6-1999

Revised Phase II Report. Programmatic EIS/EIR Technical Appendix

CalFed Bay-Delta Program

CALFED
BAY-DELTA
PROGRAM

Revised Phase II Report

Draft Programmatic EIS/EIR Technical Appendix
June 1999

Either we have hope within us or we don't. It is a dimension of the soul and is not essentially dependent on some particular observation of the world. It is an orientation of the spirit, an orientation of the heart. It transcends the world that is immediately experienced and is anchored somewhere beyond its horizons. Hope in this deep and powerful sense is not the same as joy that things are going well or a willingness to invest in enterprises that are obviously headed for early success, but rather an ability to work for something because it is good, not just because it stands a chance to succeed. Hope is definitely not the same thing as optimism. It is not the conviction that something will turn out well, but the certainty that something makes sense regardless of how it turns out. It is hope, above all, which gives the strength to live and continually try new things.

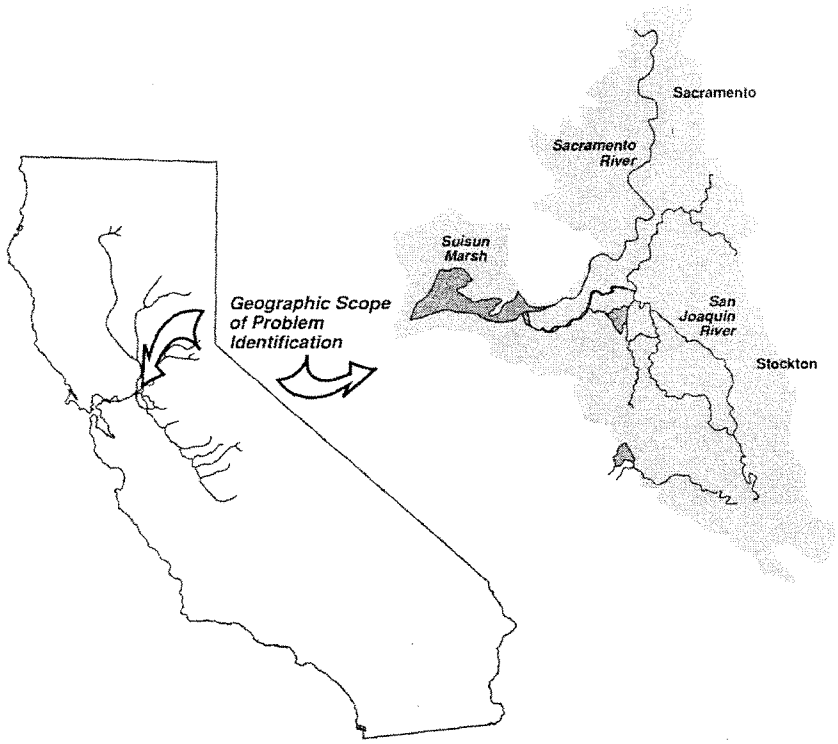
-- Vaclav Havel

TABLE OF CONTENTS

1. INTRODUCTION

A maze of tributaries, sloughs, and islands, the San Francisco Bay/Sacramento-San Joaquin Delta estuary (Bay-Delta) is the largest estuary on the West Coast. It is a haven for plants and wildlife, supporting over 750 plant and animal species. The Bay-Delta includes over 738,000 acres in five counties. The Bay-Delta is critical to California's economy, supplying drinking water for two-thirds of Californians and irrigation water for over 7 million acres of the most highly productive agricultural land in the world.

The Bay-Delta is also the hub of California's two largest water distribution systems - the Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation and the State of California's State Water Project (SWP). The CVP and SWP were built to provide improvements in navigation and flood control, water supplies for irrigation, municipal, and industrial uses, and hydropower generation. Other purposes of the CVP include fish and wildlife protection, conservation, and enhancement. In addition, at least 7,000 other permitted water diverters, some large and some small, have developed water supplies from the watershed feeding the Bay-Delta estuary. Together, these water development projects divert about 20 to 70 percent of the natural flow in the system depending on the amount of runoff available in a given year.



