franciso Estuary	$44,000
*	99-B156	South Napa River Tidal Sough and Floodplain Restoration Project	City of American Canyon	$1,520,000
	99-B158	Sacramento River Discovery Center	Sacramento River Discovery Center	$38,400
	99-B161	Riparian Corridor Acquisition and Restoration Assessment	US Bureau of Land Management	$2,175,000
	99-B169	Understanding Tidal Marsh Restoration Processes and Patterns	University of New Orleans, Office of Res. & Sponsored Programs	$1,042,246
	99-B190	Linked Hydrogeomorphic Ecosystem Models to Support Adaptive Mgmt Cosumnes-Mokelumne Paired Basin	University of California, Davis Center for Integrated Watershed Science & Mgmt	$1,546,016
	99-C118	Biological Ag Systems in Cotton-BASIC-Reducing Synthetic Pesticides & Fertilizers in the No. SJ Vly	Sustainable Cotton Project (SCP)	$460,000
	99-C121	Douglas/Long Canyon Paired - Watershed Project	Placer County Water Agency - PCWA	$83,600

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	Prop. No.	Project Title	Applicant Organization	Recommended Amt.
	99-D113	Chronic Toxicity of Environmental Contaminants in Sacramento Splittail: A Biomarker Approach	UC Davis, Dept of Animal Science	$673,684
✱	99-D116	Assessment of Pesticide Effects on Fish & Their Food Resources in the Sac-SJ Delta	UC Berkeley, Regents of the University of California	$1,875,561
	99-D119	Determination of the Causes of Dissolved Oxygen Depletion in the SJ River	CA Dept of Water Resources, Environmental Services Offices	$866,408
✱	99-D123	Dissolved Organic Carbon Release from Delta Wetlands, Part 1	US Geological Survey, Calif State University, MS 6129	$1,392,669
✱	99-E101	An Evaluation of the Potential Impacts of the Chinese Mitten crab on the Benthic Comm. in the Delta	CA Department of Water Resources,	$147,799
✱	99-E103	Effects of Introduced Species of Zooplankton & Clams on the B-D Food Web	San Francisco State University: Romberg Tiburon Center	$726,930
✱	99-E104	Assessing Ecological & Economic Impacts of the C. Mitten crab	UC Berkeley, Regents of the University	$149,429
✱	99-E116	Purple Loosestrife Prevention, Detection & Control Actions for the Sac/SJ River Delta System	CA Dept of Food & Ag, Integrated Pest Control Branch	$127,473
	99-F102	Health Monitoring of Hatchery & Natural Fall-run Chinook in SJ River	US Fish & Wildlife Service, California - Nevada Health Center	$37,860
	99-F103	Central Valley Steelhead Genetic Evaluation	CA Dept of Fish & Game, WRB	$70,636
	99-F106	Development of a comprehensive Imple. Plan for a Statiscally Designed Marking & Recovery	CA Dept of Fish & Game	$75,951
	99-G100	Estuary Action Challenge Environmental Education Project	Earth Island Istitute/Estuary Action Challenge	$50,000
	99-G103	Water Challenge 2010 Exhibit	US Army Corps of Eng, San Francisco Bay Model Visitor Center	$50,500
	99-G104	The Learning Watershed Project	American River Watershed Institute	$55,250
	99-G106	Traveling Film Festival & Exhibit/McCormack-Williamson Restoration Film	Independent Documentary Group (IDG Films)	$50,000
	99-G107	River Studies Center Exhibits & Programs	San Joaquin River Parkway & Conservation Trust	$68,415
	99-G117	1999/2000 Bay-Delta Education Program	Water Education Foundation	$32,300
	99-G119	Watershed Educational Training	Colusa County Resource Conservaton District	$13,000

Table 3.

Draft Early Implementation Actions with Direct or Indirect Effects on Delta Smelt

Actions with Direct Potential Benefits to Delta Smelt

	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
1	Ecosystem Restoration Program: South Delta Region	Identify and advance specific regional ERP goals, coordinated with other facilities and operational changes, such as flood protection, barriers, and export operations.	Improve fisheries and wildlife habitat	ERP	Levees	$2.0	$3.0		
2	Agricultural Diversions Screening Program	Consolidate and screen local ag diversions based on an appropriate priority and initiate a screen maintenance program, per Water Quality Control Plan, May 1995. A component of #31	Reduce fisheries entrainment impacts	ERP		see 31	see31		
3	Stockton Dissolved Oxygen Solution Alternatives	Evaluate and implement appropriate actions to improve San Joaquin River dissolved oxygen conditions.	Improve WQ in San Joaquin River in vicinity of Stockton	WQ	ERP	$1.0	$1.0	Multi-Agency: RWQCB lead	
4	Seek to provide water for San Joaquin River flows to meet WQ, VAMP, ESA, and other flow objectives through water purchases/transfers from willing sellers.	Component of Environmental Water Account. See #93, #94	Increased instream flows during significant periods	WT	ERP	see 94	see 94		
5	Implement spring flow management action, such as the Proposed Vernalis Adaptive Management Plan (VAMP)	Manage San Joaquin River flows, Delta exports, conduct fishery studies, evaluate benefits and minimize impacts. Establish San Joaquin River Water Quality Protection Reserve Fund to address impacts. Report on how VAMP funds will be used to improve water management practices.	Improve salmon survival, cu/gw management u/s, improve understanding of fish vs flow	external	ERP	$4.0	$4.0		USBR, DWR, and SJRGA
6	Plan, Design & Construct CVP test Tracy Fish Facility, 500 cfs screen, plus Sorting, Holding, Transport, and Release	New fish screens for TPP full export capacity to be completed by end of Stage 1	Improve fish survival	S/C	ERP	$6.5	$30.0		USBR
7	Plan, Design, & Construct new SWP Clifton Court Forebay Intake, including fish screens and salvage facilities, average daily capacity 10,300 cfs: New Screened Intake with Gates and LH Pumps		Improve fish survival, water supply flex. and reliability, drinking water quality stages, circulation, and water quality	S/C	ERP	$2.0	$4.0		DWR,USBR
8	Feasibility and Environmental study of SWP/CVP interties between export facilities and canals	Based on results of this investigation, either construct intertie and add 4600 cfs screened export capacity to CCFB or build new screen and salvage facilities at Tracy Pumping Plant. Also evaluate intertie between Delta Mendota Canal and Cal. Aqueduct between Delta pumping plants and O'Neill Forebay.		S/C	ERP	$1.0	$2.0		
9	Implement Joint Point of Diversion	Allow SWP and CVP to shift allowable exports between pumping plants to minimize environmental impacts and improve operational flexibility and water supply reliability.		external	S/C	-	-		SWRCB
10	SWP 10,300 cfs Permits, with appropriate regulatory constraints	Interim increase to 8500 cfs export capacity may be sought if benefits justify	Increased operational flexibility for water supply and environmental benefits.			-	-		

