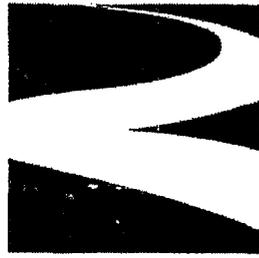


CALFED  
BAY-DELTA  
PROGRAM

May 1999

Briefing Packet



# CALFED BAY-DELTA PROGRAM

## May 1999 Briefing Packet

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# Program Overview

The CALFED Bay-Delta Program is a cooperative effort among state and federal agencies and California's environmental, urban and agricultural communities. It was initiated in 1995 by former Governor Pete Wilson and the Clinton administration to address environmental and water management problems associated with the Bay-Delta system, an intricate web of waterways created at the junction of the San Francisco Bay and the Sacramento and San Joaquin rivers and the watershed that feeds them.

The Bay-Delta system is in serious trouble. Habitats are declining, and some native species are listed as endangered. The system has suffered from impaired water quality. Water supply reliability has declined significantly. Many levees are structurally weak and present a high risk of failure.

The Bay-Delta system is a critically important part of California's natural environment and economy. It supplies drinking water for more than 22 million Californians and irrigation water for the state's \$27 billion agricultural industry. It also supports 750 plant and animal species, some found nowhere else on the planet. Ultimately, California's trillion-dollar economy, the seventh largest in the world, is at risk if environmental and water management problems in the Bay-Delta system are not resolved.

## A New Approach

The CALFED Program represents a new approach to natural resource management. It combines state and federal agencies with regulatory power over the system and California's leading urban, business, environmental and agricultural interests, all of whom are working together to develop a comprehensive solution to the problems of the Bay-Delta.

Public input is a key component of the process. Technical working groups, public meetings and workshops, and the federally chartered Bay-Delta Advisory Council all provide opportunities to participate in the decision-making process.

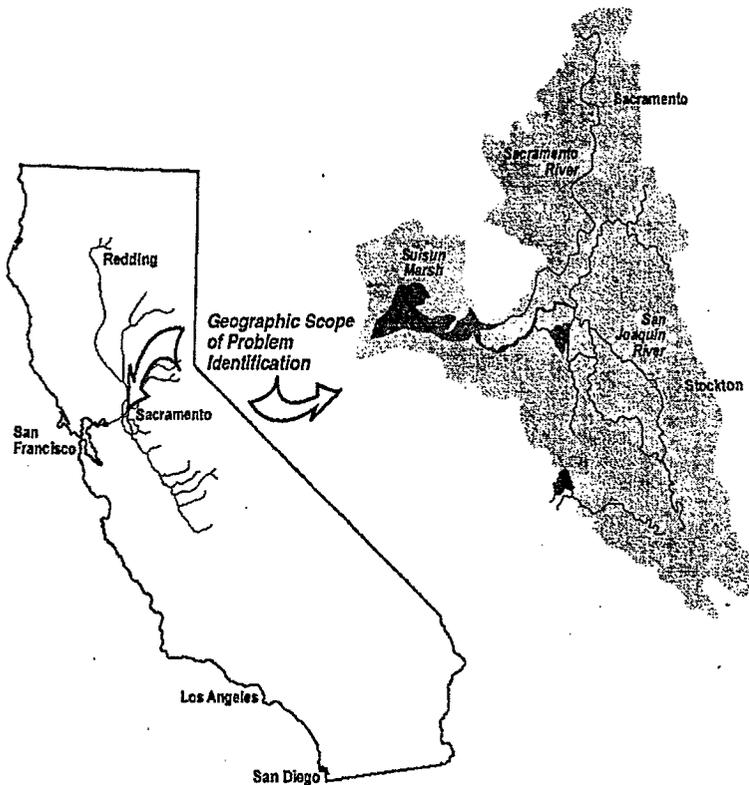
### East/West Comparison of Scope of CALFED Solution Area



# Environmental Review

The CALFED Bay-Delta Program is divided into three phases. Phase I, completed in September 1996, concentrated on identifying and defining the problems confronting the Bay-Delta system. A mission statement and guiding principles were developed, along with Program objectives and an array of potential actions to meet them. Three preliminary alternatives were identified for further analyses in Phase II.

During Phase II, currently underway, the Program is developing a preferred program alternative and conducting a comprehensive programmatic environmental review process. Because the CALFED solution area is so large, and because it is approaching its task in an integrated, comprehensive way, environmental review must be conducted on a very broad level. Phase II will conclude with the final Programmatic Environmental Statement/Environmental Impact Report (EIS/EIR). Final decision on the program plan is expected by June 2000.



## Geographic Scope

The geographic scope for the problems consists of the legally defined Delta, Suisun Bay (extending to the Carquinez Strait) and Suisun Marsh.

The geographic scope for developing possible solutions includes a much broader area that extends both upstream and downstream of the Bay-Delta. This solution scope includes the Central Valley watershed, the Southern California water system service area, San Pablo Bay, San Francisco Bay, near-shore portions of the Pacific Ocean out to the Farallon Islands and north to the Oregon border, and the Trinity River watershed, from which flows are diverted into the Bay-Delta system.

Phase III – Program implementation will begin in Phase III, following completion of the final Programmatic EIS/EIR. The CALFED solution plan is expected to take 25 to 30 years to complete. Implementation is roughly divided into three stages, with Stage 1 lasting seven years.

Site specific, detailed environmental review will occur during Phase III, prior to the implementation of each proposed action. Stage 1 actions will be grouped into a series of “bundles” to provide additional assurances for balancing benefits. For example, a bundle of actions could include levee work, habitat improvements, water quality work, and facilities and operations to improve water supply reliability. Linking the actions will help assure that progress is made in all areas. Actions may be linked within the same project EIS/EIR, by contractual documents, funding or other means.

### **CALFED Timeline – Milestones & Key Dates**

<b>3/98-7/98</b>	CALFED releases draft EIS/EIR for public review and comment.
<b>12/18/98</b>	CALFED releases Revised Phase II Report, outlining preferred alternative framework.
<b>1/99</b>	CALFED holds public workshops on preferred alternative framework.
<b>3/99</b>	CALFED releases revised program plans for public review.
<b>6/99-9/99</b>	CALFED expects to issue revised draft EIS/EIR followed by 90-day comment period
<b>4/00</b>	CALFED expects to issue final EIS/EIR/ followed by 30-day comment period.
<b>6/00</b>	Approval of final program plan by state and federal governments.
<b>2000-2030</b>	Solution plan implemented.

## Mission Statement, Objectives and Solution Principles

***The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system.***

CALFED developed the following objectives for a solution:

- Provide good water quality for all beneficial uses;
- Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species;
- Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system;
- Reduce the risk to land use and associated economic activities, water supply, infrastructure and the ecosystem from catastrophic breaching of Delta levees.

In addition, any CALFED solution must satisfy the following **solution principles**:

- ***Reduce Conflicts in the System*** Solutions will reduce major conflicts among beneficial uses of water.
- ***Be Equitable*** Solutions will focus on solving problems in all problem areas. Improvements for some problems will not be made without corresponding improvements for other problems.
- ***Be Affordable*** Solutions will be implementable and maintainable within the foreseeable resources of the Program and stakeholders.
- ***Be Durable*** Solutions will have political and economic staying power and will sustain the resources they were designed to protect and enhance.
- ***Be Implementable*** Solutions will have broad public acceptance and legal feasibility, and will be timely and relatively simple to implement compared with other alternatives.
- ***Have No Significant Redirected Impacts*** Solutions will not solve problems in the Bay-Delta system by redirecting significant negative impacts, when viewed in their entirety, within the Bay-Delta or to other regions of California.

Preferred Program  
Alternative

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# Preferred Program Alternative

The CALFED Bay-Delta Program Revised Phase II Report describes the framework for the preferred program alternative – a programmatic plan to restore ecological health to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta), provide a more reliable water supply for agriculture and cities, and improve drinking water quality in California.

While the Revised Phase II Report represents a great stride forward in developing a balanced program to solve California's environmental and water needs, it is still very much a work in progress. Research and study, negotiations among stakeholders and state and federal public agencies, and public meetings will continue in 1999.

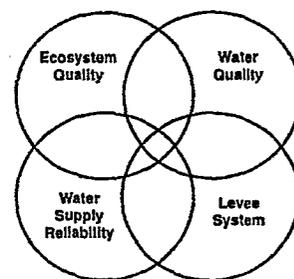
The draft preferred program alternative described in the Revised Phase II Report seeks to achieve improvements in the four interrelated problem areas: ecosystem health, water quality, levee system integrity, and water supply reliability. The "programmatic" nature of the alternative means that actions are described in broad terms. Site specific actions will be implemented after the broad program outline is adopted, and additional environmental and other permit reviews conducted. All of these actions will take an adaptive management approach: with careful monitoring, future actions will be modified if necessary as more is learned about the system and how it responds to Program actions.

The Revised Phase II Report is available on CD-ROM, in print, and on the CALFED web site <http://calfed.ca.gov>.

The preferred program alternative framework begins with strategies for solving each of the four Bay-Delta problem areas in an integrated manner. These strategies are interwoven and each must be viewed in the context of the other strategies. For example, to fully implement the Ecosystem Restoration Program (ERP), CALFED must also have a successful strategy to provide the improved water quality that is needed by the ecosystem. The levee strategy provides new opportunities for improving levee-associated habitat for Delta species. Also, water for environmental uses will benefit from improved water supply reliability.

## Key Strategies for the Four Problem Areas

Levees – Delta levees are critical to the physical integrity of the Delta, and the integrity of the state's water system. CALFED will perform risk assessment of all factors that can contribute to levee failure and the consequences of failure to Delta land uses, the ecosystem, water quality and water supply reliability, and implement appropriate risk management considering all available options. Levee improvements will incorporate successful techniques for restoring, enhancing or protecting ecosystem values.



**Water Supply Reliability** – The CALFED Program is proposing a water management strategy to ensure water supply reliability for agricultural, environmental and urban uses. This strategy recognizes the variability of water supply and demand in California. (See page 12 for more detail.) CALFED's water supply reliability goals are to:

- Reduce water diversion conflicts between environmental uses and consumptive uses;
- Decrease drought impacts for the environment and water users;
- Increase water supply availability by providing a means for water users and the environment to acquire additional water at high priority times and places;
- Increase operational flexibility by improving the ability of the system to respond to unforeseen or unpredictable events;
- Increase the utility of water used for all beneficial uses by improving water quality.

Seven general categories of tools are included in the management strategy, all of which are being used in California to some degree:

- Water conservation
- Water recycling
- Water transfers, both short-term and long-term
- Storage, both groundwater and surface water
- Watershed management
- Water quality control
- Monitoring and real-time diversion management.

A creative new component of this strategy could be an environmental water account (EWA). Through the EWA, environmental managers could control a package of assets that provides greater flexibility in helping fisheries recover. Decision-makers could react quickly to the real-time actions of fish, which do not always act according to models and scientific analyses.

Possible assets include a block of water; access to storage; ability to option and purchase water; access to canals and facilities; funding for a conservation/recycling program that will yield water for the environment; the ability to flexibly apply export standards to create water for the environment; and a contingency fund. The environment would be able to trade assets with other water users for future water use.

**Water Quality** – CALFED's strategy is to provide good water quality for all beneficial uses, and includes reducing or eliminating elements that degrade water quality at its source. In addition, CALFED is committed to continuously improving source water quality that allows municipal water suppliers to deliver safe and affordable drinking water that reliably meets and, where feasible, exceeds applicable drinking water standards. CALFED program actions will be aimed at reducing the levels of problem pollutants such as bromide, organic carbon and pathogens in Delta drinking water sources. CALFED will consider additional water management options as necessary to achieve its goals and objectives, including, but not

limited to, provision of alternative sources, use of storage facilities to improve drinking water quality, and an isolated facility to provide source water of better quality.

**Ecosystem Restoration** – CALFED’s ecosystem restoration program (ERP) is the largest, most comprehensive, and most inclusive environmental restoration program in the United States. It provides a new perspective to restoration science by focusing on the rehabilitation, protection or restoration of ecological processes that create and maintain habitats needed by fish, wildlife and plant species dependent on the Delta and its tributary systems. This strategy emphasizes solid science, adaptive management and local participation: an innovative approach that is becoming a model for similar efforts throughout the nation. By restoring the natural processes that create and maintain diverse and vital habitats, CALFED aims to meet the needs of multiple plant and animal species while reducing the amount of human intervention required to maintain habitats.

Adaptive management is an essential program concept, part of each of these strategies. It is necessary to constantly monitor the system and adapt actions that are taken to restore ecological health and improve water management.

**Delta Conveyance** – In addition to these four strategies, CALFED must consider how various Delta conveyance configurations – how water is moved through the Delta – would help implement the strategies. The Delta conveyance strategy must consider fisheries and water quality for in-Delta uses and drinking water. The existing Delta channels will be an integral part of any CALFED decision for Delta conveyance. The reliance on these channels provides a shared interest in restoring, maintaining and protecting Delta resources, including water supplies, water quality, levees, channel capacities, natural habitat and the Common Delta Pool.