Geographic Scope for Problems and Solutions

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

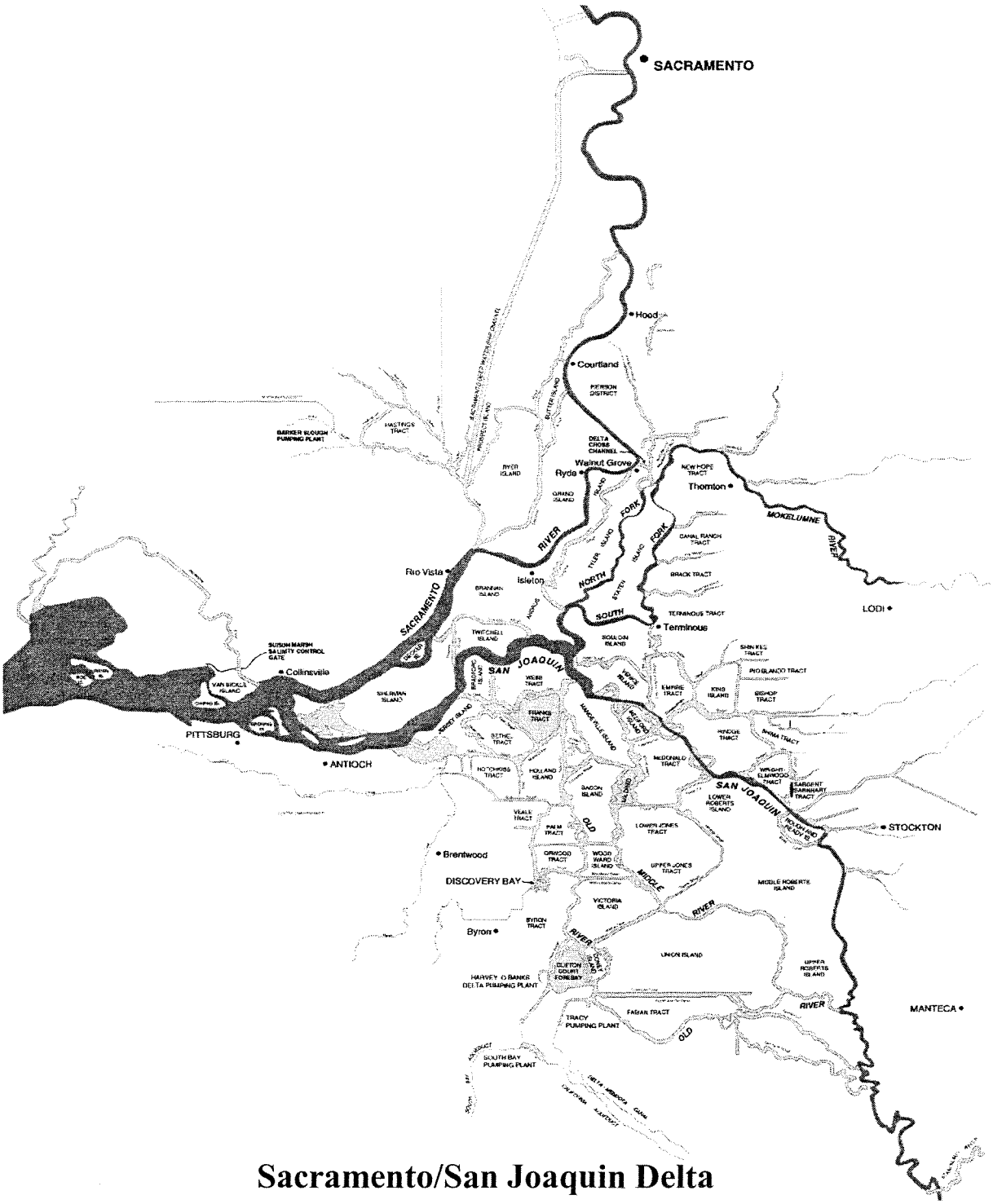
The geographic **scope for developing possible solutions** includes a much broader area that extends both upstream and downstream of the Bay-Delta. This solution scope includes the Central Valley watershed, the Southern California water system service area, San Pablo Bay, San Francisco Bay, near-shore 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.

These diversions, along with the effects of increased population pressures throughout California, exotic species, water pollution, and numerous other factors have had a serious impact on the fish and wildlife resources in the Bay-Delta estuary. This impact, as well as other effects of the continued resource conflicts in the Bay-Delta system, is discussed in detail in Chapter 2.

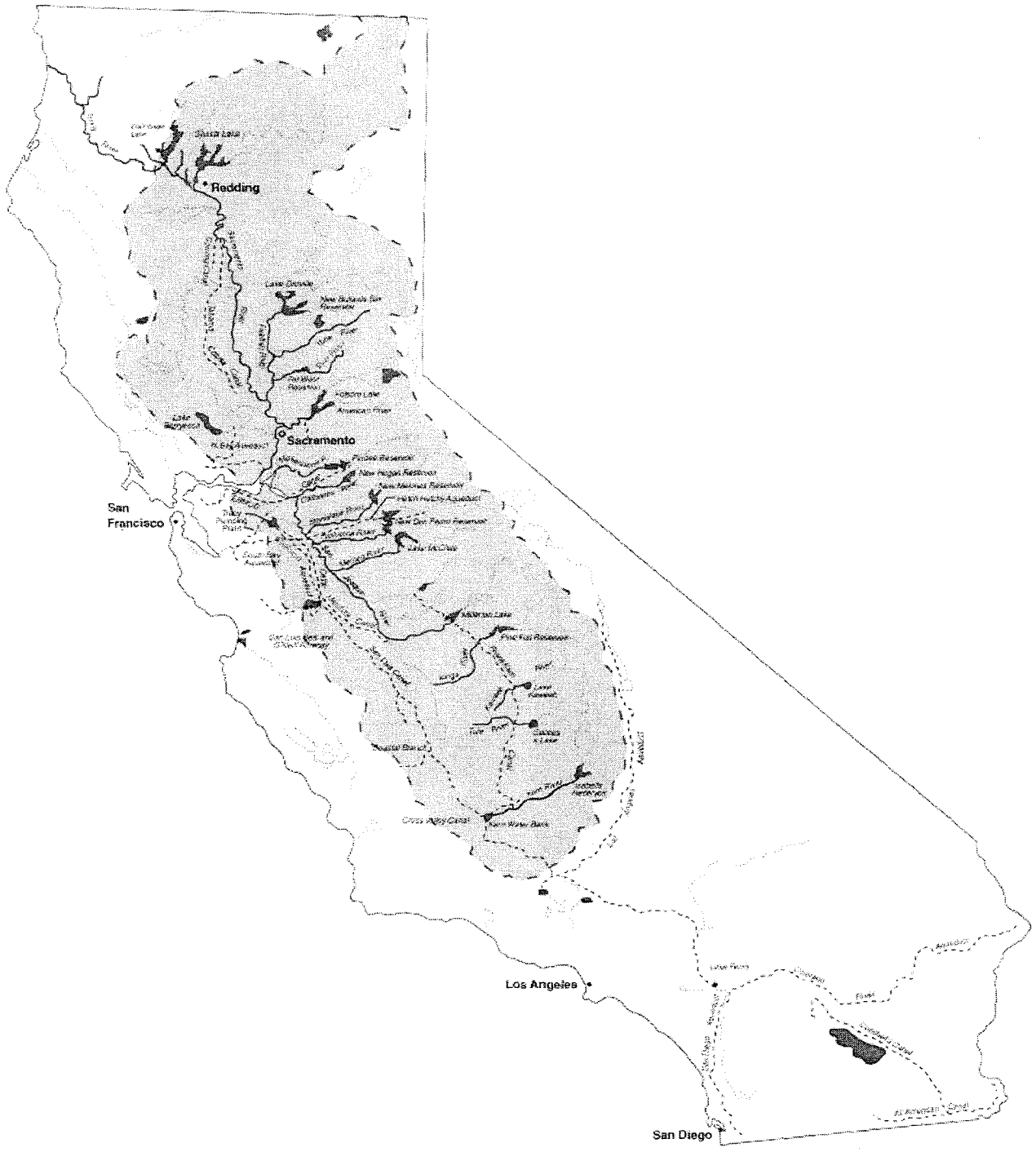
Although all agree on the importance of the Bay-Delta estuary for both fish and wildlife habitat and as a reliable source of water, few agree on how to manage and protect this valuable resource. In the past two decades, these disagreements have increasingly taken the form of protracted litigation and legislative battles; as a result, progress on virtually all water-related issues has become mired, approaching gridlock.

