CALFED ECOSYSTEM RESTORATION PROGRAM

END OF STAGE 1

EXECUTIVE SUMMARY

April 28, 2010

Implementing Agencies:
California Department of Fish & Game
United States Fish & Wildlife Service
NOAA's National Marine Fisheries Service

CALFED Ecosystem Restoration Program
End of Stage 1 Executive Summary

PURPOSE

The CALFED Ecosystem Restoration Program (ERP) has completed Stage 1, covering the first seven years of an ambitious 30-year plan to restore ecological health and improve water management in the San Francisco Bay and Sacramento-San Joaquin Delta http://www.dfg.ca.gov/erp/reports_docs.asp . The importance and urgency of ERP has been heightened by a series of events that led to a crisis in Delta resource management. Populations of certain Delta fish species have declined precipitously. Delta water-related lawsuits have challenged the regulatory framework of the State and federal water operation system. Certain alternatives, such as the peripheral canal, originally envisioned in the ROD, are being reconsidered. Scientific studies suggest that global warming and other natural forces will alter the landscape, ecology, and hydrology of the Delta increasing the need for adequate flood control and safe levees.

The ERP Strategic Plan objectives include:
- Achieve recovery for at-risk species
- Rehabilitate natural processes
- Maintain or enhance populations of selected species for sustainable commercial or recreational harvest
- Protect or restore functional habitat types
- Prevent or reduce harmful impacts from nonnative species
- Improve or maintain water quality and sediment quality conditions that support healthy ecosystems

ACCOMPLISHMENTS

ERP Stage 1 Summary

- Funded 490 grants for a total of approximately $629 million of which about 75% are complete.
- Met or exceeded nearly 80% of the 119 ERP milestones for Stage 1.
- Protected or restored more than 150,000 acres of habitat including:
    - Contributed to the restoration and protection of 8,000 acres of wetlands in San Pablo Bay and Suisun Marsh
    - Completed Goals for Restoration for North Baylands (San Pablo Bay)
    - Protected more than 11,000 acres and 18 river miles for riparian and shaded-riverine-aquatic habitat

- Enhanced or restored more than 3,900 acres and 59 miles of riparian and riverine aquatic habitat
- 500 acres of fresh emergent wetland in the San Joaquin River Region were enhanced, protected, and/or restored
- Installed or improved 70 fish screens (11 that draw >250 cfs)
- Restored stream habitats and removed impediments to salmonid passage in critical areas including Clear Creek, Battle Creek, Cottonwood Creek, and the Tuolumne, Cosumnes, Mokelumne, and Merced Rivers
- Protected 16,000 acres of agricultural land largely through conservation easements with private landowners
- More than 11,000 acres of wildlife friendly agricultural land was protected in the Delta alone
- Protected the Delta through control of invasive species including the successful treatment of Lake Davis to eradicate predatory northern pike
- Funded and contributed to development of DRERIP Conceptual Species and Habitat models
- Contributed to the development of the Suisun Marsh Restoration and Monitoring Plan
- Investments were made toward east Delta sloughs and tributaries including the lower Cosumnes River, and the South Fork Mokelumne River, McCormack-Williamson Tract and Staten Island to conserve and restore more than 17,000 acres;
- Yolo Bypass restoration projects compared wetland and crop management practices to minimize mercury methylation, reduce mosquito abatement concerns, and maximize benefits of wildlife-friendly agriculture
- The Assistance to Farmers in Integrating Agricultural Activities with Ecosystem Restoration (AFI) program established multi-regional priorities for "wildlife friendly agriculture," provided technical assistance and funds for projects that benefited native fish, giant garter snakes (GGS) and other priority species on agricultural lands

Funding and Expenditures

The ERP Implementation Plan originally identified a need of at least $150 million in dedicated funding annually, with a total cost over $1 billion through Stage 1. An additional $50 million annually was considered necessary to support the Environmental Water Account (EWA). The ERP also proposed user fees to generate approximately $35 million annually to supplement State and federal funding. At the end of Stage 1, ERP has funded and executed 490 grants with a total of approximately $629 million from State bonds and other sources (Table 1). This represents only slightly more than one-half of the funding originally considered necessary to meet ERP program objectives during the first seven years. Contributing funding sources have included the California Urban Water Agencies, State bonds, Central Valley Project Improvement Act (CVPIA), US Environmental Protection Agency Watershed Program, and the Federal Bay Delta Act (Figure 1).