CALFED’s Delta conveyance strategy is to develop a through-Delta conveyance alternative based on the existing Delta configuration with some modifications, evaluate its effectiveness and add additional conveyance and /or other water management actions if necessary to achieve CALFED goals and objectives.

## Program Elements

CALFED developed eight program elements to carry out the strategies described above. The draft preferred program alternative is comprised of these program elements, to be implemented in stages over the next 30 years. Each of the elements contributes to improvements in the four problem areas.

**Long-term Levee Protection Plan** – The goal of the Levee Protection Plan is to improve levee stability, which will contribute to water supply reliability and water quality improvements for human consumption and the environment. The levees are an integral part of the Delta landscape and are key to preserving the Delta’s physical characteristics and processes.

Actions are based on the successes of existing programs. Levee protection actions provide base-level funding to reconstruct all Delta levees to a particular standard, and additional funding for special habitat improvement and levee stabilization projects. The program will also implement best management practices (BMPs) to control subsidence on levees; assess overall risk to the levee system and develop recommendations to manage the risk; and establish an emergency management plan.

**Water Quality Program** – Improving water quality is one of the CALFED Program’s basic objectives. CALFED is committed to achieving continuous improvement in the quality of the waters of the Bay-Delta estuary for all beneficial uses and maintaining this quality once achieved. Some actions to achieve improvement can begin immediately; others will rely on comprehensive monitoring, pilot studies and research.

The Water Quality Program will focus on improving drinking water quality and reducing impacts from urban and agricultural pesticide use; trace metals; mercury; selenium; bromide; salinity; turbidity and sedimentation; low dissolved oxygen; and toxicity of unknown origin.

**Ecosystem Restoration Program** – The principal mechanism that CALFED will use to restore the health of the Bay-Delta ecosystem is the Ecosystem Restoration Program (ERP). The ERP emphasizes the restoration of ecological processes in order to create and maintain the diverse and vital habitats of the multiple plant and animal species in the Bay-Delta system. To do so, the ERP identifies over 700 programmatic restoration actions, including restoring, protecting and managing diverse habitat types representative of the system; restoring critical flows; improving Delta outflow during key springtime periods; developing prevention and control programs for invasive species; and modifying or eliminating fish passage barriers.

**Water Use Efficiency Program** – Water conservation is a concept broadly supported by Californians. The Water Use Efficiency Program includes water conservation measures for agricultural, urban and wildlife refuge uses, and water recycling actions. The program relies on appropriate conservation measures and government assistance to help users comply with the programs. Existing state and federal programs will be expanded to provide increased levels of funding and technical assistance at the local level. A high-level of water use efficiency is expected to be required as a condition for permitting new surface storage projects.

CALFED agencies will work with the Legislature and stakeholders to develop state legislation that requires appropriate measurement or metering of water use for all water users in the state. Technical and stakeholder issues will be addressed to define “appropriate measurement,” which is expected to vary by region. The definition will include the nature of regional differences, appropriate point of measurement, and the feasible level of precision.

**Water Transfer Program** – Water transfers are currently an important water management tool and have the potential to play a more significant role. The Water Transfer Program proposes a framework of actions, policies and processes that will facilitate water transfers and further develop a statewide water transfer market that can move water between users, including the environment, on a voluntary and compensated basis.

Key components of this program are establishing a California Water Transfers Information Clearinghouse to provide complete and accurate information and facilitate assessment of potential third-party impacts; coordinating among agencies to formulate policy and standardized procedures; and developing a process to identify transferable water, reservoir refill and carriage water criteria, and costs for transporting water through state and federal conveyance facilities.

**The Watershed Program** – The success of every vision and objective encompassed within the CALFED Program depends on local cooperation and public support. The Watershed Program provides an important opportunity to involve the public and generate local support for projects that enhance the physical and biological processes that occur within individual watersheds and influence the Bay-Delta ecosystem. This grassroots approach involves the public and local communities in decision-making that affects local watershed resources.

In addition, the Watershed Program provides opportunities to educate the public on a variety of watershed issues; reduce conflict resulting from lack of understanding; bring together the public and local and regional experts to address topics related to watershed health; introduce watershed stewardship practices that residents can use to improve the health of the entire system; and foster creative problem-solving for watershed-based resource issues.

**Storage** – Both surface and groundwater storage are important water management tools, and some storage will be necessary to achieve water supply reliability goals. The appropriate mix between surface and groundwater storage will be determined during Stage 1 of program implementation. (Stage 1 is expected to be the first seven years of program implementation.) Target volume for groundwater banking is 500,000 acre-feet of storage.

CALFED will focus on consideration of off-stream reservoir sites for new surface storage, but will consider expanding existing on-stream reservoirs. Under the ERP, some dams and stream obstructions will be removed to open areas of fishery habitat. Even with new surface storage, there will be fewer stream miles blocked after implementation of the CALFED Program. CALFED has reduced the number of potential surface storage sites from 52 to 14, and the list will be further narrowed to 3 to 5 by the time of program certification. Should new surface storage be considered necessary to meet CALFED goals, site selection would take place in years 4-5 of program implementation.

**Conveyance** – CALFED's strategy is to use the existing Delta system with some modifications, evaluate its effectiveness, and add additional conveyance and/or other water

management actions if necessary to achieve CALFED goals and objectives. These actions will be continually monitored, analyzed and improved as necessary to meet CALFED goals.

Potential Stage 1 improvements to the existing south Delta region include new screens for the SWP and CVP export facilities, changes in operations, channel enlargements, and other improvements to increase water supply reliability while decreasing impacts on fish and Delta water users. In the north Delta region proposals include channel enlargement for flood control, changes in Delta Cross-Channel operations, and consideration of a new screened diversion from the Sacramento River to the interior Delta to help balance water quality and fisheries concerns.

If CALFED's goals and objectives, such as its commitments to continuous water quality improvement and fisheries restoration, cannot be accomplished by this strategy during Stage 1, the preferred program alternative includes additional actions that may be taken toward these goals and objectives after thorough assessment of a variety of factors. Additional actions may be necessary to advance CALFED's commitment to seek continuous water quality improvement and achieve fishery recovery.

## Key Program Issues

- **Land Use:** CALFED seeks to preserve as much agricultural land as possible during implementation, consistent with meeting all program goals. The government already owns some of the land needed for Program implementation, and that land will be used when appropriate. Partnerships with landowners, including easements with willing landowners, will be pursued when appropriate to obtain mutual benefit if the appropriate government land is not available. Acquisition of fee title to land will be from willing sellers only and will be used when neither available government land nor partnerships are appropriate or cost-effective for the specific need.
- **Governance:** Define the future institutional structure for overall CALFED program management and coordination, and for management of each program element. Recommendations for required legislation will be made if necessary.
- **Conservation Strategy:** Complete the Conservation Strategy, which includes goals and actions for species recovery and provides the framework for incidental take associated with Stage 1 actions. Develop GIS capability. Establish a policy level agency team and policy level agency-stakeholder team to coordinate with technical effort.
- **Program Elements:** Complete strategic plans for each program element, with measurable performance goals; Stage 1 actions; financing; recommended governance; and key milestones and decision points. These plans will provide agencies, stakeholders and the public with a more complete picture of what can be expected from each program element.

- **Water Management Strategy:** Define specific water management objectives and the performance of the water management tools to achieve the objectives. Address supply/demand projections. Develop adaptive water management strategy responsive to the uncertainty of future conditions. Establish a policy level agency-stakeholder team.
- **Water Use Efficiency:**
  - Agriculture – Develop regional measurable objectives and incentive program, define “appropriate” measurement, define role of Ag Water Management Council.
  - Urban – Determine appropriate water conservation plan certification process.
  - Managed Wetlands – Complete management plan.
  - Water Recycling: Develop incentive program.
- **CMARP:** Refine CALFED Monitoring, Assessment & Research Program, with links to Stage 1 actions, Conservation Strategy and Ecosystem Restoration Program. Develop peer review process of early ecosystem restoration projects. Develop link between data and management decisions.
- **Stage 1 Priorities:** Identify the first group of Stage 1 projects, and implement an environmental documentation and permit coordination process. To allow early Stage 1 projects to move forward efficiently, a process to coordinate and consolidate CEQA/NEPA requirements will be implemented. Identify funding and implementation actions necessary to move forward with high priority actions.
- **Section 404/401 & Section 10 Compliance:** Develop a streamlined early permitting process for initial Stage 1 actions. Complete a Programmatic Section 404 Assurance Package, with a clearly defined 404 permitting process including appropriate decision criteria. Narrow the range of surface and groundwater storage facilities, and resolve the need for new surface storage.
- **Water Quality:** Establish action priorities and interim water quality targets. Initiate implementation planning to acquire funding, determine agency roles, coordinate agency regulatory responsibilities, organize work teams, develop detailed action plans and establish expert panels. Establish policy level stakeholder and agency teams.
- **Environmental Water Account (EWA):** Determine how an EWA could be structured.
- **Finance:** Refine Stage 1 cost estimates for each program element. Complete the Financing Plan for proposed program, including budget and funding sources. Resolve financial principles.
- **Water Transfers:** Complete strategic plan. Resolve need for legislation regarding water rights and Water Transfer Information Clearinghouse. Develop expedited approval process, methodology for tracking and accounting, process for calculating conveyance capacity.

# Water Management Strategy

**C**ALFED is committed to developing a balanced, integrated water management strategy that uses all available water resources management tools – including water use efficiency, water transfers, conveyance facilities, and groundwater and surface storage opportunities – to achieve CALFED’s water supply reliability goals.

Any consideration of water management in California must start with recognition of the immense variability in the availability of, and demands for water. The watershed of the Bay-Delta system is subject to a highly variable rain and snowfall pattern. Within any given year, whether wet or dry, most of the rain falls in the winter months, while snow pack typically melts in the late spring and early summer. Even within each month, precipitation and flow can vary widely.

The demand for water also varies over time. Agricultural demands tend to be higher than average in dry years because there is less precipitation available and plants need more irrigation. Local supplies may be more limited in dry years, which imposes further demands on local groundwater and on water imported from elsewhere in the system. Agricultural water demand also varies substantially seasonally: the demand is highest in the summer, when natural flows are lowest.

Many urban areas experience substantial seasonal variation in demands for landscaping irrigation. In addition, urban areas dependent on the Bay-Delta for some or all of their drinking water supply place a significant premium on the quality of the water, as well as the quantity. In dry years and dry seasons, increased salinity in the Bay-Delta reduces the usefulness of Bay-Delta water to urban users.

Ecosystem water needs are generally more consistent with the natural seasonal flow pattern than consumptive water demands. High flows in the early spring have substantial ecosystem benefits, including maintaining river and stream channels and triggering behavioral changes in some species, such as anadromous fish, that have evolved in this variable system. However, historic changes in the system have resulted in circumstances where existing flows are low during times of high ecosystem need.

The variations in water demand will be used in the development of a CALFED water management strategy that accounts for potential variability in future conditions. The range of water demands should include some perspective on potential future variation/uncertainty of:

- Population that could affect demand for water;
- Land use changes that could affect demand for water;
- Environmental water needs.



### Integrated Water Management Strategy

Water Management Objectives	Water Management Tools										
	Transfers		Conservation				Storage		Other		
	Long-Term	Short-Term	Agricultural	Urban	Wetlands	Recycling	Groundwater	Surface	Watershed Management	Water Quality Control	Monitoring and Real-Time Diversion Management
Reduce Diversion Conflicts											
Decrease Drought Impacts											
- Environmental Flows											
- Ag/Urban supply											
Increase Supply Availability											
- Drought											
- Average											
Increase Operational Flexibility											
Increase Supply Utility (WQ)											

The variations in potential water conservation will be evaluated as part of the water management strategy rather than a change in water demand.

The term "water supply reliability" means different things to different people. For example, some interpret it as average water deliveries during dry periods, but this definition doesn't account for the extreme variations in California hydrology. CALFED believes that an appropriate working definition of success in water supply reliability is the following list of objectives.

- Reduce water diversion conflicts between instream beneficial uses (environmental uses) and out-of-stream beneficial uses (consumptive uses).
- Increase access to economically efficient water supply during average and drought periods to benefit all users.
- Increase water system operational flexibility so it is better suited to respond to biological and hydrological variability and be more resilient to potential disasters.
- Improve water quality so available water supplies are suitable more uses and reuses.

Seven general categories of tools can be used to manage water in the California system. Each of these tools is already being implemented in California to some degree.

- Water conservation
- Water recycling
- Water transfers, both short-term and long-term
- Storage, both groundwater and surface water
- Watershed management
- Water quality control
- Monitoring and real-time diversion and facilities management

The appropriate water management strategy will not be a single approach, but the proper combination of all the available tools.

Several efforts are involved in the development of CALFED's water management strategy, including:

- Economic Evaluation of Water Management Alternatives – Economic analyses that evaluate different combinations of water management tools to identify least-cost ways of meeting CALFED's water supply reliability objectives. These analyses are expected to better define the available mix of demand management options and new facilities.

- Integrated Storage Investigation – Evaluation of the proper role of storage in the context of the water management strategy, and coordinate existing storage investigations.

## Economic Evaluation of Water Management Alternatives

To aid in developing a water management strategy, CALFED has undertaken an Economic Evaluation of Water Management Alternatives. The primary purposes of this effort are twofold:

1. To define how policy assumptions and preferences could affect the selection of water management tools that define the water management strategy;
2. To help evaluate the potential environmental, economic, and social benefits and impacts of alternative water management strategies.