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	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
11	Plan, Design, and Construct Permanent Operable Barriers at Head of Old River, Middle River, and Old River at Tracy.	Phase out temporary barriers as soon as feasible (permanent barriers, dredging, and ag intakes extensions completed. Retain options for future construction of permanent operable Grant Line Canal barrier if other actions fail to address local water supply avaiability needs. Costs shown are for design.	Improve fish passage (HOR), and local water supply availability and quality (MR, ORT)			$0.5	$2.0		
12	Barrier Operations	Establish Barrier Operation Coordination Team, operate for fisheries, water quality, and water supply availability goals.				-	-		
13	Barrier Monitoring	Monitor barrier effects on fish, stages, circulation, and wager quality to support real time ops and planning process.				$0.5	$0.5		
14	Agricultural Diversions Extension and Screening	Extend ag intakes where necessary, with operable barriers in place, to meet local water supply availability needs. Costs shown are for design and agreements.				$0.2	$1.0		
15	Flood Conveyance improvements in lower San Joaquin River System, including Paradise Cut, San Joaquin River, Old River, and Middle River, per FEET Report, 1997	Channel dredging, limited levee setbacks, and flood plain restoration in conjunction with ERP actions	Improve levee integrity, channel conveyance, flood plain storage, fisheries and wildlife habitat	S/C	ERP	$1.0	$1.0		Corps, DWR
16	Restore Tidal Marsh and Riparian Habitats along Georgiana Slough	The assumption is that improved habitat will decrease the diversion effect on fisheries.	Improve fisheries and wildlife habitat	ERP		$1.5	$1.0	Need additonal funding for acquisiton and implementation	
17	Study North Delta ecosystem and flood control improvements including the Lower Mokelumne River		Flood control and habitat creation w/ levee berms	S/C	ERP	$1.0	$2.0		DWR
18	Acquire and Convert Land for Shallow Water, Wetland, and Riparian Habitat	This action will contribute to establishment of a Mokelumne River Corridor.	Flood control and habitat creation w/ breached levees	ERP: Mokelumne Corridor		$3.0	$3.0	Continued funding	DWR, DFG, and others
19	Implement Suisun Marsh Diversion Screening Program	It is assumed that fish screens in this area will aid in the recovery of threatened or endangered fish species.	Reduce fisheries entrainment impacts	ERP		$0.25	$1.0	Anticipate identification of projects for implementation in 2000 , implementation in 2001	
20	Suisun Marsh and Van Sickle Island	Evaluate and restore tidal wetlands.		ERP		$6.0	$3.0		
21	Provide Needs and Opportunities Analysis for Improving Ecosystem Restoration and Flood Bypass Habitat for the Yolo Bypass area	This is a portion of a general effort for flood bypass areas, including Colusa Basin, Butte Basin, Sutter Bypass, Yolo Bypass, Chowchilla Bypass, Eastside, Fresno Slough, and James Bypass. See action 42	Improve diverse habitat, fish passage, and WQ	ERP		$1.0	$6.0	Anticipate implementation of projects in 2001	CALFED: Multi-Agency

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	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
22	Frank's Tract Habitat Restoration	Further evaluate and restore portions of Frank's Tract to provide for channel islands and tidal wetland habitat using clean dredge materials and natural sediment accretion. Combine the habitat restoration with a program to control or eradicate nuisance aquatic plants.	Create shallow water habitat, riparian	ERP		$1.5	$1.5	continued funding for potential project implementation, if project identified in 2000	DWR, Corps
23	Evaluate the Need to Screen Small Diversions in the Delta and implement	Consolidate and screen local ag diversions based on an appropriate priority and initiate a screen maintenance program, per Water Quality Control Plan, May 1995	Reduce fisheries entrainment impacts	ERP		$1.0	$1.5	Anticipate same level of funding for 2001	DFG, DWR
24	ERP Levee Relocations, Berms, Veg. Management	Cost included with In-Channel Island Restoration	Delta Shallow Water, tidal wetlands, and riparian habitat	ERP		$1.0	$1.0	Continued funding	DWR,DFG
25	In-Channel Islands Restoration		Tidal wetlands, riparian habitat, special status species	ERP		$1.0	$1.0	Additional funding for channel island restoration work	DWR,DFG
26	San Joaquin River & Tribs Study, possible Implementation, and Acquisition	Implementation of components of Comprehensive Flood Control Study		ERP		$10.0	$5.0	Continued acquisition of floodplain land	DWR, Corps
27	Establish Pilot Environmental Water Account	Funding is for establishment and administration of EWA	Improve Delta env. Protection and water supply reliability	ERP	S/C	$1.0	$1.0	Continued funding	CALFED
28	Environmental Water Purchases	Includes EWA funding	Enhance fisheries habitat	ERP	S/C	$56.0	$60.0	Conditional depending on availability of long-term supplies	CALFED

	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
		Actions with Indirect Potential Benefits to Delta Smelt							
1	Water Quality Actions	Strategy to resolve regional water quality problems; initiate highest priority actions.		WQ		-	-		
2	Veale Tract Drainage Discharge Relocation Feasibility Study and Environmental Documentation	Possible cost share with Contra Costa Water District.	Improve drinking water	WQ		$1.0	$4.0		
3	Feasibility Study: Management, Relocation and/or Treatment of RD 800 Drain Discharge	Coordination with CCWD and other affected entities	Improve drinking water	WQ		$1.0	$6.0	DWR	
4	Implement On-Farm drainage management measures	Salinity and Selenium management.	Reduce transport of salinity and selenium contaminants to San Joaquin River	WQ	ERP	$0.5	$0.5	Grasslands Water District	
5	Implement regional irrigation efficiency improvement programs to reduce saline drainage		Reduce volume of saline drainage	WQ	ERP	$0.5	$0.5		
6	Evaluate/Implement as Appropriate Release of saline agricultural drainage water during high flow periods	Implement regional and on-farm drainage retention facilities and manage discharges.	Improve late season WQ in lower San Joaquin River, potential drinking water quality impact	WQ: not yet listed		$0.1	$0.1	Local Water Distr. W/ grant assistance	
7	Study: Evaluate Recirculation Benefits and Impacts	If feasible, acquire from willing sellers water to recirculate to meet WQ and VAMP objectives.	Potential to improve water quality and meet VAMP flow requirements in lower San Joaquin River	S/C	ERP, WQ	$0.1	$0.1		DWR,USBR
8	Cache Creek Mercury Source Control Study		Develop ways to reduce Hg transport to waterways	WQ/ERP		$3.0	$2.0	RWQCB	
9	Clear Lake upper watershed mercury remediation actions			WQ/ERP		$1.0	$1.0	RWQCB,DWR	
10	Barker Slough Watershed Restoration		Improve WQ, sediment, and habitat (Watershed severely impacts North Bay Aqueduct water quality.	WQ	ERP	$0.8	$0.8	Local: County and Special Districts	
11	Comprehensive Flood Control Study	Major evaluation of Sacramento River and San Joaquin River systems, coordinated with ERP flood plain restoration opportunities.		External	Coord. Levees, S/C				Corps, DWR