Table 1. Total ERP Stage 1 expenditures by fund type.

Number of Grants [1/]	Total Expenditure[1/]	Fund Source
5	$1,257,237	Clean Water Act, Section 104(b)(3)
33	$24,646,811	CUWA: Category III
2	$255,956	CVPIA: Anadromous Fish Restoration Program
1	$39,400	CVPIA: Habitat Restoration Program
110	$123,858,879	Federal Bay Delta Act Funds - (Water and related resources)
2	$7,177,428	Proposition 13: Dissolved Oxygen
1	$17,555,436	Proposition 13: Flood Protection Corridor Program
4	$1,860,121	Proposition 13: Mine Remediation
277	$356,249,953	Proposition 204
54	$94,867,374	Proposition 50
1	$1,252,295	Proposition 84
490	**$629,020,891**	**All Funding Sources**

[1/] Does not include grants that are approved for funding but have not been executed.

Table 2. ERP restoration investment by Topic Area.

Topic Area	Total Expenditure [1/]	Number of Grants [1/]	Percent of Total Expenditures
Administrative or Program Support	$21,279,932	17	3.5
At-Risk Species Assessment	$41,757,723	42	8.6
Ecosystem Water and Sediment Quality	$73,934,281	60	12.2
Environmental Education	$ 7,051,745	33	6.7
Environmental Water Management	$8,057,853	9	1.8
Estuary Foodweb Productivity	$1,815,662	3	0.6
Fish Passage	$42,879,884	14	2.9
Fish Screens	$103,189,377	56	11.4
Harvestable Species Assessment	$8,949,093	10	2.0
Hydrodynamics, Sediment Transport, and Flow Regimes	$35,262,324	28	5.7
Local Watershed Stewardship	$18,528,298	53	10.8
Lowland Floodplains and Bypasses	$38,908,752	26	5.3
Mine Remediation	$647,000	3	0.6
Non-Native Invasive Species	$32,920,616	33	6.7
Riparian Habitat	$46,085,821	29	5.9
River Channel Restoration	$22,347,541	16	3.3
Shallow Water and Marsh Habitat	$67,248,829	43	8.8
Technical Support	$510,115	2	0.4
Upland Habitat and Wildlife Friendly Agriculture	$57,136,817	12	2.5
X2 Relationships (Freshwater-Seawater Interface)	$509,222	1	0.2
Totals	**$629,020,891**	**490**	**100.0**

FUTURE

ERP Stage 2 Conservation Strategy

Delta and Suisun Marsh. Restoration of tidal marsh and shallow subtidal habitats using Liberty Island as a model and managing adaptively with recommendations coming from the Breech III study.

Constant Fractional Marking Program for Central Valley Chinook Salmon. Provides specific information to evaluate and revise Central Valley salmon hatchery operations, track recovery of all races of Chinook salmon and evaluate effects of commercial and recreational harvest.

Non-Native Invasive Species (NIS) Program. Focuses on preventing new introductions, limiting the spread or eliminating populations of NIS, reducing the harmful ecological, economical, social and public health impacts, and providing technical assistance and coordination to regional efforts focusing on assessment and monitoring of NIS to improve rapid response to new invasions.

Contaminants and Water Quality. ERP Water Quality Program (WQP) broadly focused on environmental water quality to meet the needs of Central Valley fish and wildlife species. The ERP has funded efforts to increase dissolved oxygen in the Stockton Deepwater Ship Channel, research on mercury cycling and transport -- particularly in managed wetlands, and projects related to pesticides and legacy contaminants. Stage 2 efforts will focus on identifying methods to remediate mercury contamination in conserved lands and develop methods to minimize mercury methylization in wetlands and floodplain management.