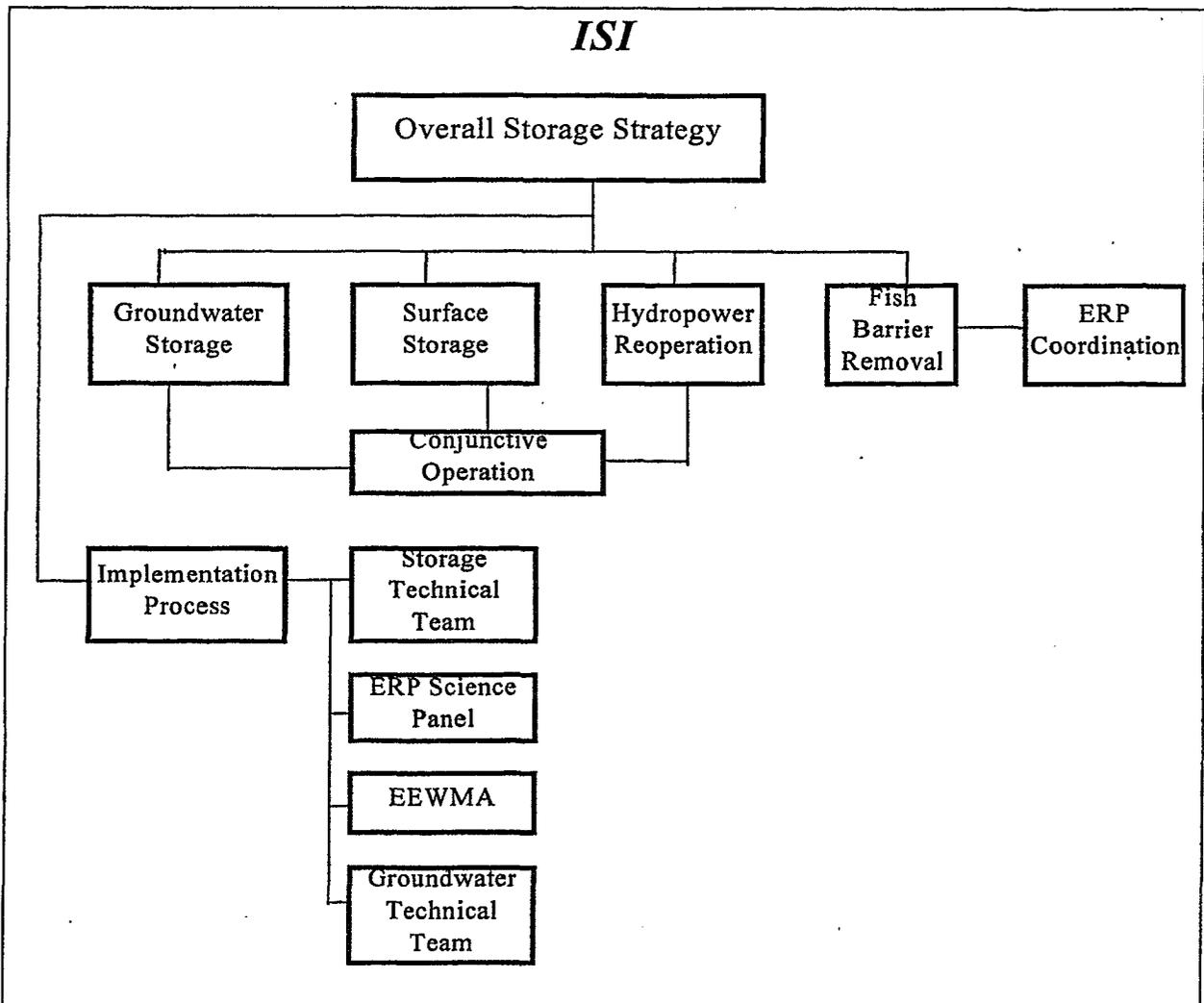
Through outreach to stakeholder groups, CALFED is developing a range of the most cost-effective water management options, or “scenarios,” to meet future California water needs in 2020. These scenarios, which include both demand reduction and supply augmentation options, will be constrained by policy assumptions and preferences obtained from a variety of stakeholder groups.

CALFED is also developing a Hydrologic-Economic Impact Modeling effort. A number of models are being linked to simulate both the hydrologic and economic consequences of statewide water management decisions. This will assist decision-makers in evaluating the benefits and impacts of alternative water management scenarios.

## Integrated Storage Investigation

The proper role of storage in the CALFED water management strategy will be evaluated as part of the Integrated Storage Investigation (ISI). The ISI is an effort to coordinate existing storage investigations being conducted by CALFED agencies, CALFED-initiated storage evaluations, and broader water management strategies and analysis to provide a comprehensive assessment of alternative storage options and their utility to overall water management.

Specifically, the ISI will evaluate surface storage, groundwater storage, power facility re-operation, and the potential for conjunctive operation of these different types of storage. These investigations, as part of the Water Management Strategy, will contribute to the Section 404 Guidelines requirement to select the least environmentally damaging practical alternative to constructing new storage facilities. The ISI will consider all practicable alternatives for storage and determine the proper mix of groundwater and surface water storage facilities. Additionally, these investigations will provide an important opportunity to



comprehensively assess and prioritize critical fish migration barriers for modification or removal.

The investigation will evaluate the various storage elements on a Bay-Delta system scale and on a local scale. It must assure that proposals for system changes take into consideration regional as well as statewide management objectives.

The study elements are designed to achieve the following objectives.

**Overall Storage Strategy:** Describe the role of storage in the Water Management Strategy and its programmatic utility and limitations. Identify the potential to achieve water quality, water supply reliability and ecosystem benefits. Determine the proper mix of surface and groundwater storage and the general operational strategy necessary to meet CALFED



objectives, based on policy assumptions agreed to by the CALFED Policy Group, technical assumptions developed with the CALFED agencies and stakeholders, and linked economic and hydrologic modeling. This investigation will be coordinated with other Program components, including an evaluation of the role of storage in improving drinking water quality, the operation of an Environmental Water Account, and an assessment of the time value of water and geofluvial processes in cooperation with the Ecosystem Restoration Program science panel.

In accordance with Clean Water Act Section 404 Guidelines, the overall storage strategy will describe whether or not all practicable alternatives to storage facilities have been implemented to the extent feasible and whether there is still an unmet need for additional storage facilities when beneficiaries pay the full cost of new facilities. This effort will be coordinated with the overall CALFED 404 process and will provide guidance through Stage 1.

**Surface Storage Investigations:** Depending on their locations and operating criteria, surface storage facilities can provide a wide range of water management functions. CALFED and its cooperating agencies have conducted a preliminary screening of potential surface storage locations and project configurations, then selected a smaller number for more detailed evaluation. The screening process continues to be refined to assure consistency with current planning conditions and available environmental data.

CALFED and its cooperating agencies are investigating surface storage facilities; north of Delta off-stream storage; in-Delta, adjacent to Delta and off-aqueduct storage; and on-stream storage enlargement studies.

**Groundwater/Conjunctive Use Programs:** CALFED has developed a framework for evaluation and development of additional groundwater and conjunctive use opportunities, based on voluntary participation by local water management entities. The proposed framework would provide opportunities for intensified groundwater monitoring, modeling, and evaluation of local and regional opportunities as well as potential impacts and mitigation requirements. It calls for the use of pilot studies to assess opportunities and impacts before full implementation. In addition, the California Department of Water Resources and the U.S. Bureau of Reclamation are working with local agencies to explore specific groundwater banking and conjunctive use opportunities. The ISI will identify beneficial pilot projects and develop operational strategies to optimize conjunctive management opportunities with existing and potential new surface storage.

**Power Facilities Re-operation Evaluation:** There is existing storage capacity in the Bay-Delta system dedicated to the generation of hydroelectric power. California law (AB 1890, 1996) requires that California utilities facilitate deregulation of electric power by appraising and separately managing their transmission and generating facilities, which has triggered an evaluation and potential divestiture of some or all of these facilities. There is the potential to re-operate some of these hydroelectric facilities to produce water supply or ecosystem

benefits. The ISI will evaluate the potential for achieving CALFED water management objectives through the re-operation of existing hydroelectric facilities. The evaluation will include consideration for conjunctive operation with existing surface storage and/or groundwater storage.

**Fish Migration Barrier Removal Evaluations:** As part of CALFED's Ecosystem Restoration Program, some obstructions to fish passage, such as small dams, are being considered for modification or removal in order to restore anadromous fish access to critical spawning habitat. The ISI will provide a more systematic approach to identifying and prioritizing barriers for future action. The evaluation will consider the potential ecosystem benefits and alternative ways to address potential water supply reliability, flood control and power impacts associated with facility removal or modification. Interested stakeholders will participate in an open evaluation and decision process of each candidate facility.

## Implementation Process

The integrated evaluation of these complex components requires substantial, coordinated effort. The initial investigation will focus on programmatic, system-wide interrelationships. CALFED will then work with the involved agencies and stakeholders to fill in detailed system-wide, regional and local evaluations. Appropriate conceptual models will be developed to illustrate and evaluate potential storage and water management strategies. CALFED will utilize a storage technical team of agency and stakeholder representatives to help guide, integrate and evaluate the study components. The ISI will be coordinated closely with the ecosystem science panel review to develop diversion and flow strategies and the Economic Evaluation of Water Management Alternatives to properly integrate economic considerations. Additionally, CALFED will provide for critical peer review at key milestones of the ISI.

Restoration  
Coordination Program

F-002297

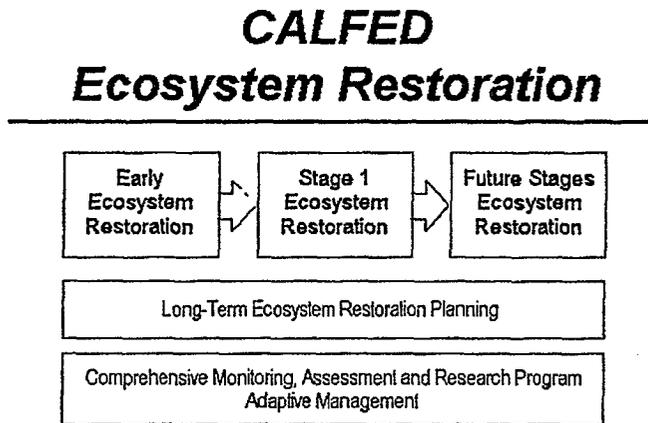
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# Restoration Coordination Program

## Background

The December 15, 1994, Bay-Delta Accord included a commitment to develop and fund non-flow related ecosystem restoration activities to improve the health of the Bay-Delta ecosystem. This funding source and commitment is commonly referred to as Category III. The Category III Steering Committee was formed to administer previous rounds of Category III funding. In 1996, the administrative function for Category III funds was shifted to the CALFED Bay-Delta Program's Restoration Coordination Program.

The CALFED Restoration Coordination Program is designed as a short-term program to allow implementation of ecosystem restoration actions while the programmatic environmental documents are being revised and finalized. It is expected that the Restoration Coordination Program will become part of the overall CALFED Ecosystem Restoration Program (ERP).



The Restoration Coordination Program receives input from the Ecosystem Roundtable, the Bay-Delta Advisory Council (BDAC) and the general public. The Ecosystem Roundtable is a subcommittee of BDAC specifically created to provide input from a broad cross-section of stakeholder interests to the Restoration Coordination Program. BDAC consists of over 30 representatives of California stakeholder groups.

BDAC is chartered under the Federal Advisory Committee Act and provides input to the overall CALFED Program.

## Integration with the CALFED Ecosystem Restoration Program

All of the projects funded under the Restoration Coordination Program have been consistent with the long-term Ecosystem Restoration Program (ERP). Long-term planning efforts such as the development of the Strategic Plan for Ecosystem Restoration and the Stage 1 actions and bundles have helped to define the funding priorities for the Restoration Coordination Program.

Some of the nation's most respected scientists and natural resource managers have critiqued and refined the program. In October 1997, CALFED convened a panel of eight independent scientists to review the Ecosystem Restoration Program Plan. The panelists had experience with the nation's major ecosystem management efforts, including Chesapeake Bay, South Florida/Everglades, and the Columbia River. The panel offered specific recommendations to strengthen the adaptive management approach for the program, the key element of the ERP implementation strategy. In response to the panel's recommendations, CALFED convened a team of six independent scientific experts to develop a strategic plan. The team – composed of nationally recognized experts in fluvial processes, regional planning, estuarine processes, fish ecology and environmental compliance – developed an adaptive management framework for implementing the CALFED ERP.