The CALFED Bay-Delta Program was established to reduce conflicts in the system by solving problems in ecosystem quality, water quality, water supply reliability, and levee and channel integrity. The Program seeks to do this by developing a long-term comprehensive plan that will restore ecological health and improve water supply and water supply reliability for beneficial uses of the Bay-Delta system. The Program has crafted alternatives that improve water quality so as to protect Delta drinking water supplies and improve the quality of aquatic habitat. Maintaining and improving the integrity of Delta levees and channels will protect agricultural, urban, and environmental uses within the Delta and protect the quality of water used elsewhere in the state. Water conservation and recycling programs can assure the efficient use of existing water supplies and any new supplies developed through the Program. **The CALFED mission, objectives, and solution principles shown in the box on page 6 guide how the Program will be implemented.** Carrying out the mission, achieving the objectives, and adhering to the solution principles will ensure that CALFED fulfills its commitment to continuous improvement in all of the four problem areas.

Given the history of conflict in the Bay-Delta system, CALFED recognizes that any proposed program to address this broad spectrum of resources will be controversial. Stakeholders participating in the CALFED process have already identified significant concerns about virtually every component in the Program. CALFED encourages all members of the public to review the material in this report and to provide comments for further consideration.



Sacramento/San Joaquin Delta



Watershed for the Sacramento/San Joaquin Delta

The Program

The CALFED Bay-Delta Program began in May of 1995 to address the tangle of complex issues that surrounds the Delta. The CALFED Program is a cooperative, interagency effort of 15 state and federal agencies with management or regulatory responsibilities for the Bay-Delta. In addition, other agencies, such as the California Department of Food & Agriculture, regularly participate in development of CALFED policies which affect their agencies.

CALFED

State Agencies

Resources Agency of California*
- Department of Water Resources
- Department of Fish and Game

California Environmental Protection Agency
- State Water Resources Control Board

California Department of Food and Agriculture

Federal Agencies

U.S. Department of Interior
- Bureau of Reclamation*
- Fish and Wildlife Service*
- Bureau of Land Management
- U. S. Geological Survey

U.S Army Corps of Engineers*

U.S. Environmental Protection Agency*

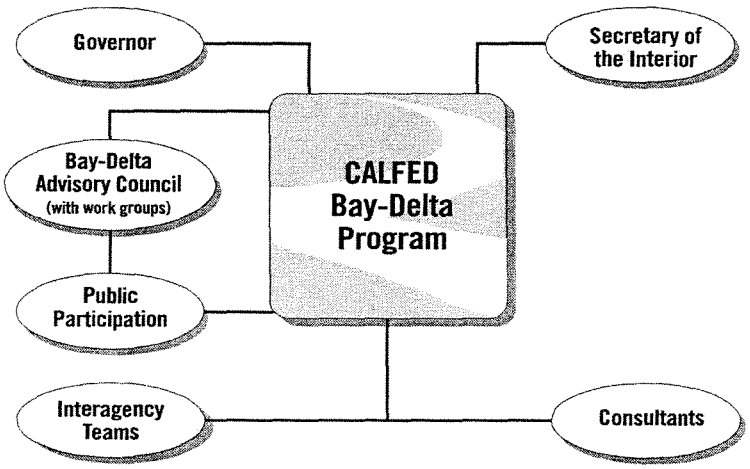
U.S. Department of Commerce
- National Marine Fisheries Service*

U.S. Department of Agriculture
- Natural Resources Conservation Service*
- U.S. Forest Service

Western Area Power Administration

* Co-lead agencies for EIS/EIR

The CALFED agencies appointed an executive director to oversee the process of developing a long-term comprehensive plan for the Bay-Delta. The Executive Director selected staff from the CALFED agencies to carry out the task. In addition, the CALFED agencies and stakeholders worked with the interagency CALFED Program team through multi-level technical and policy teams.