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	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
12	Sacramento River Mercury Source ID and Control/Remediation Study			WQ		$0.3	$0.8		
13	Diazinon and chlorpyrifos Assessment	Assess the fate and transport of diazinon and chlorpyrifos; begin implementation to reduce water quality impacts, using BMP's.		WQ	ERP	$0.4	$0.0		
14	Diazinon and chlorpyrifos Education	Develop an educational program that provides information on ways to reduce water quality impacts. Possible test market areas include Sacramento and Stockton. 1997/1998 Eco funding provided to develop BMPs. 2000- develop BMPs		WQ		$1.6	$0.8		
15	Integrated Storage Investigations								
16	Overall Storage Strategy		Improve Storage/CU utility	S/C		$1.0	$1.0		CALFED
17	Groundwater/CU Feasibility Studies with local sponsors		Improve Storage/CU utility	S/C		$2.0	$5.0		Local Cooperating Entities and CALFED
18	Groundwater/CU Programs: (Develop and Impl. GW Monitoring and Modeling Programs)		Improve Storage/CU utility	S/C		$1.0	$2.0		Local Cooperating Entities and CALFED
19	On-Stream Storage Enlargement Studies (Friant Dam Enlargement Recon Study)		Improve Flood Control and Storage/CU utility	S/C		$0.2	$0.2		Proposed Joint study: USBR , Corps, and Rec Board
20	North of Delta Off-Stream Storage Investigation (Sites and Alternatives Feasibility Study)		Improve Storage/CU utility	S/C		$10.0	$10.0		DWR
21	On-Stream Storage Enlargement (Shasta 6.5 ft Raise Feasibility Study)		Improve Storage/CU utility	S/C		$3.0	$1.5		USBR
22	In-Delta and Adjacent to Delta Storage: Feasibility Study		Improve Storage/CU utility	S/C		$1.5	$2.0		DWR
23	Power Facilities Reoperations Evaluation		Improve Storage/CU utility	S/C	ERP,WM	$0.5	$0.5		DWR, FERC, PUC, SWRCB, w/local water entities and stakeholders
24	Financial Incentive Program	Local assistance (loans & grants) for cost effective water conservation/recycling actions, Low interest loans	reduce Demand	WUE					
25		Urban		WUE		$5.0	$12.0		CALFED, Multi-agency

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	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
26		Ag		WUE		$24.0	$50.0		CALFED, Multi-agency
27		Managed Wetlands		WUE		$1.5	$3.0		CALFED, Multi-agency
28		Recycling		WUE		$14.0	$28.0		CALFED, Multi-agency
29	Technical Assistance	Recoverable loss studies, on-farm conservation studies, funded through member agencies (USBR, DWR)	reduce Demand	WUE					
30		Urban		WUE		$0.8	$1.0		CALFED, Multi-agency
31		Ag		WUE		$3.0	$3.5		CALFED, Multi-agency
32		Refuges or Managed Wetlands		WUE		$0.2	$0.5		CALFED, Multi-agency
33		Recycling		WUE		$0.8	$1.0		CALFED, Multi-agency
34	Directed Studies			WUE					
35		Research ET		WUE		$0.2	$0.25		DWR, UC
36		Pilot Measurement Program		WUE		$0.5	$0.65		CALFED, Multi-agency
37	Establish the California Water Transfer Information Clearinghouse	Features of Clearinghouse in 2000/01; develop website to disseminate transfer information and approval process requirements. No user fees. Possibly house in new division of SWRCB.	Imp. Market efficiency	WT		$0.5	$0.5		CALFED
38	Streamline the Water Transfer Approval Process	Working with SWRCB, DWR, USBR to create a more standard application process. Would be available through the Clearinghouse, among other things. Several year effort. Initial effort is to clarify existing process thru SWRCB guidebook.	Assure disclosure of proposed actions	WT		$0.09	$0.00		USBR, DWR, SWRCB
39	Require Impact Analysis Disclosure for Water Transfers	Working with SWRCB, DWR, USBR to require transfer applicants to disclose socio-economic, groundwater, and cumulative impact assesments with approval applications. Several year effort. Reqiures agencies to adopt/modify existing requirements		WT		$0.02	$0.02		USBR, DWR, SWRCB

	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
40	Expedite the SWRCB Approval Process for Some Water Transfers	SWRCB preparing guidebook on existing approval process. Help ID additional opportunities to expedite.	Imp. Market efficiency	WT		$0.50	$0.50		USBR, DWR, SWRCB
41	Develop Transferable Water Definitions for Various Types of Transfers	Develop definitions of transferable water for types of transfers that are of issue as identified in guidebook. Have to have agencies and stakeholders work closely.	Imp. Market efficiency	WT		$0.04	$0.04		USBR, DWR, SWRCB
42	Clarify Carriage Water Requirements for Cross-Delta Water Transfers	Evaluate applicability of carriage water concept to transfers and develop consensus method to calculate it.	Imp. Market efficiency	WT		$0.09	$0.04		CALFED, Multi-agency
43	Refine Refill Criteria for Reservoir Storage Based Water Transfers	Establish more consistent application of refill criteria. Facilitate discussion between SWRCB, DWR, and USBR.	Imp. Market efficiency	WT		$0.03	$0.00		DWR, USBR
44	Improve Provisions for In-stream Water Transfers	Develop accounting/tracking measures for 1707 transfers	Facilitate ERP Impl.	WT		$0.08	$0.08		CALFED, Multi-agency
45	Forecast and Disclose Conveyance Capacity in State and Federal Project Facilities	May be increased work effort at DWR and USBR	Imp. Market efficiency	WT		$0.50	$0.50		DWR, USBR
46	Evaluate policies for transferring water in existing project facilities.	Work with stakeholders and DWR/USBR to make some capacity available for transfers.	Imp. Market efficiency	WT		$0.02	$0.02		DWR, USBR
47	Evaluate the Need for Additional Water Rights Legislation	CALFED is preparing a recommendation. No additional funding expected.		WT		-	-		CALFED
48	Local assistance for Groundwater Management Plans	Incentive program for ground water management. Coordinate with conjunctive use program/incentives. Incentive dollars would not be through the Water Transfer program.	Increase use of groundwater as a water management tool.	WT	S/C	-	-		CALFED
49	Fund and implement watershed planning activities within watersheds of the greater Bay Delta ecosystem	Assist local watershed groups and government agencies to develop watershed plans through grants, directed actions training and technical support.	Manage land use, vegetation, and stream zones to reduce sediment, reduce stream flashiness, improve base flow, Reduce fire danger, reduce pathogens, and TDS	WM	ERP	$8.0	$8.0		CALFED
50	Fund and implement watershed conservation, maintenance and restoration actitivites within watersheds of the greater Bay Delta ecosystem.	Assist local watershed groups and government agencies to develop and implement programs, projects and other community based watershed improvement actitivites through grants, directed actions training and technical support.	Manage land use, vegetation, and stream zones to reduce sediment, reduce stream flashiness, improve base flow, Reduce fire danger, reduce pathogens, and TDS	WM	ERP, WQ	$12.0	$12.0		CALFED
51	Provide funding to help build the capacity of locally led watershed groups that collorobate with local landowners.	Provide, or support capacity building programs to enhance sustainability of locally led watershed programs. Programs could include training in facilitation techniques, consnsus building, conflict mgt., fund raising and other similar skills, in addition to start up support for staff costs, administration, and other operating expenses.	Significantly increased capacity for local communities to undertake watershed managemtn activities.	WM		$4.0	$4.0		CALFED