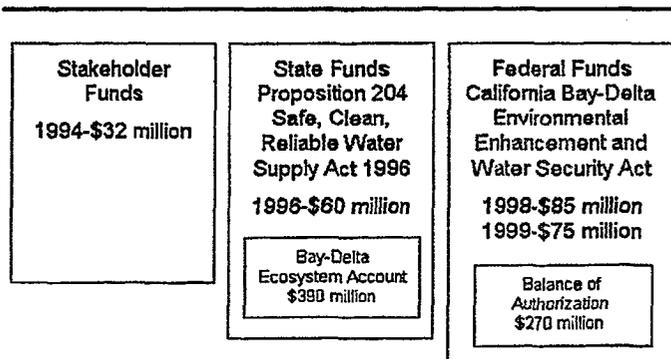
CALFED is currently working to integrate the adaptive management and ecosystem-based approach into the development of the Stage 1 Action Plan. CALFED will be working with members of the scientific community through a series of scientific, technical workshops to evaluate the results of near-term restoration projects and to select actions for Stage 1 of implementation. CALFED will then work with local scientists, landowners, county and city planners and others in regional and local meetings to plan implementation of the actions.

## Restoration Project Funding

The CALFED Restoration Coordination Program has received funding from four primary sources, including contributions from the California Urban Water Agencies, Proposition 204 State bond funds, the Federal Bay-Delta Act, and Federal EPA watershed funding. Restoration coordination funds are administered through the cooperative efforts of the CALFED agencies. In 1999 the majority of funds available are from the Federal Bay-Delta Act, with additional contributions from State Proposition 204.

Since its inception in 1996, CALFED's Restoration Coordination Program has received more than 800 proposals for a total request of more than \$1 billion. Funding of Restoration Coordination projects is a cooperative effort between state and federal agencies, stakeholders and the public. To date, CALFED has funded 195 projects for a total of approximately \$228 million. Types of projects funded have

### Ecosystem Restoration Funding Sources



included fish screens, fish ladders, land acquisition, habitat restoration, and focused research and monitoring projects designed to provide information that will improve future restoration efforts.

Once a project is approved for funding, a contract or interagency agreement is prepared for the project. The contractor is authorized to begin work once the contract or agreement is signed and the funds for that project are deemed "obligated." CALFED contracts are reimbursable. Because of this, there is a period of time between when work has been executed or completed and when subsequent invoicing occurs and payment is made. CALFED enters into three year contracts for Restoration Coordination project activities. Depending on the nature of the project, most funds are expended in the second and third years. Some activities, such as acquisition of property or conservation easements, can be executed quickly resulting in more rapid expenditures.

### 1999 Funding Priorities

Approximately \$85,679,000 is available for projects in fiscal year 1999. These include funds from the Federal Bay-Delta Act, with additional contributions from State Proposition 204. Thirteen projects have been approved for funding by the Secretary of the Interior as directed

## **State and Federal Funds Available for Projects in FY 99**

Source	Amount
Prop 204 Funds	\$3,876,000
Prop 204 Hatchery Management Program	\$250,000
Prop 204 Fish Harvest Research Program	\$500,000
Prop 204 Sediment Management Program	\$500,000
Prop 204 Water Quality Program	\$2,700,000
FY 98 Federal Bay-Delta Act Fish Passage Program	\$1,524,000
FY 98 Federal Bay-Delta Act Water Acquisition Program	\$14,500,000
FY 99 Federal Bay-Delta Act Funds	\$61,829,000
<b>Total Estimated Funds Available</b>	<b>\$85,679,000</b>

programs in 1999, at a total cost of approximately \$52,462,000. Approximately \$14,500,000 is available for environmental water acquisition.

A public solicitation for ecosystem restoration projects will be used to identify projects for the balance of funds available in

1999, approximately \$18,700,000. The 1999 Public Solicitation Package (PSP) was available to the public on February 16, 1999. Deadline for proposals to CALFED was April 16, 1999. Final project selection is expected around the end of June 1999.

Many more proposals were submitted than can be funded -- 226 proposals with a total value of \$264 million were submitted. The project selection process is now underway to determine which of the proposals will be funded. This solicitation will be used to identify and prioritize

other valuable projects that could be considered for funding should additional Federal Bay-Delta Act funds be allocated in October of 1999 for fiscal year 2000.

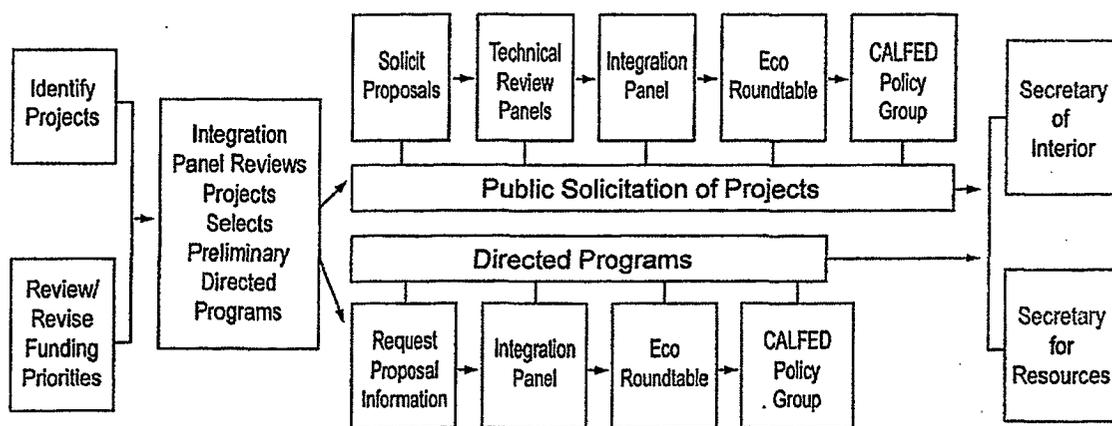
## How Projects are Selected

Ecosystem restoration projects may be selected through identification as a directed program or through a public solicitation process. CALFED has the discretion of directing funds towards specific actions – “directed programs” – that will help the program achieve its long-term ecosystem restoration goals. Projects selected as directed programs are identified through public and technical outreach and the use of the Strategic Plan for Ecosystem Restoration, the Ecosystem Restoration Program objectives and the draft Stage 1 action list.

Proposals selected through the public solicitation process are evaluated and scored by technical review panels made up of state, federal and stakeholder technical representatives with the necessary expertise. Once potential projects are identified, either as directed programs or through technical scoring of solicited proposals, they are forwarded to the CALFED Integration Panel.

The CALFED Integration Panel, comprised of state, federal and stakeholder technical representatives, evaluates potential projects based on CALFED’s comprehensive goals for ecosystem restoration. The Integration Panel takes into consideration the project’s ability to meet the funding priorities and implementation guidelines, the system-wide ecosystem benefits of the project and compatibility with non-ecosystem CALFED objectives. The

# Ecosystem Restoration Project Selection Process



Integration Panel forwards preliminary recommendations for funding to the Ecosystem Roundtable and CALFED Policy Group. The CALFED member agencies, acting through the

CALFED Policy Group, make final funding recommendations to the California Secretary for Resources and the U.S. Secretary of Interior.

## Coordination with Other Programs

A goal of the Restoration Coordination Program is to improve coordination among fish and wildlife restoration programs in the Central Valley. The need for strong coordination among restoration programs is driven by the desire of all restoration programs to maximize ecological improvements through the integration and sharing of knowledge and funding. CALFED staff meets and coordinates regularly with resource agency staff and other restoration program managers.

CALFED's largest partners are the U.S. Fish and Wildlife Service and Bureau of Reclamation, which are implementing the Central Valley Project Improvement Act (CVPIA). CALFED and these agencies have successfully partnered on many projects resulting in improvements to ecosystem health, an achievement of objectives for both programs. While the overall program objectives for CALFED and CVPIA are different, the two programs have some areas that are compatible. CALFED agencies have worked closely together to identify common areas of interest and the most effective way of cooperatively restoring ecosystem health in those areas.

CALFED is working with other state and federal restoration programs to create and share project planning and restoration information and the results of research and project monitoring activities.





# Restoring the Environment

## Investing in the Future

The CALFED Bay-Delta Program's Ecosystem Restoration Program represents one of the most ambitious and comprehensive ecosystem restoration projects ever undertaken in the United States. CALFED is simultaneously addressing the many problems affecting the Bay-Delta by developing balanced, comprehensive and integrated solutions that will take the state into the 21<sup>st</sup> Century.

In the last decade, many state and federal land management agencies have begun implementing an ecosystem approach to managing the resources under their stewardship. CALFED, too, will use an ecosystem based management approach that emphasizes the restoration of natural processes.

Many of the numerous plant and animal species that rely on the Bay-Delta ecosystem are extinct, listed as endangered or threatened, or are experiencing declines in population abundance or geographic distribution. Species declines indicate a much broader problem of deteriorating ecological health in the Bay-Delta. Traditional management of ecological resources has focused upon the needs of individual species. Ecosystem-based management takes an integrated approach to the recovery and protection of multiple species by restoring the natural physical and ecological processes that help create and maintain diverse and healthy habitats.

The benefits of restoring the environment are far reaching and improve reliability to other users. The result is not only traditional environmental improvements, but also improvements in water quality and water supply reliability for California's citizens and economy. The following discussions exemplify the unprecedented breadth and scope of the CALFED Ecosystem Restoration Program. The projects that are profiled here represent the broad concepts, improvements and benefits the CALFED Ecosystem Restoration Program is striving to achieve.

### Cosumnes River Preserve - Forming Lasting Partnerships

As the last free-flowing river on the western slope of the Sierra Nevada, the Cosumnes River watershed provides unique opportunities for both research and restoration.

Only a fraction of the Central Valley's original environment remains. The Cosumnes River, its watershed and its floodplain encompass an ecosystem of great biological importance including seasonal and permanent wetlands, riparian forests, seasonal vernal pools,

grasslands, and blue oak woodlands. The Cosumnes River Preserve is one of the largest and best examples of the Central Valley as it once was.

Restoration of natural floodplains, such as those found on the Cosumnes River Preserve, is an important step in moving toward a healthy ecosystem for the Bay-Delta. Preliminary research indicates that these areas are important to salmon, steelhead and other native species. As research continues, scientists are discovering that these areas support more species and life stages than previously thought and are important spawning habitat for native fish. Scientists are also discovering that floodplains contribute to the aquatic food web and help support important nutrient cycling processes. In addition to ecological benefits, floodplains reduce flood damage by reducing flood stages and velocities and providing a wide area for overbank flow.

Much of the preserve is maintained in agricultural land use. This allows continuation of environmentally sensitive grazing and wildlife friendly farming for commercial purposes and for wildlife habitat and use. Projects like the Cosumnes River Preserve protect agricultural lands from development, provide support to rural communities, and provide open space and buffers to nearby urban areas.

The Cosumnes River Preserve is a showcase for partnerships, with participation by the U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, The Nature Conservancy and local agricultural districts. Since 1984, the preserve has evolved into one of California's most prominent conservation projects. More than 35,000 acres of riverside habitat along the lower floodplain of the Cosumnes has been protected. The Cosumnes River Preserve is saving crucial habitat on a large scale within a rapidly urbanizing area. The preserve is a multifaceted program combining land acquisition, land use planning, compatible economic development, public and private partnerships, habitat restoration, and community outreach and education.

The CALFED Bay-Delta Program, one of many partners in this project, has provided more than \$13 million for the purpose of preserving and restoring these important lands. This ambitious effort will save the best features of this remarkable landscape for the use and enjoyment of future generations while addressing the livelihood and health of the people who share this land.

## Sacramento River Conservation Area

The Sacramento River is the largest and most important river ecosystem in the State of California. Historically, the riparian forest corridor along the Sacramento River averaged four to five miles wide. Today only 5 percent of the forests remain.

Rivers, along with their closely associated floodplain and upland areas, comprise corridors of great economic, social, cultural and environmental value. In 1986 the California Legislature



passed Senate Bill 1086 that called for the development of a management plan for the Sacramento River and its tributaries which would protect, restore and enhance both fisheries and riparian habitat. Through extensive public outreach and the establishment of a consensus-based planning group, a set of guiding principles were developed to govern riparian habitat management along the Sacramento River. The establishment of the Sacramento River Conservation Area, which includes approximately 213,000 acres along 222 miles of the main stem between Keswick Dam and Verona,

was an outcome of this process. This program seeks to balance the existing land uses and needs with preservation and restoration actions. Participation in this program is voluntary for landowners in the conservation area and focuses on people and the environment working together. The program addresses flood management and economic concerns and provides information and education.

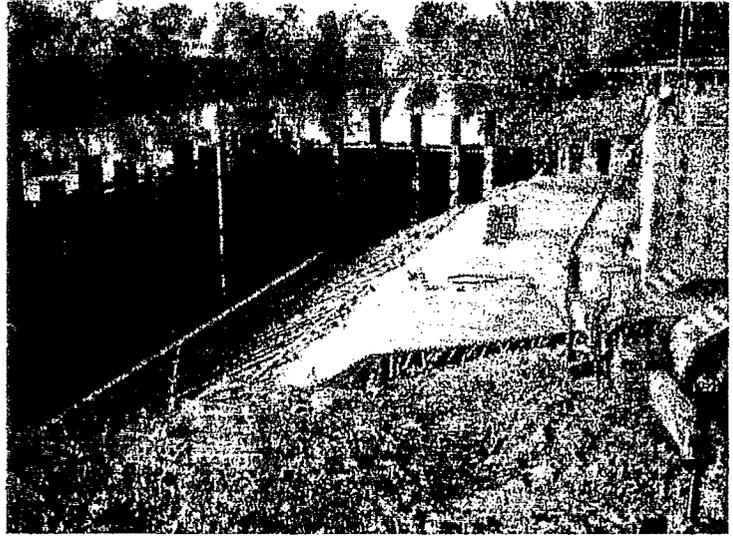
CALFED has provided support for both riparian and fisheries actions identified through the SB 1086 process. More than \$36 million has been dedicated toward preserving and restoring riparian habitat, providing fish protection measures and conducting research within the Sacramento River Conservation Area.