Bay-Delta Conservation Plan. The Bay Delta Conservation Plan (BDCP) will create a stable regulatory framework to conserve and recover at-risk native species and natural communities in the Delta and provide water supply reliability. A joint Habitat Conservation Plan/Natural Community Conservation Plan is being developed through a collaborative process with water users, State and federal agencies, and non-governmental organizations. The BDCP will examine how to improve the design and operation of the State and Federal Water Projects over both the short term and the long term and implement a major program for restoring and managing habitats within the Delta. The ERP provides technical staff support to the BDCP to ensure consistency between BDCP. ERP also contributes to meeting BDCP restoration goals.

Adaptive Management and Conceptual Models. New information from monitoring restoration actions, IEP and other research projects will be used to revise and update DRERIP conceptual models, which are being used to develop the Stage 2 Conservation Strategy, develop BDCP conservation strategy, and

modify ongoing program plans to respond adaptively to the results of implemented projects, research and improved scientific understanding. Additional models will be developed as needed to evaluate restoration actions at the landscape level for selected species.

Performance Measures. The new ERP Performance Measures Unit is coordinating with the CALFED Science Program staff to develop measurable criteria for evaluating the effectiveness of ERP restoration and management actions. The conceptual models will identify stressors, drivers, and other variables that are being used to measure success and guide monitoring protocols in coordination with IEP and BDCP in order to optimize utility of performance monitoring activities between planning efforts.

CALFED Ecosystem Restoration Program's 2010 Proposal Solicitation Package (PSP). ERP will be conducting a focused solicitation in 2010. The focus will be on the Delta aquatic habitats which support species noted as pelagic organisms in decline (POD) and federal recovery plans for anadromous and other native fish species.

Fish Passage Improvement Program (FPIP). The FPIP team studies and evaluates structures that impede fish migration and assists with engineering and environmental evaluations for migration barrier removal or modification. The FPIP team is guided by an annual work plan developed by an Interagency Review Team (IRT) that includes representatives from the ERP Implementing Agency managers and FPIP. High priority fish passage issues are identified and engineering in support of requirements for ecosystem restoration are included in ERP work plans.

Delta and Sacramento River Ecological Flows Tool. The Sacramento River Ecological Flows Study (SacEFT) was developed to model hydrogeomorphic, and habitat restoration parameters, and will be expanded for application to the Delta (DeltaEFT) "branch" of the software. Completion of the project is expected to provide the ability to explicitly link upstream (Sacramento River) ecological responses evaluated with SacEFT to ecosystem responses in the Delta evaluated with DeltaEFT.

Battle Creek Salmon and Steelhead Restoration Project. The Battle Creek

Proposed Stage 2 Actions for Freshwater Flows and Natural Flow Regimes

Action 1: Revise the Ecological Flow Tool, originally developed for the Sacramento River, to include the Delta.

Action 2: Develop local projects to test the "Variable Delta" hypothesis to see if manipulating dissolved oxygen levels, salinity, flows, and temperatures can help control invasive aquatic species and to see how native species use or avoid these conditions.

Action 3: Improve monitoring of in-Delta hydrodynamics and fish assemblage response to hydrologic conditions to assist with developing ecosystem management decisions and tools.

Salmon and Steelhead Restoration Project will restore approximately 42 miles of historical anadromous fish habitat in Battle Creek, and an additional 6 miles of habitat in its tributaries in three phases including:

- Removal of 5 diversion dams
- Installing fish ladders at 3 diversion dams and screening their diversions,
- Increasing flow releases from all remaining diversion dams,
- Direct connection of powerhouse tailraces to power canals to eliminate redundant screening requirements, flow fluctuations associated with powerhouse operations, and reduced false attraction of returning fish.