The CALFED Program is a collaborative effort including representatives of agricultural, urban, environmental, fishery, business, and rural counties who have contributed

to the process. The Bay-Delta Advisory Council (BDAC), a federally chartered citizens' advisory committee with over 30 members, provides formal comment and advice to the agencies during regularly scheduled public meetings. In addition, the CALFED process has included members of the public in development of every program component from ecosystem restoration to financing.

CALFED BAY-DELTA PROGRAM
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.

The Program was divided into three discrete phases.

Phase I

In Phase I, completed in September 1996, CALFED identified the problems confronting the Bay-Delta, developed a mission statement and guiding principles, and devised three preliminary categories of solutions for Delta water conveyance.

Following scoping, public comment, and agency review, CALFED concluded that each program alternative would include a significant set of program actions which were grouped into elements to address problems for levee system integrity, water quality improvements, ecosystem restoration, and water use efficiency measures. Two additional elements (water transfers and watershed management) were added to each alternative because of their value in helping the Program meet its multiple objectives. These six program elements have generally been referred to as the *common programs*. In addition, CALFED identified three preliminary alternatives to be further analyzed in Phase II. The three preliminary alternatives represented three differing approaches to conveying water through the Delta. The first conveyance configuration relied primarily on the existing conveyance system, with some minor changes in the south Delta. The second configuration relied on enlarging channels within the Delta. The third configuration included in-Delta channel modifications and a conveyance channel that would move some water around the Delta. Each of these alternatives also included consideration of new ground and surface water storage options.

Phase II

CALFED is currently in Phase II, which will culminate in a Final Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR) in April 2000 and Certification and a Record of Decision (ROD) in June 2000. A programmatic EIS/EIR, also referred to as a first-tier document, is typically prepared for a series of actions that can be characterized as one large project and is required for actions proposed by or approved by state and federal agencies. In Phase II, CALFED is developing a Preferred Program Alternative, is conducting comprehensive programmatic environmental review, and is developing the implementation plan focusing on the first seven years (Stage 1) following the Certification and ROD on the EIS/EIR.

This Revised Phase II Report primarily focuses on the draft Preferred Program Alternative including background, description, and implementation plan. The full draft Programmatic EIS/EIR, appendices, and supporting technical reports -- comprising thousands of pages -- are available from CALFED and at major libraries throughout the state.

Phase III

In Phase III, following completion of the Final Programmatic EIS/EIR, implementation will begin. This period will include site-specific environmental review and permitting, as necessary. Because of the size and complexity of any of the alternatives, implementation is likely to take place over a period of thirty or more years. Part of the challenge for Phase II is designing an implementation strategy that acknowledges this long implementation period and keeps all participants committed to the successful completion of all phases of implementation.

CALFED has begun more detailed planning for the first part of the implementation phase, called Stage 1. This stage will last for the first seven years of Phase III. Even more detailed planning has occurred for the first two years of Stage 1. Specific actions, called Stage 1a actions, are being developed for the first two years of implementation. More detail on implementation is included in Chapter 4.

Public Involvement

During Phase I, which ended September 1996, CALFED held scoping meetings, technical workshops, public information meetings, and public BDAC workgroup meetings. The commitment to active public involvement has continued through Phase II with additional public meetings, presentations before focused groups, media outreach, special mailings of newsletters, regularly updated information on the Program's web site, and a toll-free public information telephone line.

WHERE TO FIND PUBLIC OUTREACH INFORMATION

- Program's website (http:\\calfed.ca.gov)
- Toll-free public information telephone line (1-800-700-5752)
- *CALFED News*, *EcoUpdate* and Factsheets (available from CALFED Bay-Delta Program, 1416 Ninth Street, Suite 1155, Sacramento, CA 95814; phone 916-657-2666)
- Bay Delta Advisory Council and other public meetings

In addition to the many CALFED-sponsored general public meetings and stakeholder workshops, 17 formal public hearings on the March 1998 Draft Programmatic EIS/EIR were held around the state in April and May 1998. During the formal public comment period the Program received over 1800 comments which included 469 speakers at the hearings. Thousands of post cards and form letters were also received. The comments were used to improve the program plans and assist in evaluation and development of the Preferred Program Alternative. This Draft EIS/EIR with appendices includes changes that reflect comments received.

In 1999, following the release of the December Revised Phase II Report, CALFED held several informational workshops for the public. These covered the framework for the draft preferred alternative and specific aspects of the proposed program such as water conservation and conjunctive use.

The release of this Draft Programmatic EIS/EIR is being followed by a 90-day public comment period, and formal public hearings are scheduled in August and September 1999.

The Program has worked to involve California's diverse multi-cultural communities by producing fact sheets in five languages (Spanish, Chinese, Japanese, Korean, and Vietnamese), meeting with multi-cultural business, media, social service and agricultural organizations, and placing media notices in ethnic media outlets. Increasing awareness and knowledge among the multi-cultural communities is a continued goal of CALFED's public outreach.

Tribal Involvement

CALFED agencies remain committed to fulfilling their responsibilities to consult, on a government-to-government basis, with the sovereign tribes that will be affected by the CALFED Program. Although there are no federally recognized tribes in the Delta, CALFED will actively engage the tribes in the Bay-Delta watershed as specific projects in these areas develop. More immediately, CALFED will hold consultations open to all California tribes during 1999. In addition, a tribal representative will be appointed to the Bay-Delta Advisory Council.