## **Fish Protection - Major and Small Screening Programs**

Water from the Bay-Delta system is a critical component to California's economy. Diverted water provides irrigation for more than 200 different crops, drinking water for two-thirds of Californians, and water for refuges and other wetland habitat areas.

Fish and aquatic organisms are captured in (entrained) water diversions. In most cases, entrained organisms do not survive. Some diversions have screens that exclude most juvenile and adult fish, however, eggs and larval fish, invertebrates, planktonic plants,

organic debris and dissolved nutrients are lost to diversions. The conflict between the loss of important environmental components and the need to divert water for beneficial uses is an important issue for the CALFED Program. Because of the magnitude and significance of this conflict and its potential to adversely affect California's natural resources and its economy, the CALFED agencies are working to reduce the adverse effects of water diversions. More than \$34 million has been provided to local irrigation districts operating 36 projects focused on reducing the adverse environmental effects of water diversions:



- Research to allow better understanding of the effects of entrainment and how it can best be managed.
- Relocation and consolidation of water diversions.
- Feasibility, engineering and installation of fish screens on major water diversions. When all the projects approved by CALFED are completed, nearly 75 percent of the diverted water on the upper Sacramento River will be screened.
- Installation of fish screens on small water diversions and funding provided to Natural Resources Conservation Service's existing voluntary small fish screen program.

## San Joaquin National Wildlife Refuge

The U.S. Fish and Wildlife Service's San Joaquin National Wildlife Refuge (SJNWR) is a good example of a project with the partnerships and multiple benefits CALFED seeks to achieve. Expansion of the refuge will reduce flooding, protect and restore valuable wildlife habitat and provide other local benefits.

The San Joaquin National Wildlife Refuge is located in the heart of the San Joaquin Valley and includes portions of the natural floodplain for the San Joaquin, Stanislaus and Tuolumne rivers. The San Joaquin Valley is an important contributor to California's agricultural wealth and prosperity. The conversion of wetlands to farmlands has changed the landscape by diminishing the valley's wetland and riparian habitats and the species dependent on those habitats. What remains of the river ecosystem is vitally important to existing wildlife populations.

In 1997 devastating floods swept through the San Joaquin Valley, costing lives and an estimated \$2 billion in property damage. The San Joaquin River broke through its leveed banks, inundated urban areas and flooded vast areas of farmland. As a result, Federal and State agencies are developing nonstructural flood control strategies that include expansion of the SJNWR that also protect riparian and wetland habitats.

More than \$10.5 million of federal Bay-Delta Act funds have been provided to the U.S. Fish and Wildlife Service for expansion of the San Joaquin National Wildlife Refuge. The benefits provided by this project include widening of the floodplain, increased residence time and transient storage of flood waters, groundwater recharge and the protection and restoration of important riparian and wetland habitats.

## North Delta National Wildlife Refuge

The Yolo Bypass and North Delta areas present tremendous opportunities for reducing flood damage and achieving restoration of areas important to at-risk species. The Yolo Bypass floods approximately every third year, conveying 80 percent of the inflow from the Sacramento River basin during high water events. Flooding of the Yolo Bypass creates a 59,000-acre expanse of shallow water habitat, approximately doubling the wetted area of the Bay-Delta. The proposed U.S. Fish and Wildlife Service North Delta National Wildlife Refuge is located about 10 miles west of Walnut Grove in the southern end of the Yolo Bypass. The area under consideration includes three delta islands: Prospect Island, Liberty Island and Little Holland Tract. CALFED has approved more than \$5 million toward the restoration of Prospect Island, which is currently in public ownership, and has approved more than \$8.5 million for the acquisition of Liberty Island. Preservation and restoration of these lands will provide important values for fish and wildlife species and substantially improve the conveyance of floodwaters through the North Delta.

A diversity of habitats lie within the area: open tidal emergent marsh, riparian forest, seasonal wetlands, uplands and agricultural lands. The Yolo Bypass supports at least 40 different species of fish including Delta smelt, steelhead trout, sturgeon and winter-run chinook salmon. Scientists believe that access to flooded areas in the bypass gives native fish a competitive edge over exotic species. For example, the bypass appears to be particularly valuable habitat for the recently listed Sacramento splittail, providing spawning, rearing and foraging habitat. Similarly, the bypass is important for rearing young chinook salmon, which grow faster on the floodplain because of warm temperatures and an abundant food supply. In addition, the bypass has proven to be an important link in nutrient cycling and in the Bay-Delta food chain.

## Butte Creek Restoration

Butte Creek is one of many important tributary streams for the Bay-Delta, and one of the best modern day success stories to demonstrate the value of investing in restoration activities.

The ecological health of the Bay-Delta depends on ecological processes and functions, habitats, and fish and wildlife species present within its tributary watersheds including Butte Creek. Fall and spring-run chinook salmon and steelhead trout live and spawn in Butte Creek. The status and abundance of spring-run chinook salmon is an important measure of ecological health for Butte Creek and the Bay-Delta. As late as the 1960s, Butte Creek supported more than 4,000 adult spring-run chinook salmon. In recent years the spring-run chinook populations have been in the range of 200-1,000 adults. The decline of Butte Creek's anadromous fishery is attributed to many factors. Many fish are lost to unscreened diversions or stranded by unblocked agricultural drains. Others are unable to negotiate the many diversion dams and barriers. Poor quantity and quality of flow and poaching also dramatically impact the fish on Butte Creek.

CALFED has been actively involved in funding local irrigation districts to restore Butte Creek. More than \$5.6 million has been approved for 12 projects, including fish screens, fish passage and small dam removal, watershed support and general restoration activities. In 1995, spring-run salmon returns reached a record of more than 8,000, demonstrating that Butte Creek had the potential to attract a large number of spring-run chinook salmon with adequate streamflows. As a further demonstration of restoration success, this year spring-run returns reached a phenomenal high of more than 20,000 adult fish.

## Battle Creek

Battle Creek is recognized as having outstanding potential for restoring salmon and steelhead. Battle Creek is unique in that it is the only stream on the western rim that supports all four runs of native chinook salmon, and the only tributary capable of supporting the endangered winter-run chinook salmon.

Providing access to valuable spawning and rearing habitat is an important component to the recovery of endangered and threatened anadromous fish. The Battle Creek Project is an example of the opportunities available to improve fish passage to historical habitats. To date, has approved funding of more than \$34 million to the U.S. Fish and Wildlife Service, California Department of Fish and Game, Bureau of Reclamation, Pacific Gas and Electric and other project partners for the Battle Creek Project and fish passage improvements on other streams.

Battle Creek is a cold, spring-fed stream with constant high flows during the dry season (250 cfs) making it the only Sacramento River tributary resistant to drought. Its remote, shaded

Extensive historical records document Battle Creek's enormous potential for supporting all four races of salmon and steelhead. The restoration of Battle Creek will provide a unique opportunity to restore a drought resistant population of the state and federally listed winter-run chinook salmon. Presently, the main population of winter-run salmon spawns in the Sacramento River. During droughts winter-run chinook salmon suffer severe mortality from elevated water temperatures.

The Battle Creek Project will remove five dams and ladder others. Diversions will be screened and flows improved. These actions will result in salmon having improved water quality and access to 42 miles of historical anadromous fish habitat. Implementation of this project will take five to seven years.

## The "Bay" in Bay-Delta – Protecting the Health of the Suisun, San Pablo and San Francisco Bays

Many fish, wildlife and other living organisms that depend on the Delta either pass through, or spend part of their life cycle downstream of the Delta. The ecological health of Suisun Bay, San Pablo Bay and San Francisco Bay can influence the success and recovery of species dependent on the Delta and even the success of restoration efforts themselves. Restoration activities implemented upstream of the bays provide direct benefits to the bays through improved inflow, improved quality of water flowing into the bay areas, improved ecological processes and functions such as foodweb support and nutrient cycling, and increased population numbers and health of ecologically important species.



Important habitat types found in the Bay areas include permanent tidal marshes, seasonal wetlands, perennial grasslands and wet meadows, agricultural lands and riparian habitats. The separation of wetlands from tidal flows and the reclamation of emergent wetlands have altered ecological processes and functions. Removing tidal action from the marsh and bayland soils has resulted in oxidation and subsidence and adverse changes in wetland soil chemistry. The loss of these important processes and functions has reduced available habitat for native species, reduced water quality and decreased the area available for dispersing flood waters and depositing suspended silt. In addition to the loss of ecological functions, the bays continue to be at-risk from high levels of contaminants affecting water quality, introduction

of non-native species especially from ships ballast water, loss of aquatic organisms to water diversions, dredging and dredge disposal, and the loss of habitat areas to development.

More than \$11 million has been approved for 22 projects to directly support habitat restoration, contaminant reduction and improved water quality, research and evaluation of non-native species and provide watershed support in the bay areas. In addition, millions of dollars are being spent on upstream ecosystem restoration that directly benefits the bays through improved ecological inputs.

## **Invasive and Non-Native Species**

Invasive and non-native species are one of the greatest threats to restoration efforts for the Bay-Delta. A new non-native species is identified in the Bay-Delta every 15 weeks.

Invasive and non-native species have had a significant impact throughout the Bay-Delta ecosystem. Non-native species make up an increasing proportion of the zooplankton, fish species and aquatic plant communities in the Bay-Delta. Research has shown that a large number of non-native species dominate some Bay-Delta habitats in number of species, number of individuals, biomass, and rate of invasion. It is unclear which species are affecting the Bay-Delta, exactly how they are affecting the Bay-Delta ecology and to what extent they can be eradicated or controlled effectively.

It is critically important to reduce the number of new non-native species to the Bay-Delta. It is also important that we understand how existing non-native species function in the Bay-Delta ecosystem and how non-native species will influence future restoration efforts.

Under the funding support of the Federal Bay-Delta Act, the U.S. Fish and Wildlife Service is leading a Non-native Invasive Species work team to develop, implement, manage, and coordinate a non-native species program for CALFED. The objectives of the program are to develop a long-term Strategic Plan and Implementation Plan, now in draft, and to manage non-native invasive species in the Bay-Delta estuary and its watersheds. The program will support projects to prevent or minimize additional invasive species from being introduced, and control-oriented management and research projects to eradicate or manage invasive species once they have arrived.

## **Environmental Water Quality**

An estimated 5,000-40,000 tons of contaminants enter the Bay-Delta annually. Researchers frequently discover that water and sediments in various parts of the Bay-Delta ecosystem are toxic to fish and invertebrates and present a risk to human health.

Contaminants are present in varying degrees in the water and sediments of aquatic habitats in many areas of California. Poor water quality affects ecological habitats and species

important to the Bay-Delta. Scientists have determined that contaminants can adversely affect the aquatic foodwebs, and fish and wildlife populations in the Bay-Delta ecosystem.

Water quality conditions which have the potential to adversely affect the Bay-Delta ecosystem include low levels of dissolved oxygen that block upstream migration of anadromous fish and reduce the survival of other aquatic organisms; bioaccumulation of selenium which can be highly toxic to aquatic life at relatively low concentrations; salinity which can cause local and seasonal environmental impacts to fish; unknown sources of toxicity that cause both toxic effects and mortality to aquatic life; and pesticide loads from agricultural runoff which have the potential to impair aquatic life.

How future restoration sites are managed has the potential to affect water quality. Ecosystem restoration activities that maximize water quality benefits to ecological habitats and species, while not adversely impacting other uses such as drinking water, are an important part of the CALFED Program. CALFED has approved more than \$14 million for 19 water quality research and conainment projects to answer important water quality questions and implement actions that achieve restoration goals and improve water quality for the Bay-Delta system.

## Looking Toward the Future

A key to successful ecosystem restoration is learning from all restoration and management actions. Research and education provide opportunities to both gain information, and share it. Through decades of scientific research, we have come to understand much about the Bay-Delta ecosystem and the species that depend upon it. However, we do not understand all of the ecological processes and interactions.

Education programs are important to develop a broader understanding of natural resource conservation issues at the individual and community level. CALFED's educational efforts are intended to increase public awareness, knowledge and appreciation of natural resources and ecosystem restoration activities, foster active participation in conservation programs, and encourage individuals to wisely use natural resources consistent with CALFED's ecosystem goals and objectives. Nearly \$3 million for 14 environmental education projects has been approved.

Educational programs provide the opportunity for sharing of existing information, while research and project monitoring help gain new answers to important questions. Learning from research and project monitoring allows resource managers and the public to evaluate and update the problems, objectives and models used to direct restoration actions. All CALFED projects have a research element, and are designed to provide information that can be used in future decision-making. More than \$17 million for 31 projects has been approved research important ecological questions. In the future, through adaptive management,

CALFED ecosystem restoration actions will be revised or redesigned to be more effective as new information or research results become available. This allows the restoration program to evolve and improve as the ecosystem responds to management actions.