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	Action Description	Detail/Assumptions	Primary Effects	CALFED Program	Secondary CALFED Program	FY 2000 Cost (millions)	FY 2001 Cost (millions)	Program Manager Notes	Implementing Entity
52	Provide funding and assistance to locally led watershed efforts to help build and administer watershed education programs.	Fund the development of local education programs through communities, schools, and universities, non-governmental organizations, local agencies and watershed stewardship groups,	Increased awareness and understandingwithin communities of the importance of ahealth functional watershed	WM	ERP	$1.0	$1.0		CALFED
53	Establish, fund and maintain assistance to local watershed groups, and landowners for project concept, design, and implementation	Ensure adequate levels of technical assistance and scientific support to locally led watershed management programs.	Sound scientiically based watershed plans, and projects.	WM	ERP,	$3.0	$3.0		CALFED
54	Assist CALFED's monitoring program to develop appropriate watershed management performance measures and monitoring protocols	Ensure that adaptive management can be applied at multiple scales (including site, project, and program) and across land ownerships by developing a suite of protocols to help track a wide range of watershed responses to change.	The program will have releiable data and information with to adaptively management the program, and program actitivities.	WM	ERP	$0.5	$0.5		CALFED
55	Begin development of baseline information needed to conduct scientically sound watershed planning and management within watersheds of the greater Bay Delta ecosystem.	Support watershed assessment efforts in the tributary basins of the greater Bay Delta watershed consistent with CALFED's monitoring program and local watershed program needs.	Expanded information base available for watershed planning, implementaion and monitoring activities.	WM	ERP,WQ	$1.5	$1.5		CALFED
56	Improve the use and usefulness of existing watershed resource information centers	Support the expansion of an active network of watershed data and information to assist watershed programs to conduct effective watershed management, conservation and restoration activities	Expanded capability of watershed managers to collect, store, retrieve and exchange data and information.	WM	ERP	$1.0	$1.0		CALFED
57	Provide oversight for the program through the CALFED oversight entity	Insure adequate funding to conduct administrative, management, and oversight for the watershed program, within the framework of the overall CALFED oversight entity.		WM		$0.5	$0.5		CALFED
58	Field Surveys for all special status species in and around all potential surface storage and groundwater sites			S/C		$1.0	$1.0		
59	Feasibility evaluation of water exchanges between San Joaquin River/Tulare lake watersheds and urban water users to improve drinking water quality			WQ	WT	-	-		
60	Supplement existing monitoring programs	Implement additional system or landscape level monitoring programs to provide for measurement of progress and evaluation of performance of the ERP		ERP		$7.0	$7.0		

Table 4.

Delta Smelt: Ecosystem Restoration Program Plan Restoration Targets and Programmatic Actions

21-Jun-99

	Ecosystem Element	Type		Target		Programmatic Action
Sacramento-San Joaquin Delta						
1	Delta Sloughs	Habitat	1	Restore ecological structure and functions of the Delta waterways network by increasing the land-water interface ratio a minimum of 50 to 75% compared to 1906 conditions and by restoring 100 to 150 miles of small distributary sloughs (less than 50 to75 feet wide) hydrologically connected to larger existing Delta channels. (Note: This target is in addition to the Delta slough target presented in the target section for Delta Channel Hydraulics.)	1a	To replace lost slough habitat and provide high-quality habitat areas for fish and associated wildlife, the short-term solution for the Central and West Delta Ecological Unit is to restore 20 miles of slough habitat. The long-term solution is to restore 50 miles of slough habitat. In both the North Delta and East Delta Ecological Units, the short-term solution is to restore 10 miles of slough habitat. The long-term solution is to restore 30 miles of slough habitat. In the South Delta Ecological Unit, the short-term solution is to restore 25 miles of slough habitat and the long-term solution is to restore 50 miles of slough habitat.
2	Delta Sloughs	Habitat	1	Restore ecological structure and functions of the Delta waterways network by increasing the land-water interface ratio a minimum of 50% to75% compared to 1906 conditions and by restoring 100 to 150 miles of small distributary sloughs (less than 50 to 75 feet wide) hydrologically connected to larger existing Delta channels. (Note: This target is in addition to the Delta slough target presented in the target section for Delta Channel Hydraulics.)	1b	Restore tidal action to portions of islands and tracts in the North and East Delta Ecological Management Units with appropriate elevation, topography, and hydrogeomorphic conditions. This will sustain tidally influenced freshwater emergent wetland with 20 to 30 linear miles of narrow, serpentine shaped sloughs within the wetlands and floodplain.
3	Fresh Emergent Wetland (Tidal)	Habitat	1	Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000 to 45,000 acres of lands designated for floodplain restoration.	1a	Develop tidal freshwater marshes in the North Delta Ecological Management Unit.
4	Fresh Emergent Wetland (Tidal)	Habitat	1	Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000 to 45,000 acres of lands designated for floodplain restoration.	1b	Develop tidal wetlands on small tracts of converted leveed lands along Snodgrass Slough.
5	Fresh Emergent Wetland (Tidal)	Habitat	1	Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000 to 45,000 acres of lands designated for floodplain restoration.	1c	Develop tidal wetlands along the upper ends of dead-end sloughs in the east Delta.
6	Fresh Emergent Wetland (Tidal)	Habitat	1	Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000 to 45,000 acres of lands designated for floodplain restoration.	1d	Develop tidal wetlands along all setback levees and levees with restored riparian habitat.
7	Fresh Emergent Wetland (Tidal)	Habitat	1	Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000 to45,000 acres of lands designated for floodplain restoration.	1e	Develop tidal freshwater marshes on restored channel island habitat.

Based on June 1999 version of ERPP Volume II: Ecological Management Zone Visions

	Ecosystem Element	Type	Target	Programmatic Action
8	Midchannel Islands and Shoals	Habitat	1 Maintain existing channel islands and restore 50 to 200 acres of high value islands in selected sloughs and channels in each of the Delta's ecological management units.	1a Actively protect and improve existing channel islands in the Delta.
9	Midchannel Islands and Shoals	Habitat	1 Maintain existing channel islands and restore 50 to 200 acres of high value islands in selected sloughs and channels in each of the Delta's ecological units.	1b Restore 50 to 200 acres of channel islands in the Delta, where channel islands once existed.
10	Riparian and Riverine Aquatic	Habitat	1 Restore 10 to 20 linear miles of riparian and riverine aquatic habitat along the San Joaquin River in the South Delta Ecological Management Unit to create corridors of riparian vegetation of which 50% is greater than 75 feet wide and 40% is no less than 300 feet wide and 1 mile in length.	1a Develop a cooperative program to restore riparian habitat by obtaining conservation easements or by purchase from willing sellers.
11	Riparian and Riverine Aquatic	Habitat	2 Restore 15 to 25 linear miles of riparian and riverine aquatic habitat along other Delta island levees throughout the South Delta Ecological Management Unit. This will create corridors of riparian vegetation of which 60% is more than 75 feet wide, with 10% no less than 300 feet wide and 1 mile long.	2a Develop a cooperative program to restore riparian habitat by obtaining conservation easements or by purchase from willing sellers.
12	Riparian and Riverine Aquatic	Habitat	3 Restore 10 to 15 linear miles of riparian and riverine aquatic habitat along the Sacramento River below Sacramento of which 40% is to be more than 75 feet wide and 20% over 300 feet wide.	3a Obtain conservation easements for, or purchase from willing sellers, land needed to restore 10 to15 linear miles of riparian habitat along the Sacramento River in the North Delta Ecological Management Unit. Obtain conservation easements for, or purchase from willing sellers, land needed to create corridors of riparian vegetation.
13	Riparian and Riverine Aquatic	Habitat	4 Restore 8 to 15 linear miles of riparian and riverine aquatic habitat in the East Delta Ecological Management Unit of which 40% is to be more than 75 feet wide and 20% over 300 feet wide.	4a Obtain conservation easements for, or purchase from willing sellers, land needed to restore 5 to10 linear miles along the Mokelumne River and 3 to 5 miles along the Cosumnes River in the East Delta Ecological Management Unit to create corridors of riparian vegetation.
14	Riparian and Riverine Aquatic	Habitat	5 Restore 10 to 20 linear miles of riparian and riverine aquatic habitat in the North Delta Ecological Management Unit of which 40% is to be more that 75 feet wide and 20% over 300 feet wide.	5a Obtain conservation easements for, or purchase from willing sellers, land needed to restore 5 to 10 linear miles along the Steamboat Slough as part of the development of a North Delta Habitat Corridor.
15	Riparian and Riverine Aquatic	Habitat	6 Restore or plant riparian and riverine aquatic habitats in association with actions to recreate slough habitat and set back levees.	6a Obtain conservation easements for, or purchase from willing sellers, land needed to restore riparian habitat along newly created sloughs and sloughs with new levee setbacks.
16	Riparian and Riverine Aquatic	Habitat	6 Restore or plant riparian and riverine aquatic habitats in association with actions to recreate slough habitat and set back levees.	6b Obtain conservation easements for, or purchase from willing sellers, land needed to restore riparian habitat along new or upgraded Delta levees.