Calhoun Cut Ecological Reserve.
The project would complete planning and restoration design for the Calhoun Cut restoration project to reestablish tidal circulation in the marshes along Lindsey Slough. Acquisition of the Peterson Ranch will add 1,600 acres to the Calhoun Cut Ecological Reserve to protect vernal pool habitat, provide habitat connectivity, and allow floodplain migration expected from climate change.

Floodplain Dynamics. Natural restoration of tidal wetlands and the effectiveness of breached islands is underway to assess food web production and transport, flood water conveyance, wave and wind erosion, and species response. Studies have found that native fish species assemblages increasingly resemble reference site assemblages in restored marshes approaching eight years maturity. The Breach III project will provide a predictive level of understanding of abiotic and biotic processes and responses to tidal wetland restoration. Also considered will be how restoration processes influence local flooding and levee erosion over time. A quantitative approach to predicting ecological responses to change in habitat structure will be developed. Models will also be used for interpreting alternative restoration and flood conveyance scenarios which can be applied to future tidal wetland restoration in the Delta as part of ERP and BDCP.

Potential Stage 2 Actions for Decline in Productivity and the Aquatic Food Web:

Action 1: Continue to study the roles of non-native species (e.g,. *Corbula*) and contaminant toxicity in the potential declines in food availability for aquatic species.

Action 2: Continue to study tidal marsh restoration efforts in the Delta and Suisun Marsh to determine whether this restoration improves system productivity.

Suisun Marsh Plan. The Suisun Marsh Plan (SMP) describes actions to preserve and enhance managed seasonal wetlands, carry out a comprehensive levee program, and protect ecosystem and drinking water quality, while restoring habitat for tidal marsh dependent sensitive species. The Plan will present strategies to resolve permitting issues related to past and ongoing management activities of diverse stakeholders including DFG and private wetland managers.

Hill Slough Restoration Project. This project will restore tidal habitat to approximately 950 acres of diked seasonal wetlands. The project will re-

introduce tidal action to the site, restoring a transition of perennial aquatic habitat in the deepest areas, to high and low intertidal marsh, and lowland alluvial habitat at higher elevations. The outcome will be a self-sustaining marsh ecosystem created through restoration of natural hydrologic and sedimentation processes and reliance on natural abiotic and biological succession processes. This will contribute to CALFED's ERP goal of restoring 5,000-7,000 acres of tidal wetlands in Suisun Marsh. The SMP will be periodically updated and refined based on adaptive management principles, new scientific knowledge, project and ecosystem monitoring, and implementation progress.

Potential Stage 2 Actions for Intertidal Habitat Restoration:

Action 1: Continue habitat restoration, property acquisition, planning, and monitoring on specified sites: Cache Slough complex, including Prospect and Liberty islands, Lindsey Slough and Yolo Bypass Wildlife Area

Action 2: Implement and monitor the planned Dutch Slough restoration project, restore up to 483 acres of emergent wetland (a portion of which would be tidal), and generate information on how to best restore tidal marsh habitat.

Action 3: Continue studies in the lower Yolo Bypass to improve understanding of aquatic species' response to tidal wetland restoration.

Action 4: Conduct studies to determine whether fish benefits from tidal marsh that have been demonstrated in the saline portion of the estuary is also true for the freshwater portion of the estuary.

Dutch Slough. This is a three phase project to acquire and restore 1,166 acre site adjacent to Dutch Slough and the mouth of Marsh Creek in the western Delta. Phase I included the acquisition of three contiguous parcels which make up the site, and associated site management. Phase II which is underway includes detailed design, planning and environmental documentation for the restoration. Phase III will implement the restoration by constructing perimeter flood protection levees and returning tidal influence to the restoration site. Currently Phase I has been completed, Phase II is ongoing, and Phase III is in the planning stage.

Potential Stage 2 Actions for Water Diversions:

Action 1: Continue participation in the Sacramento Valley-Delta Fish Screen Program to reduce entrainment mortality of juvenile fish by installing state-of-the-art fish screens on Sacramento River and Delta diversions; this includes collection of monitoring data prior to construction.