## Ecological Indicators

**E**cological indicators are tools to measure the health of the Bay-Delta system. With indicators, the efficiency and durability of restoration projects and management actions can be measured. Indicators will provide information that can improve our technical understanding of the interrelationships and interdependence of ecological processes, habitats and species within the Bay-Delta system.

Ecological indicators have an essential role in a science-based approach to ecosystem restoration and management. They can be direct measures of ecological attributes (e.g., streamflows, flood pattern, magnitude and duration) or can be a synthesis of several independent measures (e.g., trends in abundance, reproductive success, diversity, composition and distribution of native resident and migratory birds). Indicators are used to describe and present information on ecological conditions, trends, and their significance and are used to translate program goals and objectives into measurable benchmarks of program success.

The CALFED Environmental Restoration Program (ERP) has specific ecological indicators and goals for each stream section and habitat type within the Bay-Delta area. CALFED can thus relate selection of high priority ecosystem restoration projects to the goals in the ERP and track how each project meets ERP goals.

The ERP will employ three general interrelated types of ecological indicators (Figure 1). These types of indicators are described below in increasing levels of detail.

## Essential Ecological Indicators

Essential Ecological Indicators (EEI) are a carefully selected set of measurements or indices that sum-up CALFED's assessment of the ecological integrity or health of the Bay-Delta Ecosystem. They provide a scientifically valid summation of assessment of ecological integrity. They are also easily understandable to the public and decision-makers. The proposed draft EEIs include topics such as habitat type and quality; water quality; comparison of historical and current flows; and species composition and health.

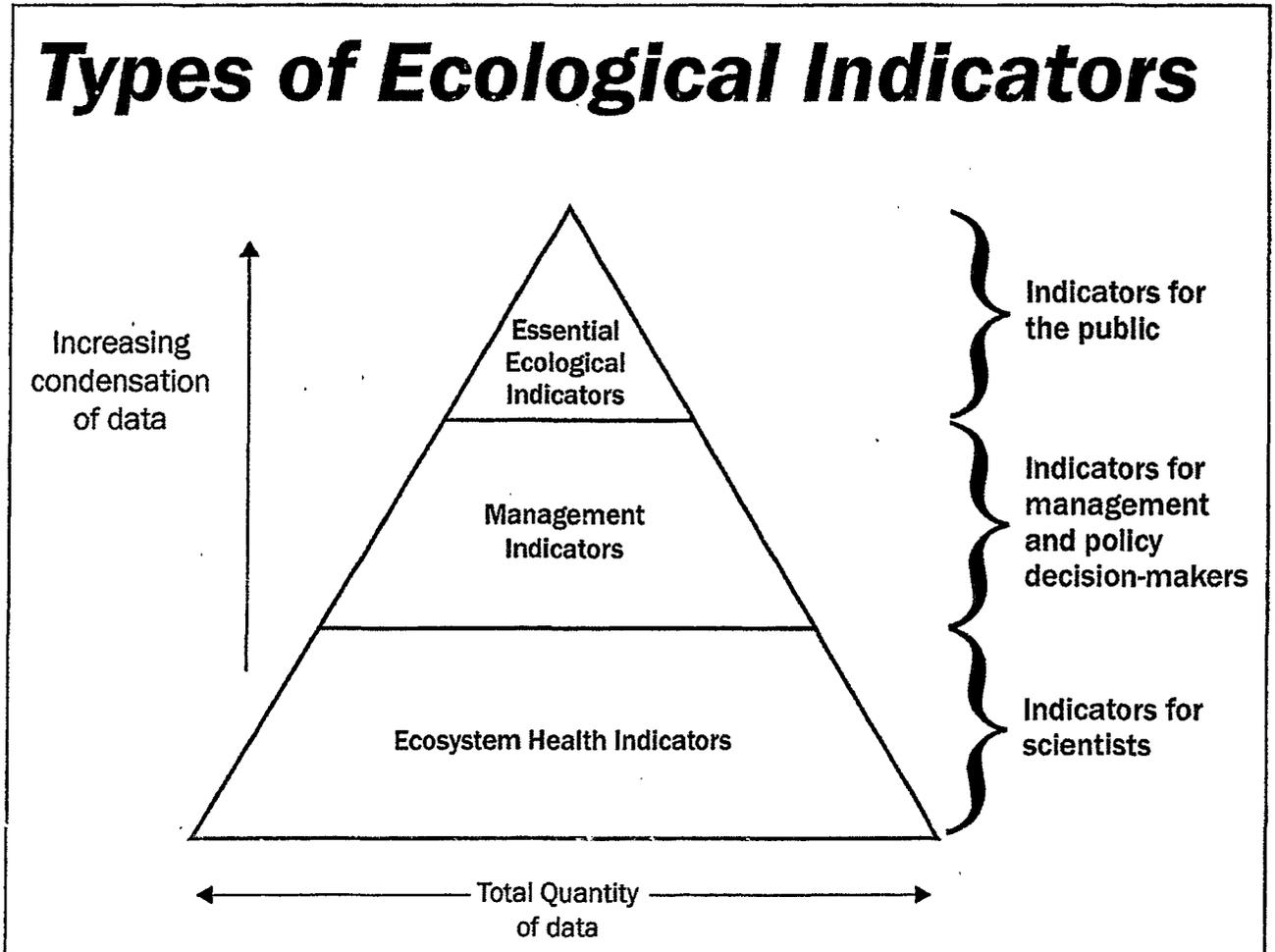
## Management Indicators

Management and project success indicators provide tools to measure program progress, and to support the decision-making process and adaptive management. Project success indicators are typically performance measures or standards of design for specific actions.

The management indicators are intended to reflect change more quickly than indicators of ecosystem health. They are typically comprised of measurements that can be obtained

annually or more frequently. Most of the management indicators that will be used in CALFED are based on ecological elements that are currently monitored in the Bay-Delta system. Examples of management indicators include population levels or indices of species; measurement of flow and circulation patterns; water quality; and abundance of habitats

Figure 1



## Ecosystem Health Indicators

Ecosystem-level indicators can be organized into five broad categories, each of which reflects essential aspects of ecosystem structure and function.

### General Hydrologic Attributes

Ensuring the integrity of natural hydrology is an essential aspect of restoring and maintaining healthy ecological structure and function. In rivers and streams for example, minimal flow levels are necessary to assure viability of all life stages of native aquatic organisms, and to maintain adequate groundwater levels in support of riparian vegetation. Sufficient seasonal shifts in stream level are essential to flushing, groundwater and other river-riparian exchange processes. Seasonal velocity ranges and timing must be compatible with viability of all life stages of aquatic organisms and with the maintenance of sediment delivery/deposition processes. Periodic flooding is necessary to maintain diversity and succession within riparian zone, and for the exchange of materials between riverine, riparian and floodplain habitats.

Examples of hydrologic indicators:

- flows and floods
- water movement patterns/circulation
- salinity distribution
- groundwater exchange

### General Geomorphic Attributes

Ensuring the integrity of major geomorphic features – the physical structure – and processes of rivers is essential to restoring and maintaining healthy ecological structure and function. For example, altered local topography may cause habitat fragmentation. Physical barriers may prevent or inhibit natural water, sediment and/or animal movement, and/or prevent reestablishment of riparian vegetation even if hydrologic restoration is successful. In-stream structure, channel meander, and cross-sectional profile interact with flow to determine sediment deposition, distribution and substrate composition.

Examples of geomorphic indicators:

- topography
- sediment budget – the amount of sediment entering and leaving the river
- sediment composition

### Habitat Attributes

Habitat attributes define essential aspects of system structure and function. For example, the disconnection of nearby habitats (through construction of barriers or alteration of natural topography) may prevent full community development and/or restrict the distribution and viability of some populations. More specialized (within-habitat) attributes that distinguish habitat-types are being addressed elsewhere (habitat-level of the topology). Both within and

among habitat attributes are essential to the support of native biological communities and natural ecological processes in these ecosystems.

Examples of local and system-wide habitat indicators:

- habitat extent and distribution
- connectivity to other habitats
- habitat diversity
- water and sediment quality

### **Native Biological Community**

Restoration and protection of natural communities is another essential aspect of restoring and protecting ecosystem integrity. The maintenance of overall diversity of biological life and fundamental aspects of community structure are fundamental ecosystem processes.

Examples of community indicators:

- species composition
- abundance/dominance relationships
- species diversity
- trophic structure – the food chain
- threatened or endangered species
- exotics

### **Community Energetics/Nutrient Cycling Attributes**

The acquisition, cycling and fate of energy and nutrients are critical aspects of ecosystem function, and essential to the support of native biological communities.

Examples of energy and nutrient indicators:

- nutrient sources and sinks
- carbon budget
- food webs and nutrient cycling



Appendices

# Appendices

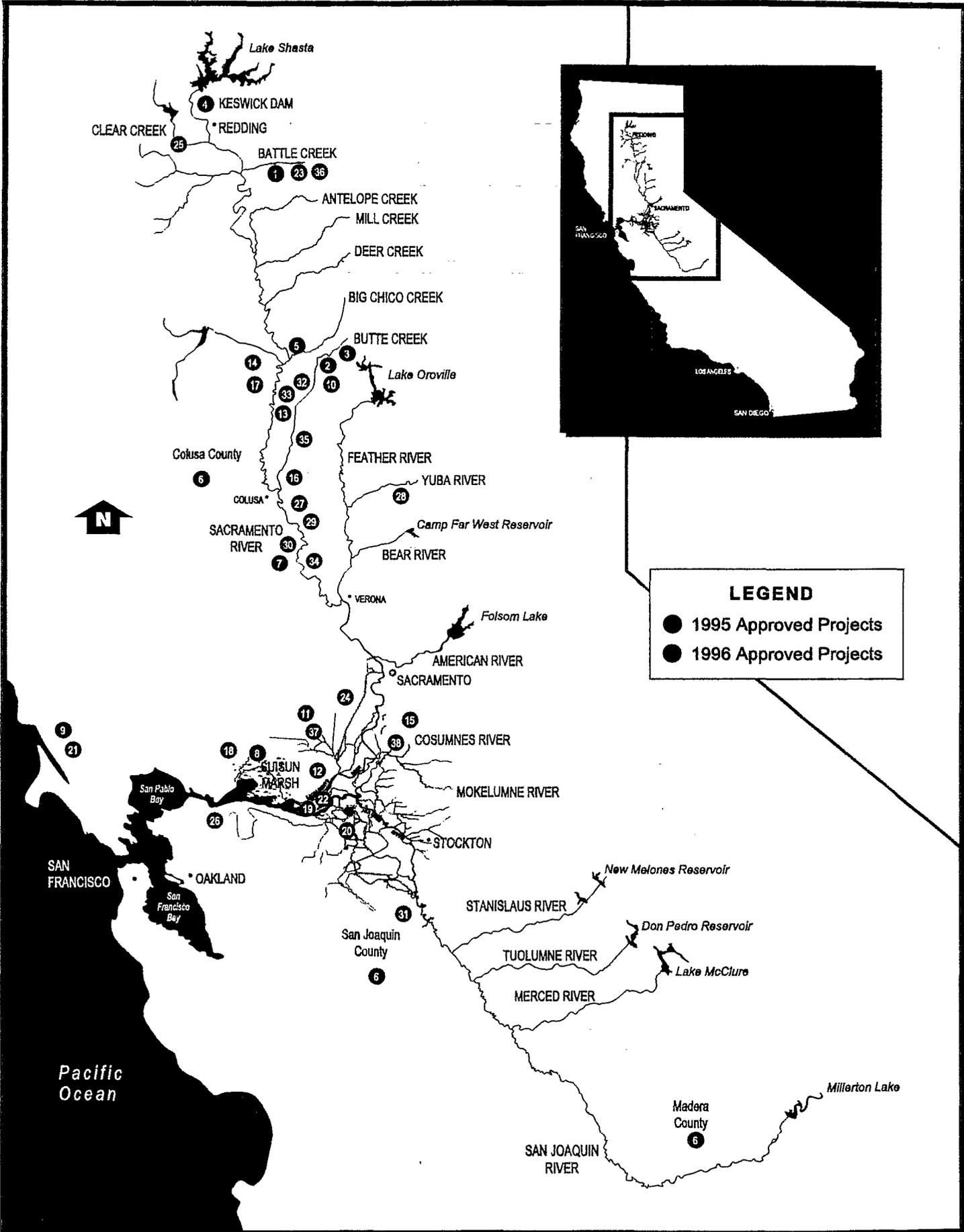
Category III 1995-1996 Restoration Projects