Next Steps in Phase II

Between this Draft Programmatic EIS/EIR and the Final EIS/EIR in April 2000, work will continue on refining and evaluating the Preferred Program Alternative. This will include additional technical evaluations. Concurrently, work will continue on the development of the implementation strategy for near- and long-term actions. CALFED will work with elected officials, local agencies, interest groups, and the public over the coming months to finalize the Preferred Program Alternative and implementation strategies.

Some Delta Statistics

Area of the Watershed: The system drains more than 61,000 square miles, or 37% of the state.
Area of the Delta: The legal Delta includes 738,000 acres.
Delta Inflow*: Historic inflow ranges from 6 to 69 million acre feet (MAF) per year; average is 24 MAF.
Diversions: Over 7,000 diverters draw water from the system, including 1,800 in the Delta itself.
Delta Exports*: The SWP and CVP draw an average of 5.9 MAF (approximately 3.6 MAF for agriculture and 2.3 MAF for urban uses) from the Delta each year .
In-Delta Water Use: Net in-Delta water use averages approximately 1 MAF annually.
Flora: Over 400 plant species can be found in the Delta, not including agricultural crops.
Fauna: The Delta harbors about 225 birds, 52 mammals, and 22 reptile and amphibian species.
Fish: There are 54 fish species in the Delta, and a total of 130 in the Delta and Bay.
Marshes: There are 8,000 acres of tidal marsh in the Delta.
Levees and Channels: Over 700 miles of waterways are protected by 1100 miles of levees.
Subsidence: Some Delta lands are more than 20 feet below sea level.
Delta Farmland: Over 520,000 acres are farmed in the Delta.
Principal Crops: The most commonly grown Delta crops are wheat, alfalfa, corn, and tomatoes.
Agricultural Value: Average annual gross value of Delta production is $500 million.
Recreation: Recreational use of the Delta is about 12 million user days per year

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* Simulated flow based on historical hydrology, but with existing storage and conveyance facilities in place and operating to meet 1995 levels of demand.

2. BACKGROUND

2.1 Bay-Delta Problems/Objectives

There is a rich history of conflict over resource management in the Bay-Delta system. For decades the region has been the focus of competing interests--economic and ecological, urban and agricultural. These conflicting demands have resulted in several resource threats to the Bay-Delta: the decline of wildlife habitat; the threat of extinction of several native plant and animal species; the collapse of one of the richest commercial fisheries in the nation; the degradation of Delta water quality; the continued land subsidence on Delta islands; and a Delta levee system faced with a high risk of failure.

At the simplest level, problems occur when there is conflict over the use of resources from the Bay-Delta system. As water demands increase, California asks more of the system, and there is more conflict. Single-purpose efforts to solve problems often fail to address the conflict. To the extent that these efforts acquire or protect resources for one interest, they may cause impacts on other resources and increase the level of conflict. Major conflicts are summarized below.

- *Fisheries and Water Diversions.* The conflict between fisheries and water diversions results primarily from fish mortality attributable to water diversions. This includes direct loss at pumps, reduced survival when young fish are drawn out of river channels into the Delta, reduced spawning success of adults when migratory cues are altered, and reduced survival associated with inadequate stream flows and reduced Delta outflows. The need to protect listed species has prompted restrictions on pumping and other regulations, which restrict the quantity and timing of diversions.

- *Habitat and Land Use.* Habitat to support various life stages of aquatic and terrestrial plants and animals in the Bay-Delta has been lost because of conversion of that habitat to agricultural and urban uses. In addition, some habitat has been lost or adversely altered due to construction of flood control facilities and levees needed to protect developed land. Efforts to restore the habitat can also create conflict with existing uses, such as agriculture and levee maintenance.

- *Water Supply Availability and Other Beneficial Uses.* As water use and competition for water have increased during the past several decades, so has conflict among users. A major part of this conflict is between the volume of instream water needs and out-of-stream water needs, and the timing of those needs within the hydrologic cycle.

- *Water Quality and Human Activities.* Water quality for ecosystem and consumptive uses can be adversely affected by a broad range of human activities. In addition to particular activities that discharge pollutants (such as abandoned mines or industrial sources), urban and agricultural areas produce degraded surface runoff that can seriously affect the Bay-Delta's many beneficial uses.

From these central conflicts, CALFED identified a series of problems in each of four problem areas. From each problem, a program objective was developed. A complete set of identified problems and program objectives is contained in a publication entitled *Problem/Objective Definition*, March 1996. Copies are available from the CALFED Program office The four problem areas for the Bay-Delta system are:

Ecosystem Quality - The Bay-Delta system no longer provides the broad diversity of habitats nor the habitat quality necessary to maintain ecological functions and support healthy populations and communities of plants and animals. The health of the Bay-Delta ecosystem has declined in response to a loss of habitat to support various life stages of aquatic and terrestrial biota and a reduction in habitat quality due to several factors including diversion of water, toxics, and exotic species.

The primary ecosystem quality objective of the Program is to 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. A goal that follows from this primary objective is to achieve recovery of at-risk native species dependent on the Delta and Suisun Bay as the first step toward establishing large, self-sustaining populations of these species; support similar recovery of at-risk native species in San Francisco Bay and the watershed above the estuary; and minimize the need for future endangered species listings by reversing downward population trends of native species that are not listed. The strategy to achieve the objective and goals for ecosystem restoration is to begin recovery of ecosystem health by reducing or eliminating factors that degrade habitat, impair ecological functions, or reduce the population size or health of species.