Action 2: Continue ERP coordination with State and Regional Water Quality Control Boards, and IEP, studies and activities geared toward determining the impacts of diversions on various life stages of fish.

Action 3: Further investigation of role of E/I ratio as a dominant factor in particle fate, in relation to entrainment of pelagic organisms (including eggs and larvae) in SWP and CVP pumps and other diversions (E/I ratio range of 0.17 to 0.35). Salmon smolts may not be accurately captured by this model because their behavior likely makes their fate substantially different from neutrally buoyant particles such as pelagic species' eggs and larvae.

Develop Flow Standards for the San Joaquin River and Tuolumne Rivers. The Department of Fish and Game is assisting the State Water Resources Control Board staff (Water Board) develop the scientific foundation for new water flow objectives for the San Joaquin River and its tributaries (i.e., the Stanislaus, Tuolumne, and Merced Rivers). The report under

development includes sections describing the historical salmon populations, current state of salmon populations, and watershed hydrology. Other sections will cover an assessment of factors and stressors that limit fish populations including water quality and quantity, habitat quality and quantity, harvest, passage, and predation. The Department will use available scientific information and the San Joaquin River escapement model to develop flow recommendations.

Delta Governance. The Department will be working with the Delta Stewardship Council and Sacramento-San Joaquin Delta Conservancy staff to incorporate the CALFED Ecosystem Restoration Program End of Stage 1 Evaluation, and Stage 2 Conservation Strategy for the Delta and Suisun Marsh into the Comprehensive Plan for the Delta. This will assure that valuable information from research during the first seven years of the ERP immediately informs Council actions. Biological and programmatic lessons learned from CALFED Stage 1, and priorities based on imperiled Delta species requirements must be implemented without delay. As the state implementing agency for the ERP, DFG is dedicated to a seamless transition from our relationship with the California Bay Delta Authority and CALFED Science Program to the governance structure established by SBX7 1. The ERP will be working with Delta Stewardship Council as it develops the Comprehensive Delta Plan to ensure that the most up-to-date natural resource information and policy is available to the Council and Conservancy. The Department will also bring its ongoing ERP activities to the Council for its input and to assure consistency with developing a comprehensive plan for the Delta.

Bay-Delta Conservation Plan. The Department continues to support restoration priorities in the Delta identified by ERP and Delta Vision as early implementation actions which can meet Bay-Delta Conservation Plan (BDCP) goals. The Department working with the Delta Independent Science Board will be working to refine and further develop the DRERIP conceptual models for important Delta fish species and critical habitats. In keeping with the use of "best available science," the models have undergone peer review by independent scientists and been reviewed by the Delta Independent Science Board. These models are important tools to guide ongoing and future restoration and management actions in the Delta, and support a sound adaptive management Process.

For further information regarding the ERP and related programs:

http://www.dfg.ca.gov/erp/reports_docs.asp

ERP Milestones Reports and Program Plan
http://www.dfg.ca.gov/erp/MYPP.asp

ERP Performance Monitoring Program
http://www.dfg.ca.gov/erp/monitoring.asp

CALFED Science Program
http://www.science.calwater.ca.gov/science_index.html

Pelagic Organism Decline http://www.water.ca.gov/iep/about/pelagic.cfm

Delta Vision Blue Ribbon Task Force's Vision & Strategic Plan (DVSP)
http://deltavision.ca.gov/

Delta Regional Ecosystem Restoration Implementation Plan (DRERIP)
http://www.science.calwater.ca.gov/drerip/drerip_index.html

OCAP Biological Assessment/Opinion http://www.usbr.gov/mp/cvo/ocap_page.html

Delta Risk Management Strategy http://www.water.ca.gov/floodmgmt/dsmo/sab/drmsp/

Interagency Ecological Program http://www.water.ca.gov/iep/

ADDITIONAL NEW PROGRAMS INCLUDE:

The Delta Stewardship Council http://www.deltacouncil.ca.gov/

The Delta Science Program http://www.deltacouncil.ca.gov/delta_science_program/

The Delta Protection Commission http://www.delta.ca.gov/