	Ecosystem Element	Type	Target		Programmatic Action	
17	Riparian and Riverine Aquatic	Habitat	7	Protect existing riparian woodlands in North, East, and South Delta Ecological Management Units.	7a	Expand the Stone Lakes and Cosumnes River Preserves from their current size by an additional 500 acres of existing woodland habitat. Share costs with the Nature Conservancy to acquire in fee-title the lands needed from willing landowners.
18	Riparian and Riverine Aquatic	Habitat	7	Protect existing riparian woodlands in North, East, and South Delta Ecological Management Units.	7b	Purchase riparian woodland property or easements.
19	Tidal Perennial Aquatic	Habitat	1	Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Management Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Management Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Management Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Management Unit.	1a	Restore 500 acres of shallow-water habitat at Prospect Island in the North Delta Ecological Management Unit.
20	Tidal Perennial Aquatic	Habitat	1	Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Management Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Management Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Management Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Management Unit.	1b	Restore 1,000 acres of shallow-water habitat in the downstream (south) end of the Yolo Bypass (Little Holland and Liberty islands) within the North Delta Ecological Management Unit.
21	Tidal Perennial Aquatic	Habitat	1	Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Management Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Management Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Management Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Management Unit.	1c	Restore 1,000 acres of shallow-water habitat at the eastern edge of the East Delta Ecological Management Unit where existing land elevations range from 5 to 9 feet below mean sea level.
22	Tidal Perennial Aquatic	Habitat	1	Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Management Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Management Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Management Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Management Unit.	1d	Restore 2,000 acres of shallow-water habitat at the south and eastern edge of the South Delta Ecological Management Unit where existing land elevations range from 5 to 9 feet below mean sea level.
23	Tidal Perennial Aquatic	Habitat	1	Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Management Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Management Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Management Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Management Unit.	1e	Restore 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Management Unit where existing land elevations range from 5-9 feet below mean sea level. A program of fill placement or longer term subsidence reversal may be needed to accomplish this action.

	Ecosystem Element	Type	Target		Programmatic Action	
24	Tidal Perennial Aquatic	Habitat	2	Restore 500 acres of shoals in the westernmost portion of the Central and West Delta.	2a	Implement a sediment management program that results in deposition and accretion within portions of Central and West Delta channels and bays, forming 500 acres of shallow shoal habitat restored to tidal influence.
25	Bay-Delta Aquatic Foodweb	Process	1	Increase primary and secondary nutrient productivity in the Delta to levels historically observed in the 1960s and early 1970s.	1a	Actions described to restore streamflow, floodplain inundation, Delta hydraulics, tidal wetlands and sloughs, and riparian habitat would increase primary and secondary productivity in the Delta. Relocating the intake of the South Delta pumping plants to the North Delta would also increase Delta productivity.
26	Bay-Delta Hydraulics	Process	1	Reestablish more natural internal Delta hydraulics in channels.	1a	Reduce velocities in selected Delta channels by increasing cross-sectional areas of channel by means of setback levees or by constricting to flows into and out of the channels.
27	Bay-Delta Hydraulics	Process	1	Reestablish more natural internal Delta hydraulics in channels.	1b	Increase tidal flow and cross-Delta transfer of water to south Delta pumping plants to selected channels to lessen flow through other channels.
28	Bay-Delta Hydraulics	Process	1	Reestablish more natural internal Delta hydraulics in channels.	1c	Manage the operation of existing physical barriers so that resulting hydraulics upstream and downstream of the barrier are more like levels in the mid-1960s.
29	Bay-Delta Hydraulics	Process	1	Reestablish more natural internal Delta hydraulics in channels.	1d	Close the DCC when opportunities allow, as specified in the 1995 Water Quality Control Plan and recommended by the U.S. Fish and Wildlife Service (1995), in the period from November through January when appropriate conditions trigger closure (i.e., internal Delta exports are occurring).
30	Bay-Delta Hydraulics	Process	2	Restore hydrodynamic conditions in the rivers and sloughs of the Delta sufficient to support targets for the restoration of aquatic resources.	2a	Restore 3,000 to 4,000 acres of tidal perennial aquatic habitat and 20,000 to 25,000 acres of tidally influenced freshwater marsh. (Note: These recommendations are contained within programmatic actions presented for tidal perennial aquatic habitat and fresh emergent wetland and are not additions to acreages previously presented.)
31	Bay-Delta Hydraulics	Process	3	Maintain net downstream flows in the mainstem San Joaquin River from Vernalis to immediately west of Stockton during the period from September through November to help sustain dissolved oxygen levels and water temperatures sufficient for upstream migrating adult fall-run chinook salmon.	3a	Operate a fully operational barrier at the head of Old River in the period from August through November.