Water Supply Reliability - During the past several decades, as water diversions and recognition of environmental water needs have both increased, conflicts between these water uses have also increased. In response to declining fish and wildlife populations, water flow and timing requirements have been established for certain fish and wildlife species. Over the past decade, a number of protective actions including the Central Valley Project Improvement Act and the Delta Accord have reduced the CVP and SWP ability to meet the water demand both in quantity and timing for exports from the Delta. Conflicts between protective environmental measures and Delta exports also reduce opportunities for market water transfers. There are concerns that additional restrictions that might be needed to protect species or for other regulatory purposes could increase the

uncertainty of Delta water supplies which, in turn, have created economic uncertainty in the water service areas and increased conflict over supplies.

The primary water supply reliability objective of the Program is to reduce the mismatch between Bay-Delta water supplies and current and other projected beneficial uses dependent on the Bay-Delta system. The Program has a three-part strategy to improve water supply reliability:

- Increase the utility of available water supplies (making water suitable for more uses and reuses).
- Improve access to existing or new water supplies, in an economically efficient manner, for environmental, urban, and agricultural beneficial uses.
- Improve flexibility of managing water supply and demand in order to reduce conflicts between beneficial uses, improve access to water supplies, and decrease system vulnerability.

This strategy seeks to reduce the mismatch between supply and beneficial uses through a variety of actions including increasing the ability and flexibility to store and transport water, reducing the impact of water diversions on the Bay-Delta system, and managing demand by increasing water conservation and recycling and by better facilitating water transfer markets.

Water Quality - Bay-Delta water quality is a major concern. The Delta is a source of drinking water for millions of Californians and is critical to the state's agricultural sector. In addition, good water quality is required to maintain the high quality habitat needed in the Bay-Delta system to support a diversity of fish and wildlife populations.

The primary water quality objective of the Program is to provide good water quality for all beneficial uses. Good water quality means different things to different users, and there are different ways to achieve the objective. The Program's strategy to achieve the water quality objective includes a combination of measures including source reduction, alternative sources of water, treatment, and storage and conveyance improvements. Many of the Program's water quality sub-objectives concentrate on a direct source control approach.

Levee System Integrity - Settlers first constructed levees in the Sacramento-San Joaquin Delta during the late 1800s. Initially settlers built levees to turn swamp and overflow lands into agricultural land and over time increased the levee heights to maintain protection as both settling of levees and shallow subsidence of Delta island soils occurred (oxidation, peat fires, and wind erosion have lowered interior island elevations over time). The increased levee heights combined with poor levee construction, and

inadequate levee maintenance makes Delta levees vulnerable to failure, especially during earthquakes or floods. Delta island farmland, residences, wildlife habitat, and critical infrastructure can be flooded as a result of a levee failure. Levee failure on specific Delta islands can have direct or indirect impacts on water supply distribution systems. Direct impacts result from flooding of distribution systems such as the Mokelumne Aqueduct, and indirect impacts result from salty water moving up into the Delta, as an island is inundated under non-flood conditions. The increased salinity in the Delta would be of particular concern in a low water year, when less freshwater would be available to flush out the salt water (such as occurred when the Brannan Andrus Island levee failed in 1972). Long-term flooding of specific Delta islands can have an effect on water quality by changing the rate and area of the mixing zone. A long interruption of water supply for in-Delta and export use by both urban and agricultural users could result, until the salt water could be flushed from the Delta.

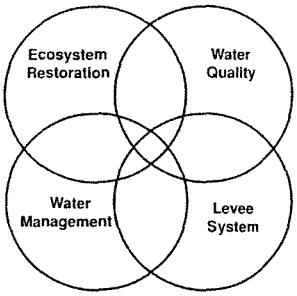
The primary levee system vulnerability objective of the Program is to reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees. Failure of Delta levees can result either from catastrophic events, such as earthquakes and floods, or from gradual deterioration. Subsidence of the Delta island peat soils and settling of levee foundations places additional pressure on levees and increases the risk of failure. The Program's strategy for achieving the levee system integrity objectives is to implement a comprehensive plan to address long-term levee stabilization and develop an effective emergency response capability in the event of failure while providing opportunities to maintain and enhance ecosystem values.

The unprecedented scope of the CALFED Bay-Delta Program cannot be overstated. The vast geographic extent of the area under consideration, the variety and complexity of the hydrological and ecological process involved, the history of conflict among the affected interests, and the magnitude of the potential economic consequences for California's commercial, agricultural, and industrial base all combine to make this effort the most ambitious of its kind anywhere in the world. In the United States, only the well-known efforts at addressing environmental and institutional problems in the Columbia River Basin, Chesapeake Bay, and in the Florida Everglades can serve as comparisons.

2.2 Fundamental Program Concepts

Three fundamental concepts related to the Bay-Delta system and its problems have guided the development of proposed CALFED solutions. These concepts are not new, but CALFED has looked at them in new ways to develop options for solving problems successfully.

First, the four problem areas (ecosystem quality, water quality, water supply reliability, and levee system integrity) are **interrelated**. CALFED cannot effectively describe problems in one problem area without discussing the other problem areas. It follows that solutions will be interrelated as well; many past attempts to improve a single problem area have achieved limited success because solutions were too narrowly focused.



Second, there is great variation in the flow of water through the system and in the demand for that water at any time scale that might be examined (from year to year, between seasons, even on a daily basis within a single season). The value of water for all uses tends to vary according to its scarcity, quality, and timing. This leads to the need for a water management strategy.