1997 Restoration Coordination Projects

1998 Restoration Coordination Projects

1999 Directed Programs

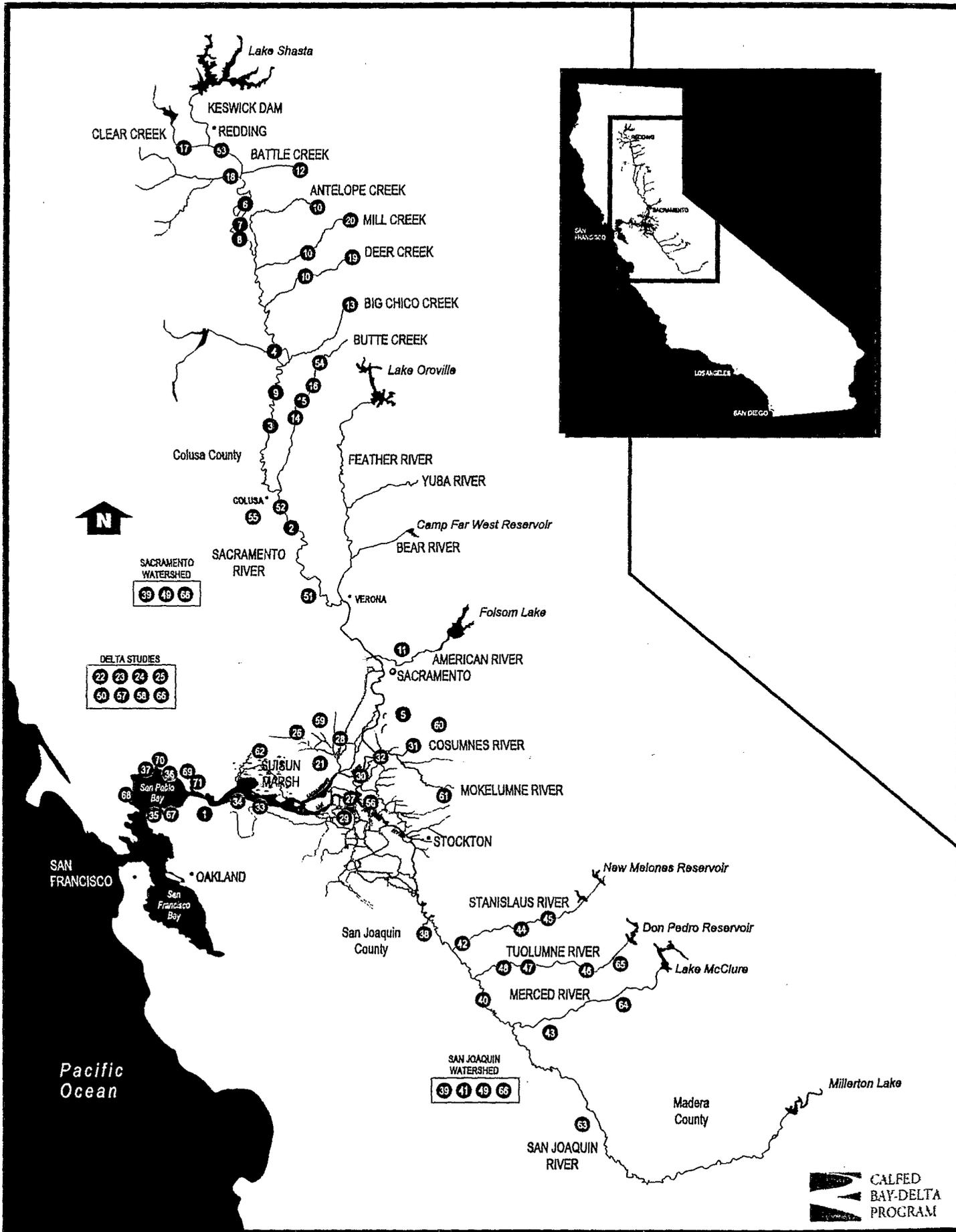
# CATEGORY III 1995-1996 RESTORATION PROJECTS



# CATEGORY III 1995 - 1996 Restoration Projects

MAP #	Project Title	Type	Amount Funded
1	Battle Creek - Interim Flow Restoration Program	O	500,000
2	Butte Creek - Durham Mutual Dam Fish Screen & Ladder Project	O	316,500
3	Butte Creek - Parrott-Phelan Dam Fish Ladder Project	O	418,000
4	Sacramento River - Keswick Dam Gravel Restoration Project	O	52,500
5	Big Chico Creek - M&T/Parrott Pump Relocation & Fish Screen Project	O	1,610,000
6	Colusa, Madera, & San Joaquin Co.- BIOS	O	660,000
7	Sacramento R. - Riparian Habitat Restoration Project	O	400,000
8	Suisun Marsh - Fish Screen Program	O	450,000
9	Winter-run Chinook Salmon Captive Broodstock Program	O	300,000
10	Butte Creek - Western Canal WD Install. of Siphon & Associated Improvements.	O	3,095,873
11	Prospect Island - Shallow Water Habitat/Wetlands Restor. Project	O	2,500,000
12	Sacramento R. - (Verona-Collinsville) Rip. Habitat Restoration	O	500,000
13	Sacramento R. - Princeton Pumping Plant Fish Screen	O	75,000
14	Sacto R-Princeton-Codora-Glenn/- Provident Fish Screen -Feasibility	O	75,000
15	Cosumnes R. - TNC Cosumnes Preserve (Valensin Ranch Acquisition)	O	1,500,000
16	Lower Butte Creek- Habitat Restoration Study	O	221,000
17	Sacto R. - Princeton-Codora-Glenn/Provident Fish Screen-Installation	O	5,500,000
18	Suisun Marsh - Fish Screen Program	O	500,000
19	Sherman Island - Levee Habitat Demonstration Project	O	480,000
20	Delta - App. Res. to Predict Evol. of Eco. Functions of Restored Diked Wetlands	O	475,000
21	Applied Research to Identify Chinook Salmon Runs via Genetics	O	450,000
22	Decker Island - Tidal Wetland Restoration	O	399,000
23	Battle Creek - Chinook Salmon & Steelhead Restoration Study	O	306,000
24	Yolo Bypass - Habitat Restoration Study	O	256,000
25	Clear Creek - Property Acquisition	O	211,000
26	Bay/Delta - Intro. of Non-indigenous Aquatic Species Research Program	O	197,000
27	Sacramento River and Major Trib.- Corridor Mapping Project	O	145,200
28	Yuba River - Browns Valley ID Fish Screen Project	O	114,7500
29	Applied Res. to Determine Effects of Toxics on Cen. Valley Chinook Salmon	O	110,000
30	Sacto R. (Wilkins Slough) - Fish Screen	O	100,000
31	San Joaquin R. - Banta-Carbona ID Fish Screen Project	O	100,000
32	Butte Creek - Adams Dam Fish Screen & Ladder	O	70,304
33	Butte Creek - Gorrill Dam Fish Screen & Ladder	O	67,990
34	Innovative Fish Screen for Small Diversions Demonstration Project	O	90,000
35	Butte Creek - Watershed Management Strategy Plan	O	83,000
36	Battle Creek - Chinook Salmon & Establish Watershed Conservancy	O	50,000
37	Prospect Island - Develop Monitoring Plan	O	35,000
38	North Delta Area - Juvenile Salmon Rearing	O	24,500

# CALFED 1997 RESTORATION PROJECTS

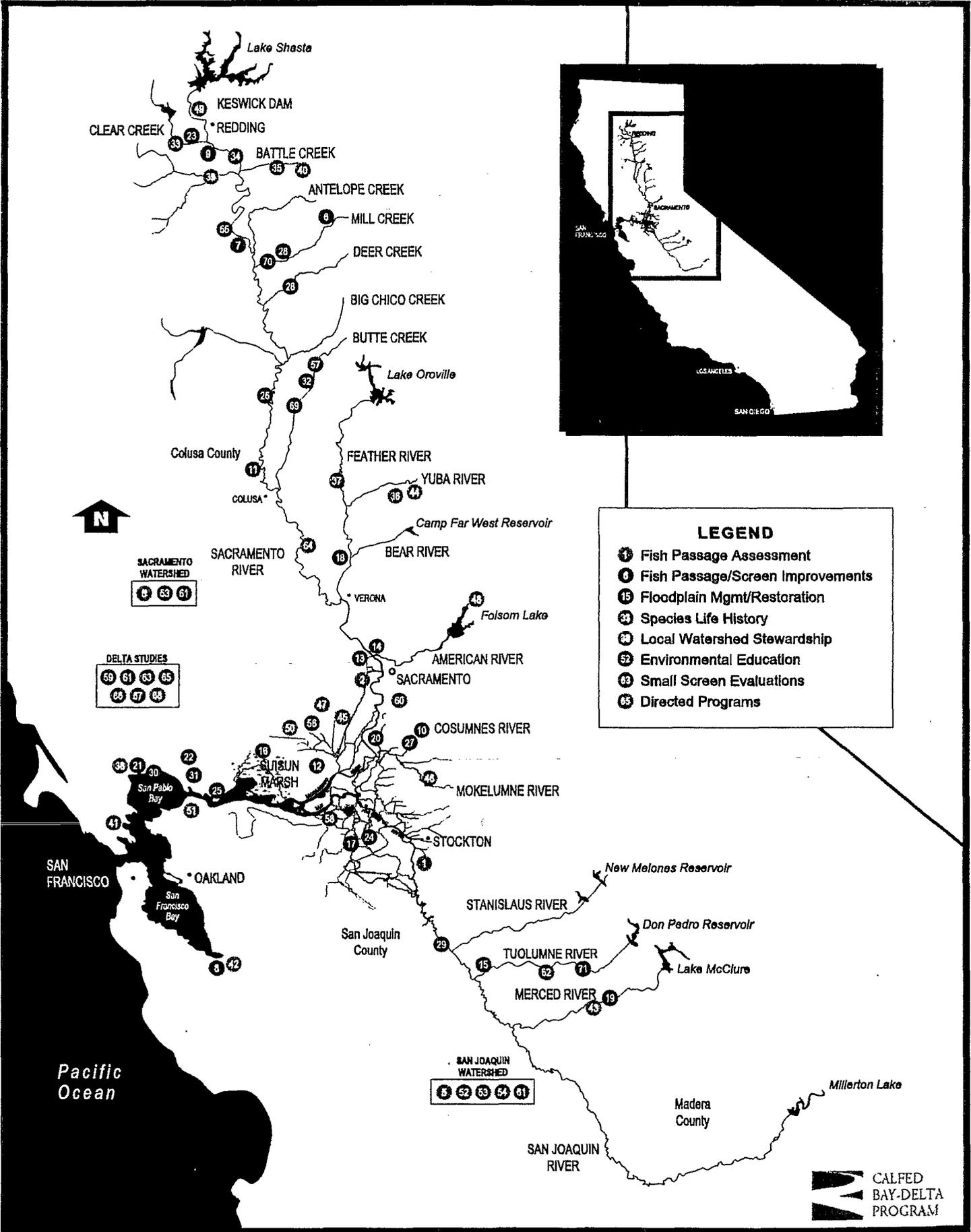


# CALFED 1997 Restoration Projects

Map #	Project Description	Type	Amount Funded
1	IPM Partnership to Improve Water Quality in Suisun Bay and Local Creeks	F	\$266,000
2	RD 108 Screen	S	\$2,500,000
3	Princeton Fish Screen	S	\$1,750,000
4	Wilson Ranch Screen	O	\$200,000
5	Assessment & Implementation of Urban Use Reduction of Diazion & Chlorpyrifos	S	\$663,500
6	Watershed Management Planning B Upper Sacramento River	S	\$200,000
7	Sacramento River Floodplain Acquisition B National Process Restoration	S	\$9,879,800
8	Sacramento River Floodplain Acquisition B Active Riparian Forest Restoration	S	\$1,292,500
9	Sacramento River Meander Restoration Project	S	\$898,700
10	Watershed Improvements/Sediment Stabilization (Deer, Mill, Antelope Creeks)	F	\$371,000
11	Watershed Restoration Planning (American River)	S	\$222,530
12	Battle Creek Screens and Fish Passage	O	\$395,000
13	Watershed Plan (Big Chico Creek)	F	\$422,830
14	Gorrill Dam Screen and Ladder	O	\$369,641
15	Adams Dam Screen and Passage	O	\$242,000
16	Butte Creek Acquisition and Riparian Restoration	S	\$186,128
17	Saeltzer Dam Fish Passage	O	\$238,200
18	Cottonwood Creek Channel Restoration	S	\$61,000
19	Watershed Plan Implementation (Deer Creek)	O	\$196,554
20	Lower Mill Creek Riparian Restoration	S	\$69,000
21	Hastings Tract Screen Feasibility Study	O	\$27,000
22	Monitoring of Delta contaminants	S	\$100,000
23	Effects of Wetlands Restoration on Methyl Mercury Levels	S	\$530,617
24	Sedimentation Movement, & Availability & Monitoring in the Delta	F	\$1,046,200
25	Contaminant Effects on Smelt	S	\$437,000
26	Jepson Prairie Restoration	S	\$244,000
27	In-Channel Island Demonstration Project	S	\$270,270
28	Liberty Island Acquisition	F	\$8,577,000
29	Franks Tract Restoration	S	\$231,500
30	Tyler Island Levee Protection & Habitat Restoration Pilot Project	S	\$885,202
31	Cosumnes Floodplain Acquisition & Restoration	S/F	\$10,375,100
32	Mokelumne River Setback Levee & Habitat Restoration	S	\$365,000
33	Bay Point Shoreline Restoration Plan	S	\$185,000
34	Martinez Regional Shoreline Restoration	S	\$325,000
35	Preventing Exotic Introductions from Ballast Water	S	\$222,830
36	Cullinan Ranch Restoration	S	\$368,500
37	Tolay Creek Restoration	S	\$283,000
38	Banta-Carbona Fish Screen	O	\$938,875
39	Biologically Integrated Orchard Systems (BIOS) B Pesticide and Fertilizer Reductions	S	\$1,680,631
40	San Joaquin River Real-time Water Quality Management Program	S	\$932,000
41	Developing a Genetic Baseline for San Joaquin Salmon	S	\$387,003
42	Acquisition and Restoration of Refuge Lands	F	\$10,647,000
43	Bear Creek Floodplain Restoration Demonstration Project	F	\$334,000
44	Stanislaus River Channel Restoration		cancelled
45	Knights Ferry Gravel Replenishment	S	\$536,410
46	Gravel Replacement (Basso Bridge)	S	\$250,975
47	Tuolumne River Channel Restoration	O	\$2,353,100
48	Tuolumne River Setback Levees & Channel Restoration	O	\$2,801,000
49	Evaluation of Alternative Pesticide Use Reduction Practices	S	\$957,781
50	Assessment of Organic Matter in the Habitat and Its Relationship to the Food Chain	F	\$1,400,000
51	Richter Brothers Screen	F	\$49,000
52	Boeger Family Farm Screen	F	\$15,000
53	ACID fish Passage	F	\$325,000
54	Butte Creek Watershed	F	\$294,000
55	Sand and Salt Creek Watershed Project	F	\$598,633
56	Twitchell Island Restoration	S	\$3,000,000
57	Evaluation of Selenium Sources, Levels and Consequences in the Delta	F	\$1,588,709