	Ecosystem Element	Type	Target	Programmatic Action
32	Bay-Delta Hydraulics	Process	4 Restore 50 to 100 miles of tidal channels in the southern Yolo Bypass within the north Delta, while maintaining or improving the flood carrying capacity of the Yolo Bypass. (Note: this target is in addition to targets and programmatic actions presented in the Delta Sloughs habitat section.)	4a Construct a network of channels within the Yolo Bypass that connect Putah and Cache Creek sinks, and potentially the Colusa drain to the Delta. These hannels should effectively drain all flooded lands in the bypass after floodflows stop entering the bypass from Fremont and Sacramento weirs. The channels would maintain a base flow through the spring to allow juvenile anadromous and resident fish to move from rearing and migratory areas.
33	Bay-Delta Hydraulics	Process	4 Restore 50 to 100 miles of tidal channels in the southern Yolo Bypass within the north Delta, while maintaining or improving the flood carrying capacity of the Yolo Bypass. (Note: this target is in addition to targets and programmatic actions presented in the Delta Sloughs habitat section.)	4b Reduce flow constrictions in Yolo Bypass such asthose in the openings in the railway causeway that parallels Interstate 80.
34	Central Valley Stream Temperatures	Process	1 More frequently maintain daily water temperatures in the Delta channels below 60 F in the spring and 65 F in the fall to meet the temperature needs of salmon and steelhead migrating through or rearing in the Delta.	1a Improve riparian woodland habitats along migrating channels and sloughs of the Delta.
35	Central Valley Stream Temperatures	Process	1 More frequently maintain daily water temperatures in the Delta channels below 60 F in the spring and 65 F in the fall to meet the temperature needs of salmon and steelhead migrating through or rearing in the Delta.	1b Improve SRA habitat along migration routes in Delta.
36	Central Valley Streamflow	Process	1 Provide a March outflow that occurs from the natural late-winter and early-spring peak in inflow from the Sacramento River. This outflow should be at least 20,000 cfs for 10 days in dry years, at least 30,000 cfs for 10 days in below-normal years, and 40,000 cfs for 10 days in above-normal water years. Wet year outflow is generally adequate under the present level of development.	1a Prescribed outflows in March should be met by the cumulative flows of prescribed flows for the Sacramento, Feather, Yuba, and American rivers. Assurances must be obtained (e.g., to limit Delta diversions) that these prescribed flows will be allowed to contribute to Delta outflow. A portion of the inflow would be from base (minimum) flows from the east Delta tributaries and the San Joaquin River and its tributaries.
37	Central Valley Streamflow	Process	2 Provide a late-April to early May outflow that emulates the spring inflow from the San Joaquin River. The outflow should be at least 20,000 cfs for 10 days in dry years, 30,000 cfs in below normal years, and 40,000 cfs in above normal years. These flows would be achieved through base flows from the Sacramento River and flow events from the Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced rivers.	2a Prescribed outflows in late April and early May should be met by the cumulative flows of prescribed flows from the Stanislaus, Tuolumne, and Merced rivers (see East San Joaquin Basin Ecological Management Zone), and Mokelumne and Calaveras rivers (see Eastside Delta Tributaries Ecological Management Zone). It will be necessary to obtain assurances that these prescribed flows will be allowed to contribute to Delta outflow. The flow event would be made up of: the Cosumnes River, Mokelumne, Calaveras, and San Joaquin tributary pulsed flows prescribed under the May 1995 Water Quality Control Plan, and supplemental flows.

	Ecosystem Element	Type	Target	Programmatic Action
38	Central Valley Streamflow	Process	3 Provide a fall or early winter outflow that emulates the first "winter" rain through the Delta.	3a Allow the first "significant" fall/winter natural flow into the Delta (most likely from rainfall or from unimpaired flows from tributaries and lower watersheds below storage reservoirs or from flows recommended by DFG and Anadromous Fish Restoration Program) to pass through the Delta to the San Francisco Bay by limiting water diversions from the Delta for up to 10 days. (No supplementary release of stored water from reservoirs would be required above that required to meet flows prescribed by DFG and AFRP.)
39	Central Valley Streamflow	Process	4 Provide a minimum flow of 13,000 cfs on the Sacramento River below Sacramento in May of all but critical years (U.S. Fish and Wildlife Service 1995).	4a Supplement flows in May of all but critical years as needed from Shasta, Oroville, and Folsom reservoirs to maintain an inflow of 13,000 cfs to the Delta.
40	Natural Floodplain and Flood Processes	Process	1 Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain of the Delta.	1a Convert leveed lands to tidal wetland/slough complexes in the North Delta Ecological Management Unit. Permanently convert island tracts (Little Holland, Liberty, and Prospect) at the south end of the Yolo Bypass to tidal wetlands/slough complexes. Convert small tracts along Snodgrass Slough to tidal wetland/slough complexes. Construct setback levees along Minor, Steamboat, Oxford, and Elk Sloughs.
41	Natural Floodplain and Flood Processes	Process	1 Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain of the Delta.	1b In the East Delta Ecological Management Unit, construct setback levees along the South Mokelumne River and connecting dead-end sloughs (Beaver, Hog, and Sycamore).
42	Natural Floodplain and Flood Processes	Process	1 Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain of the Delta.	1c Remove levees that hinder tidal and floodflows in the headwater basins of east Delta dead-end sloughs (Beaver, Hog, and Sycamore) and allow these lands to be subject to flood overflow and tidal action.
43	Natural Floodplain and Flood Processes	Process	1 Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain of the Delta.	1d Convert deeper subsided (sunken) lands between dead-end sloughs in the East Delta Ecological Management Unit east of the South Mokelumne River channel to either overflow basins and nontidal wetlands or land designated for agricultural use.
44	Natural Floodplain and Flood Processes	Process	1 Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain of the Delta.	1e Construct setback levees in the South Delta Ecological Unit along the San Joaquin River between Mossdale and Stockton.
45	Natural Floodplain and Flood Processes	Process	1 Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain of the Delta.	1f Convert adjacent lands along the San Joaquin River between Mossdale and Stockton to either overflow basins and nontidal wetlands or land designated for agricultural use.

	Ecosystem Element	Type	Target		Programmatic Action	
46	Natural Floodplain and Flood Processes	Process	1	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain of the Delta.	1g	Construct setback levees on corners of Delta islands along the San Joaquin River channel in the Central and West Delta Ecological Unit. Open leveed lands to tidal action where possible along the margins of West Delta Ecological Unit.
47	Contaminants	Stressor	1	Reduce loading, concentrations, and bioaccumulation of contaminants of concern to ecosystem health in the water, sediments, and tissues of fish and wildlife in the Sacramento-San Joaquin Delta Ecological Zone by 25 to 50% as measured against current average levels.	1a	Reduce the input of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife in the Delta by modifying land management practices and chemical dependency on 50,000 acres of urban and agricultural lands that drain untreated into Delta channels and sloughs. Actions will focus on modifying agricultural practices and urban land uses on a large scale basis. To reduce the concentration of pesticide residues, the amount applied will be reduced and the amount of pesticide load reaching the Delta's aquatic habitats will be further reduced by taking advantage of biological and chemical processes within wetland systems, which can help break down harmful pesticide residues.
48	Contaminants	Stressor	1	Reduce loading, concentrations, and bioaccumulation of contaminants of concern to ecosystem health in the water, sediments, and tissues of fish and wildlife in the Sacramento-San Joaquin Delta Ecological Zone by 25 to 50% as measured against current average levels.	1b	Reduce levels of hydrocarbons and other contaminants entering the Delta foodweb from elevated releases into the estuary at oil refineries.
49	Dredging and Sediment Disposal	Stressor	1	Limit dredging in channel zones that are not essential for flood conveyance or maintenance of industrial shipping pathways, and avoid dredging activities in shallow water areas (<3 meters mean high water) except where it is needed to restore flood conveyance capacity.	1a	Use alternate sources (rather than Delta inchannel sources) of levee maintenance material, such as excavation of abandoned nonessential levees, excavation material from the restoration of secondary tidal channels, dry-side island interior borrow pits, upland borrow sites, Cache Creek settling basin and Yolo Bypass sediment deposits, and deep water dredging sites in the San Francisco Bay.
50	Dredging and Sediment Disposal	Stressor	1	Limit dredging in channel zones that are not essential for flood conveyance or maintenance of industrial shipping pathways, and avoid dredging activities in shallow water areas (<3 meters mean high water) except where it is needed to restore flood conveyance capacity.	1b	Restrict or minimize effects of dredging activities near existing midchannel tule islands and shoals that are vulnerable to erosion and exhibit clear signs of area reduction in response to channel and bar incision (cutting).
51	Dredging and Sediment Disposal	Stressor	2	Avoid dredging during spawning and rearing periods for delta smelt and rearing periods for winter-run chinook salmon.	2a	Follow DFG guidelines for dredging in the estuary.
52	Dredging and Sediment Disposal	Stressor	2	Avoid dredging during spawning and rearing periods for delta smelt and rearing periods for winter-run chinook salmon.	2b	Provide stockpiles of levee maintenance materials in three or more selected land-side areas to avoid the need to obtain material from Delta channels during restricted periods.
53	Invasive Aquatic Organisms	Stressor	1	Reduce or eliminate the influx of non-native aquatic species in ship ballast water.	1a	Fund additional inspection staff to enforce existing regulations.