Finally, the solutions must be guided by **adaptive management**. The Bay-Delta system is exceedingly complex, and it is subject to constant change as a result of factors as diverse as global warming and the introduction of exotic species. CALFED will need to adaptively manage the system as we learn from our actions and as conditions change.

Interrelationships

In the past, most efforts to improve water supply reliability or water quality, improve ecosystem health, or maintain and improve Delta levees were single-purpose projects. A single purpose can keep the scope of a project manageable but may ultimately make the project more difficult to implement. The difficulty occurs because a project with narrow scope may help to solve a single problem but have impacts on other resources, causing other problems. This in turn leads to conflict. Ultimately, either no problem is solved, or one problem is solved while others are created.

The CALFED Program takes a different approach, recognizing that many of the problems in the Bay-Delta system are interrelated. Problems in any one problem area cannot be solved effectively without addressing problems in all four areas at once. This greatly increases the scope of our efforts but will ultimately enable us to make progress and move forward to a lasting solution.

Thus, the most important single difference between the CALFED Bay-Delta Program and

Eight Program Elements Working Together to Solve the Four Problem Areas

- Long-Term Levee Protection Plan
- Water Quality Program
- Ecosystem Restoration Program
- Water Use Efficiency Program
- Water Transfer Program
- Watershed Program
- Storage
- Conveyance

past efforts to solve resource problems is the comprehensive nature of CALFED's interrelated resource management strategies. A comprehensive CALFED solution will also be supported by governance and finance mechanisms that overcome problem-specific or resource-specific limitations of previous, more narrowly focused, approaches.

Significantly, there are many linkages among the objectives in the four problem areas and among the actions that might be taken to achieve these objectives. Solving problems in four areas at once does not require a four-fold increase in the cost or number of actions. Most actions that are taken to meet program objectives, if carefully developed and implemented, will make simultaneous improvements in two, three, or even four problem areas.

What kinds of actions can be taken to solve problems in the Bay-Delta system? The actions can be grouped into categories of levee system improvements, water quality improvements, ecosystem restoration, water use efficiency, water transfers, watershed management, water storage, and Delta conveyance modifications. Specific actions range from physical restoration of habitat in the Delta to water conservation measures. Descriptions of the Program's strategies for solving problems by implementing these actions are presented in Chapter 3 of this document. More detailed descriptions for the first stage of implementation are presented in Chapter 4. Complete descriptions of program elements are contained in other *Program Plan Appendices* to this *Draft Programmatic EIS/EIR.*

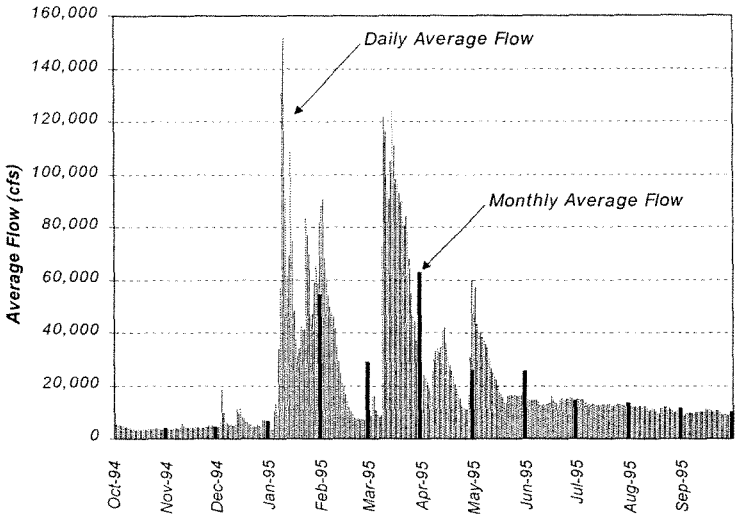
While CALFED generally does not expect to rely on new regulations to implement Program objectives, it does recognize that existing regulatory programs will continue to be implemented by CALFED agencies. CALFED represents a unique opportunity to provide high-level coordination of these regulatory programs so that regulatory implementation works in furtherance of CALFED Program goals. The CALFED Bay-Delta Program specifically defines incentives and voluntary partnerships to implement many individual actions in the Program. Incentives allow stakeholders to participate in CALFED actions which may not have been economical to them without the incentives. Partnerships allow stakeholders and CALFED agencies to leverage their individual resources by teaming together to implement certain actions.

Some regulations, like those contained in the State and federal Endangered Species Acts (ESA) and Section 404 of the Clean Water Act, are ones that CALFED must satisfy as the Program is implemented. Many other regulatory actions can be made more effective and constructive as a result of CALFED actions. For example, water quality regulatory agencies are obligated to develop total maximum daily loads (TMDLs) for certain water quality constituents in the Bay-Delta system. CALFED efforts in monitoring and research will provide valuable information which will assist regulatory agencies in developing these TMDLs. CALFED incentive-based source control actions will help reduce the load of these and other pollutants. In this way, the CALFED Bay-Delta Program will help in meeting many ongoing regulatory requirements.