58	Culture of Delta Smelt	S	\$194,870
59	Cache Slough Habitat Enhancement	F	\$85,000
60	Inventory of Forest Road Systems, Cat Creek Watershed	F	\$38,000
61	Woodbridge Fish Screen and Passage	F	\$1,575,000
62	Selected Fish Screens, Suisun Marsh	S	\$3,230,850
63	Bacterial Treatment of Selenium in the Panoche Drainage	F	\$1,148,326
64	Merced River Ranch Acquisition and Restoration	S	\$658,000
65	Basso Bridge Land Acquisition	S	\$172,500
66	Evaluation of Tagging Data	F	\$625,000
67	San Francisco Bay Area Wetlands Ecosystem Goals Project	F	\$76,000
68	Hamilton Wetlands Restoration Project	S	\$1,000,000
69	Napa River Watershed Stewardship	O	\$250,000
70	Sonoma Creek Watershed Restoration Project	O	\$300,000
71	South Napa River Wetlands Acquisition & Restoration Program	F	\$1,000,000

# CALFED 1998 RESTORATION PROJECTS

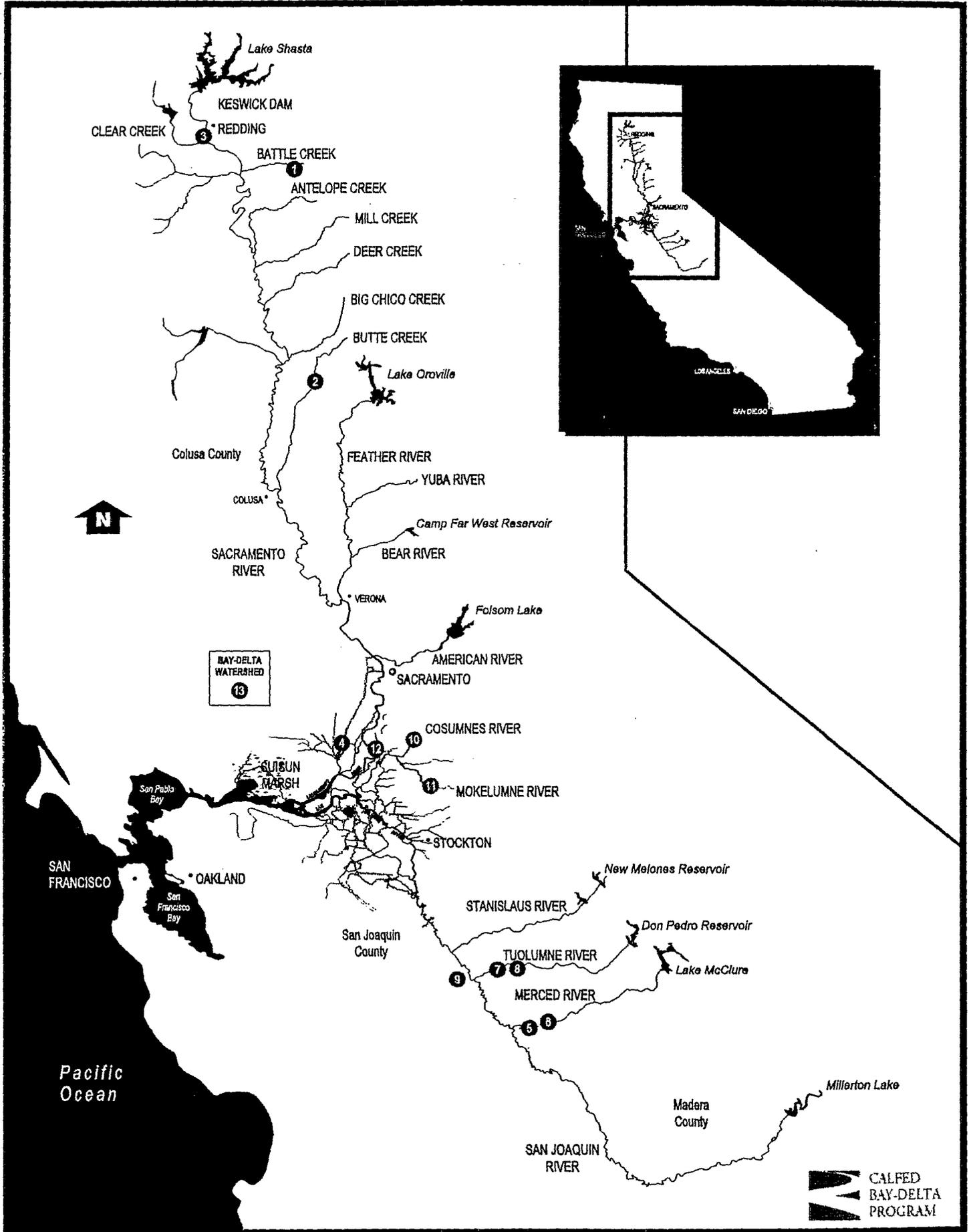


# CALFED 1998 Restoration Projects

Map #	Project Title	Type	Amount Funded
1	Adult Fall-Run Chinook Salmon Movement in the lower San Joaquin River and south Delta	S	285,000
2	Reclamation District 2035 Fish Screen	S	100,000
3	Butte Creek Salmon/Steelhead Passage		cancelled
4	Restoring Salmon/Steelhead Passage on Yuba River		cancelled
5	Expanding CA Salmon Habitat Through Non-governmental/Nonregulatory Mechanisms	S	49,000
6	Anadromous Fish Passage at Clough Dam on Mill Creek	F	1,280,000
7	Fish Passage Improvement Project at the Red Bluff Diversion Dam	F	340,600
8	Steelhead and Chinook Salmon Fish Passage Barrier Remediation on the Guadalupe River	F	178,200
9	ACID Fish Passage and Fish Screen Improvement Project, Phase II	F	860,000
10	Cosumnes River Salmonid Barrier Program	F	188,255
11	Boeger Family Farms Fish Screen Phase III: Construction	F	139,500
12	Hastings Tract Fish Screen Phase II: Construction	F	271,250
13	City of Sacramento Fish Screen Replacement Project Phase 2	F	654,500
14	American Basin Fish Screen and Habitat Improvement Project	F	200,000
15	Grayson River Ranch Perpetual Easement and Restoration	F	732,000
16	Hill Slough West Habitat Demonstration Project	F	200,000
17	Rhode Island Floodplain Management and Habitat Restoration	F	25,000
18	Nelson Slough Wildlife Area Restoration Demonstration Project	F	256,476
19	Phase 3 - Merced River Salmon Habitat Enhancement	F	2,433,759
20	Stone Lakes NWR Land Acquisitions	F	1,900,000
21	Petaluma Marsh Expansion Project - Marin County	F	352,135
22	South Napa River Wetlands Acquisition and Restoration Program	F	431,000
23	Lower Clear Creek Floodway Restoration Project	F	3,559,596
24	Fern-Headreach Tidal Perennial Aquatic and Shaded River Aquatic Conservation Project	F	425,000
25	Benicia Waterfront Marsh Restoration	F	59,000
26	Floodplain Acquisition, Management, and Monitoring on the Sacramento River	F	1,000,000
27	Cosumnes River Acquisition, Restoration Planning and Demonstration	F	750,000
28	Deer and Mill Creeks Acquisition and Enhancement	F	1,000,000
29	Lower San Joaquin River Floodplain Protection and Restoration Project	F	1,100,000
30	Biological Restoration and Monitoring in the Suisun Marsh/North San Francisco Bay	F	772,667
31	South Napa River Tidal Slough and Floodplain Restoration Project	F	1,455,000
32	Butte Creek Riparian Restoration Demonstration	F	76,348
33	Genetic comparison of stocks considered for re-establishing steelhead in Clear Creek	S	45,493
34	Spawning areas of green sturgeon in the upper Sacramento River	S	60,801
35	Monitoring adult and juvenile spring and winter Chinook salmon and steelhead, Battle Creek	S	150,000
36	Life History and Stock Composition of Steelhead Trout	S	120,000
37	Biological Assessment of Green Sturgeon in the Sacramento-San Joaquin Watershed	S	241,000
38	Petaluma River Watershed Restoration Program	F	220,000
39	Cottonwood Creek Watershed Group Formation	F	161,000
40	Battle Creek Watershed Stewardship	F	145,000
41	Local Watershed Stewardship: Steelhead Trout Plan	F	47,500
42	Cold Water Fisheries and Water Quality Element	F	200,000
43	Merced River Corridor Restoration Plan	F	300,000
44	South Yuba River Coordinated Watershed Management Plan	F	264,000
45	Watershed Restoration Strategy for the Yolo Bypass	F	244,188
46	Proposal to Develop Local Watershed Stewardship Plan for the Lower Mokelumne River	F	159,000
47	Union School Slough Watershed Improvement Program	F	636,000
48	American River Integrated Watershed Stewardship Strategy	F	220,750
49	Sulphur Creek Coordinated Resource Management Planning Group	F	23,828
50	Lower Putah Creek Watershed Stewardship Program	F	100,500
51	Alhambra Creek Watershed CRMP Program	F	138,500
52	San Joaquin Valley 'Salmonids in the Classroom' Program Enhancement	F	3,000
53	Traveling Film Festival/Heron Booth/Video Archive	F	54,000

54	Environmental Agriculture Conferences and Field Tours	F	28,000
55	Sacramento River, Headwaters to the Ocean, Public Information and Education	F	49,640
56	Discover the Flyway	F	49,000
57	The Butte Creek Watershed Educational Workshops and Field Tours Series	F	33,000
58	Bay-Delta Environmental Restoration Education Program	F	40,000
59	The Virtual Science Center and Hands-on Learning Programs	F	42,000
60	Water Hyacinth Education Program	F	9,600
61	Water Challenge 2010	F	64,500
62	Tuolumne River Natural Resources Program	F	44,700
63	Developing a Methodology to Accurately Simulate the Entrainment of Fish	S	200,000
64	Pelger Mutual Water Company: Small Fish Screen Evaluation	S	95,000
65	Water Quality Criteria for Chlophyrifos and Diazinon	S	67,753
66	Fathead Minnow Toxicity	S	400,000
67	Algal Toxicity	S	500,000
68	Sediment Water Quality	S	500,000
69	Butte Creek Acquisition and Riparian Restoration	F	125,000
70	Lower Mill Creek Riparian Restoration	F	29,730
71	Tuolumne River Setback Levees and Channel Restoration	F	655,700

# CALFED FEBRUARY 1999 RESTORATION PROJECTS



# CALFED 1999 Restoration Projects

Map #	Project Title	Type	Amount Funded
1	Battle Creek Salmon and Steelhead Restoration Project	F	\$28,000,000
2	Lower Butte Creek Project: Phase II - Preliminary Engineering and Environmental Analysis	F	\$775,000
3	ACID Fish Passage Improvement Project, Phase III	S/F	\$10,506,000
4	Prospect Island Monitoring Project	F	\$915,000
5	Lower Western Stone project	F	\$130,000
6	Phase I: Robinson/Gallo Project - Ratzlaff Reach Site	F	\$1,633,000
7	Special Run Pool 10 Restoration	F	\$165,000
8	Mining Reach Restoration Project No. 2 - MJ Ruddy Segment	F	\$3,332,000
9	Cost share with NRCS easements. 4 on the Tuolumne and 5 on the San Joaquin	F	\$1,545,000
10	East Delta Corridor Habitat Study - Cosumnes River Feasibility Study	S	\$400,000
11	East Delta Corridor Habitat Study - Mokelumne River Feasibility Study	S	\$400,000
12	McCormack-Williamson Tract's Wildlife-Friendly Levee Management Program	F	\$860,000
13	Assessment of Ecological and Human Health Impacts of Mercury in the Bay-Delta Watershed	F	\$3,800,000