	Ecosystem Element	Type	Target	Programmatic Action
54	Invasive Aquatic Organisms	Stressor	1 Reduce or eliminate the influx of non-native aquatic species in ship ballast water.	1b Help fund research on ballast water treatment techniques, which could eliminate non-native species before ballast water is released.
55	Invasive Aquatic Organisms	Stressor	2 Reduce the potential for introducing non-native aquatic organisms at border crossings.	2a Provide funding to the California Department of Food and Agriculture to expand the current State border inspection process to include a comprehensive program of exclusion, detection, and management of invasive aquatic species such as the zebra mussel.
56	Invasive Aquatic Plants	Stressor	1 Manage existing and restored dead-end and open-ended sloughs and channels within the Sacramento-San Joaquin Delta Ecological Management Zone so that the total surface area of these sloughs and channels covered by invasive non-native aquatic plants is reduced.	1a Conduct large-scale, annual weed eradication programs throughout existing and restored dead-end and open-ended sloughs and channels within each of the Delta's ecological units so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants within 10 years.
57	Invasive Aquatic Plants	Stressor	1 Manage existing and restored dead-end and open-ended sloughs and channels within the Sacramento-San Joaquin Delta Ecological Management Zone so that the total surface area of these sloughs and channels covered by invasive non-native aquatic plants is reduced.	1b Evaluate the feasibility of developing a program to commercially harvest and convert water hyacinth to methane (natural gas) and organic fertilizer.
58	Invasive Aquatic Plants	Stressor	2 Reduce the potential for introducing non-native aquatic plant and animal species at border crossings.	2a Provide funding to the California Department of Food and Agriculture to expand the current state border inspection process to include a comprehensive program of exclusion, detection, and management of invasive aquatic species such as the zebra mussel, purple loosestrife, and hydrilla.
59	Invasive Riparian and Salt Marsh Plants	Stressor	1 Reduce surface area covered by non-native plants to less than 1%.	1a Control non-native riparian plants.
60	Invasive Riparian and Salt Marsh Plants	Stressor	2 Reduce the aerial extent of invasive non-native woody species, such as Giant Reed (i.e., arundo or false bamboo) and eucalyptus, that compete with native riparian vegetation by reducing the area of non-natives by 50% throughout the Delta and eradicating invasive woody plants from restoration areas.	2a Implement a program throughout the Delta to remove and suppress the spread of invasive non-native plants that compete with native riparian vegetation by reducing the aerial extent of species such as False Bamboo, eucalyptus, and non-native cordgrass by 50%.
61	Invasive Riparian and Salt Marsh Plants	Stressor	2 Reduce the aerial extent of invasive non-native woody species, such as Giant Reed (i.e., arundo or false bamboo) and eucalyptus, that compete with native riparian vegetation by reducing the area of non-natives by 50% throughout the Delta and eradicating invasive woody plants from restoration areas.	2b Implement a program throughout the Delta that, before restoration actions, eliminates invasive woody plants that could interfere with the restoration of native riparian vegetation

	Ecosystem Element	Type	Target		Programmatic Action	
62	Levees, Bridges, and Bank Protection	Stressor	1	Increase shoreline and floodplain riparian habitat in the Delta by changing the vegetation maintenance practices on both the water and land side of berms on 25 to 75 miles of the Sacramento, Mokelumne, and San Joaquin rivers, and on 25 to 100 miles of other Delta channels and sloughs confined by levees.	1a	Enter into agreements with willing levee reclamation districts to change levee and berm vegetation management practices that promote establish maturate shoreline riparian vegetation. This will restore and maintain the health of aquatic resources. Reimburse districts for any additional maintenance and inspection costs.
63	Predation and Competition	Stressor	1	Reduce loss of juvenile fish in Clifton Court Forebay to predation by 75% to 90%.	1a	Develop a cooperative program to reevaluate the need to remove predatory fish from Clifton Court Forebay.
64	Predation and Competition	Stressor	1	Reduce loss of juvenile fish in Clifton Court Forebay to predation by 75% to 90%.	1b	Evaluate alternative methods to remove predator fish from Clifton Court Forebay with emphasis in predator removal near the fish facility.
65	Predation and Competition	Stressor	1	Reduce loss of juvenile fish in Clifton Court Forebay to predation by 75% to 90%.	1c	Evaluate alternate operational strategies to reduce entrainment of juvenile fish into Clifton Court Forebay.
66	Predation and Competition	Stressor	2	Reduce in-channel predation loss of juvenile fish near structures such as bridge pilings and diversions.	2a	Develop a cooperative program to reevaluate opportunities to modify in-channel structures to eliminate predatore habitat.
67	Water Diversion	Stressor	1	Reduce loss of important fish at diversions.	1a	Consolidate and screen agricultural diversions in the Delta.
68	Water Diversion	Stressor	1	Reduce loss of important fish at diversions.	1b	Replace or upgrade the screens at the SWP and CVP intakes with positive barrier, fish bypass screens and state-of-the-art fish holding and transportation systems.
69	Water Diversion	Stressor	1	Reduce loss of important fish at diversions.	1c	Upgrade screens at Pacific Gas & Electric Company's Contra Costa power plant with fine-mesh, positive barrier, fish bypass screens.

	Ecosystem Element	Type	Target		Programmatic Action	
Suisun Marsh\North San Francisco Bay						
70	Essential Fish Habitat	Habitat	1	Maintain and improve existing freshwater fish habitat and essential fish habitat through the integration of actions described for ecological processes, habitats, and stressor reduction or elimination.	1a	No additional programmatic actions are recommended.
71	Riparian and Riverine Aquatic	Habitat	1	Restore 10 to15 linear miles of riparian habitat along corridors of riparian scrub and shrub vegetation in each of the Ecological Management Units, of which 60% is more than 15 yards wide and 25% is no less than 5 yards wide and 1 mile long.	1a	Coordinate with landowners and managers to restore and maintain 10 to15 linear miles of riparian habitat along corridors of riparian scrub and shrub vegetation in each of the ecological units, of which 60% is more than 15 yards wide and 25% is no less than 5 yards wide and 1 mile long.
72	Saline Emergent Wetland	Habitat	1	Restore tidal action to 5,000 to 7,000 acres in the Suisun Bay and Marsh Ecological Management Unit; 1,000 to 2,000 acres in the Napa River Ecological Management Unit; 500 to1,000 acres each in the Sonoma Creek, Petaluma River, and San Pablo Bay Ecological Management Units.	1a	Develop a cooperative program to acquire, in fee-title or through a conservation easement, the land needed for tidal restoration, and complete the needed steps to restore the wetlands to tidal action.
73	Saline Emergent Wetland	Habitat	2	Protect 6,200 acres of existing saline emergent wetlands in the Suisun Bay and Marsh Ecological Management Zone.	2a	Develop a cooperative program to acquire, in fee-title or through a conservation easement, existing wetlands subject to tidal action.
74	Saline Emergent Wetland	Habitat	3	Restore full tidal action to muted marsh areas along the north shore of the Contra Costa shoreline.	3a	Develop a cooperative program to evaluate, acquire, in fee-title or through a conservation easement, and restore existing muted wetlands to full tidal action.
75	Tidal Perennial Aquatic	Habitat	1	Restore 1,500 acres of shallow-water habitat in the Suisun Marsh/North San Francisco Bay Ecological Management Zone.	1a	Develop a cooperative program to acquire and restore 1,500 acres of shallow-water habitat in the Suisun Bay and Marsh Ecological Management Unit.
76	Tidal Perennial Aquatic	Habitat	1	Restore 1,500 acres of shallow-water habitat in the Suisun Marsh/North San Francisco Bay Ecological Management Zone.	1b	Develop a cooperative program to evaluate the feasibility of restoring shallow-water habitat in the San Pablo Bay Ecological Management Unit.

	Ecosystem Element	Type	Target		Programmatic Action	
77	Tidal Sloughs	Habitat	1	Restore slough habitat for fish and associated wildlife species. Restore 5 miles of slough habitat in the near-term, and 10 miles in the long-term, in the Suisun Bay and Marsh Ecological Management Unit. Restore 10 miles of slough habitat in the near-term, and 20 miles in the long-term, in the Napa River Ecological Management Units. Restore 10 miles of slough habitat in the near-term, and 20 miles in the long- term, in the Sonoma Creek Ecological Management Units. Restore 10 miles of slough habitat in the near-term, and 20 miles in the long- term, in the Petaluma River Ecological Management Units	1a	In association with wetland/marsh restoration efforts, construct sloughs in marsh/slough complexes by acquiring land and purchasing easements.
78	Bay-Delta Aquatic Foodweb	Process	1	Increase primary and secondary nutrient productivity in the Suisun Marsh/North San Francisco Bay to levels historically observed in the 1960s and early 1970s.	1a	Actions described to restore streamflow, floodplains, tidal wetlands and sloughs, and riparian habitat would increase primary and secondary productivity in the Suisun and North San Francisco Bay areas.
79	Bay-Delta Aquatic Foodweb	Process	1	Increase primary and secondary nutrient productivity in the Suisun Marsh/North San Francisco Bay to levels historically observed in the 1960s and early 1970s.	1b	Implement an expanded aquatic foodweb research program to better understand the linkage of adjacent and transitional wetland habitats and the aquatic foodweb.
80	Central Valley Streamflow	Process	1	More closely emulate the natural pattern of seasonal freshwater inflow to North San Francisco Bay to transport sediments; allow upstream and downstream fish passage; contribute to riparian vegetation succession; permit transport of larval fish to the entrapment zone; maintain the entrapment zone in Suisun Bay; and provide adequate attraction flows for upstream, through-Bay migrating salmon. Delta outflow in dry and normal years will be improved by coordinating releases and natural flows in the Sacramento River Basin to provide a March flow event of at least 20,000 cfs for 10 days in dry years, at least 30,000 cfs for 10 days in below-normal years, and at least 40,000 cfs for 10 days in above-normal years. The existing smaller, late-April and early-May flow event will be improved with additional releases of water from San Joaquin River and Delta tributaries to provide flows of magnitudes and durations similar to those prescribed for March.	1a	Develop a cooperative program to provide target flows in dry and normal years by allowing inflows to major storage reservoirs prescribed in the visions of upstream ecological management zones to pass downstream into and through the Delta. (This action would result from an accumulation of recommendations for spring flow events and minimum flows from upstream ecological management zones.)
81	Natural Floodplain and Flood Processes	Process	1	Expand the floodplain area in the Napa River, Sonoma Creek, and Petaluma River Ecological Management Units by putting approximately 10% of leveed lands into the active floodplain.	1a	Convert leveed lands to tidal wetland/slough complexes.

	Ecosystem Element	Type	Target		Programmatic Action
82	Contaminants	Stressor	1	Reduce the input of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife in the Suisun Marsh/North San Francisco Bay Ecological Management Zone.	1a Support programs already in place to regulate the discharge of pollutants or reduce pollutant toxicity in Bay waters.
83	Invasive Aquatic Organisms	Stressor	1	Reduce or eliminate the influx of non-native aquatic species in ship ballast water.	1a Fund additional inspection staff to enforce existing regulations.
84	Invasive Aquatic Organisms	Stressor	1	Reduce or eliminate the influx of non-native aquatic species in ship ballast water.	1b Help fund research on ballast water treatment techniques that could eliminate non-native species before ballast water is released.
85	Invasive Aquatic Organisms	Stressor	2	Reduce the potential for influx of non-native aquatic species at border crossings.	2a Provide funding to the California Department of Food and Agriculture to expand or establish, as appropriate, a comprehensive program to exclude, detect, and manage invasive aquatic species, such as zebra mussel.
86	Invasive Aquatic Plants	Stressor	1	Manage existing and restored dead-end and open-end sloughs and channels within the ecological management zone so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants.	1a Conduct large-scale, annual weed eradication programs throughout existing and restored dead-end and open-end sloughs and channels in each ecological management unit so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants within 10 years.
87	Invasive Riparian and Salt Marsh Plants	Stressor	1	Reduce by 50% the area covered by invasive non-native woody species, such as giant reed and eucalyptus, that compete with native riparian vegetation, and eradicate invasive woody plants from restoration areas.	1a Develop a cooperative program to remove and suppress invasive non-native plants that compete with native riparian vegetation by reducing the area occupied by these species (such as giant reed and eucalyptus) by 50%.
88	Invasive Riparian and Salt Marsh Plants	Stressor	1	Reduce byn 50% the area covered by invasive non-native woody species, such as giant reed and eucalyptus, that compete with native riparian vegetation, and eradicate invasive woody plants from restoration areas.	1b Develop a cooperative program to eliminate invasive woody plants from restoration sites to protect native riparian vegetation.
89	Invasive Riparian and Salt Marsh Plants	Stressor	1	Reduce byn 50% the area covered by invasive non-native woody species, such as giant reed and eucalyptus, that compete with native riparian vegetation, and eradicate invasive woody plants from restoration areas.	1c Develop a cooperative program to develop control measures for perennial pepperweed.
90	Predation and Competition	Stressor	1	Limit supplementation of striped bass to life stages that minimize the rate of predation on juvenile anadromous and estuarine fish.	1a Provide sufficient equipment, support staff, and operation and maintenance funds to hold juvenile striped bass longer so they can be planted at 2 years of age instead of 1 year of age.
91	Predation and Competition	Stressor	1	Limit supplementation of striped bass to life stages that minimize the rate of predation on juvenile anadromous and estuarine fish.	1b Cooperatively develop an ecologically sound basis for limiting stocking of striped bass and chinook salmon in the Bay to areas and periods that will not increase predation rates on special-status species, such as longfin smelt and delta smelt, and other native fishes.

	Ecosystem Element	Type	Target	Programmatic Action
92	Water Diversion	Stressor	1 Reduce entrainment losses of juvenile fish at agricultural, power plant, and managed wetland diversions by 25 to 50% by installing positive-barrier fish screens on large diversion structures.	1a Develop a cooperative program to consolidate, screen, or eliminate diversions in the Suisun Marsh/North San Francisco Bay Ecological Management Zone.