Variations in Supply and Demand

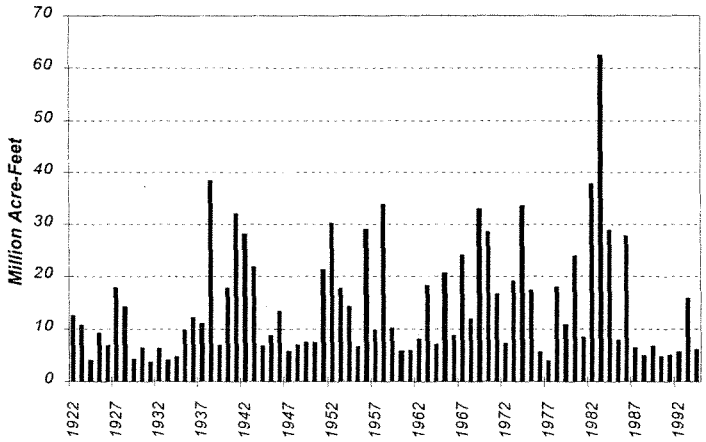
Any consideration of water management in California must start with a recognition of the immense variability in the availability of and demands for water. The watershed of the Bay-Delta system is subject to a highly variable rain and snowfall pattern. The total amount of precipitation and runoff in the watershed varies widely from month to month and from year to year. Year types are classified into five types from wet to critically dry, but even within each type there is considerable variation in the pattern of precipitation. 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. In other months, water flow is typically much lower, leading to dramatically different flow levels for different months. Even within each month, flow can vary widely.

Sacramento River Flow at Hamilton City
Water Year 1995



Two figures help illustrate the variability in the hydrologic system. Water flow variability is most notable when daily flows are examined. The first figure presents a graph of daily flows throughout a water year. For comparison, average monthly flows are also shown (thicker black bars). The average monthly flows mask the much greater variation exhibited in daily flows that rise and fall with the passing of each major storm system. It is quite typical for winter and spring storms to produce periodic peaks in flow such as those shown in January, March, and May.

Yearly Total Delta Outlfow



The second figure shows a simulated yearly total Delta outflow for the period from 1922 to 1994. The simulated Delta outflow is based on historical hydrology, but with existing storage and conveyance facilities in place and operating to meet system-wide 1995 level of demand. The graph reflects

the average annual variability that occurs from year to year. Memorable extremes, such as the drought of 1976-77, are quite apparent.

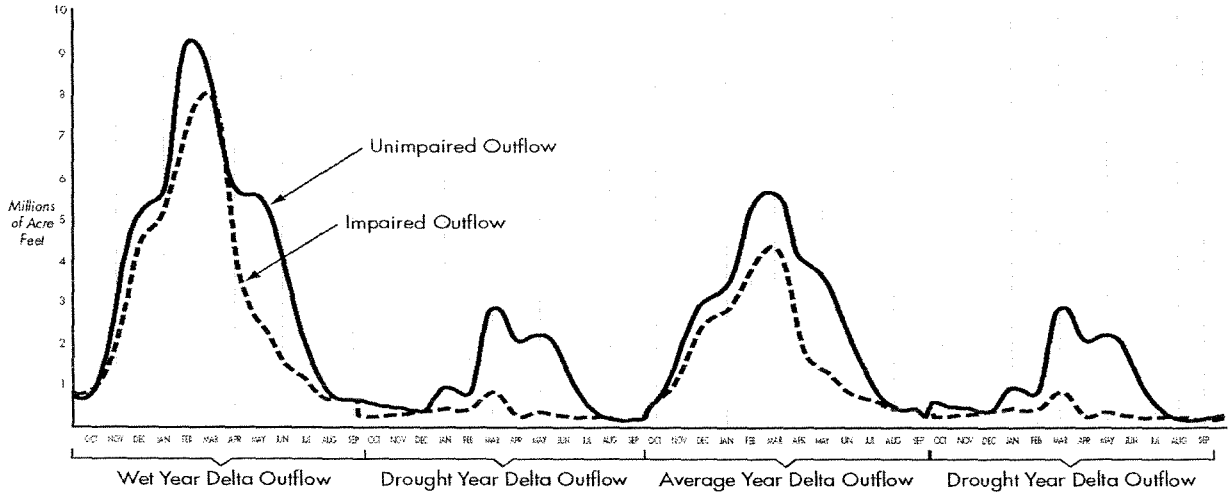
The demand for water also varies over time. Agricultural demands tend to be higher than average in dry years, because there is less precipitation available and plants need more irrigation. In addition, local surface supplies may be more limited in dry years, which imposes further demands on local groundwater 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.

Urban demands for water vary as well. 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 water (in addition to the quantity). In dry years and in dry seasons, increased salinity in the Bay Delta (from both saltwater intrusion and upstream discharges), reduces the usefulness of Bay Delta water to urban users.

The value of water in the ecosystem varies over time. For example, 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. Ecosystem water needs are generally more consistent with the natural seasonal flow pattern than consumptive water demand, but historic changes in the system have resulted in circumstances where existing flows are low during times of high ecosystem need.

Variation in ecosystem demands for water is highlighted in the figure, below, which illustrates the simulated impact of the water diversion system on natural flow patterns.

Change in Delta Outflow from System Development



This figure suggests that water diversions have had a relatively higher impact on the natural flow regime in drier water years than in wetter water years. As discussed below, many of the recent environmental protections in the Bay Delta system have tried to reduce this relative stress on the environment during drier years. This discussion of the wide variability of both the supply of and demand for water suggests one important water management conclusion; averages don't tell the whole story.

Averages are misleading because they mask the variability in flows and demands. An increase in Delta outflow in an average year may have only a minor beneficial effect on the environmental health of the system, whereas a similar increase in a dry or critically dry period may yield much greater environmental benefits. Similarly, although average increases in supplies may be desirable for urban and agricultural users, dry and critical year supplies are substantially more important given the higher demand and reduced alternatives. This variation in water supply and demand results in conflicts over water in the state, and conflict increases substantially in dry and critical years when all water uses, both environmental and consumptive, demand more water.

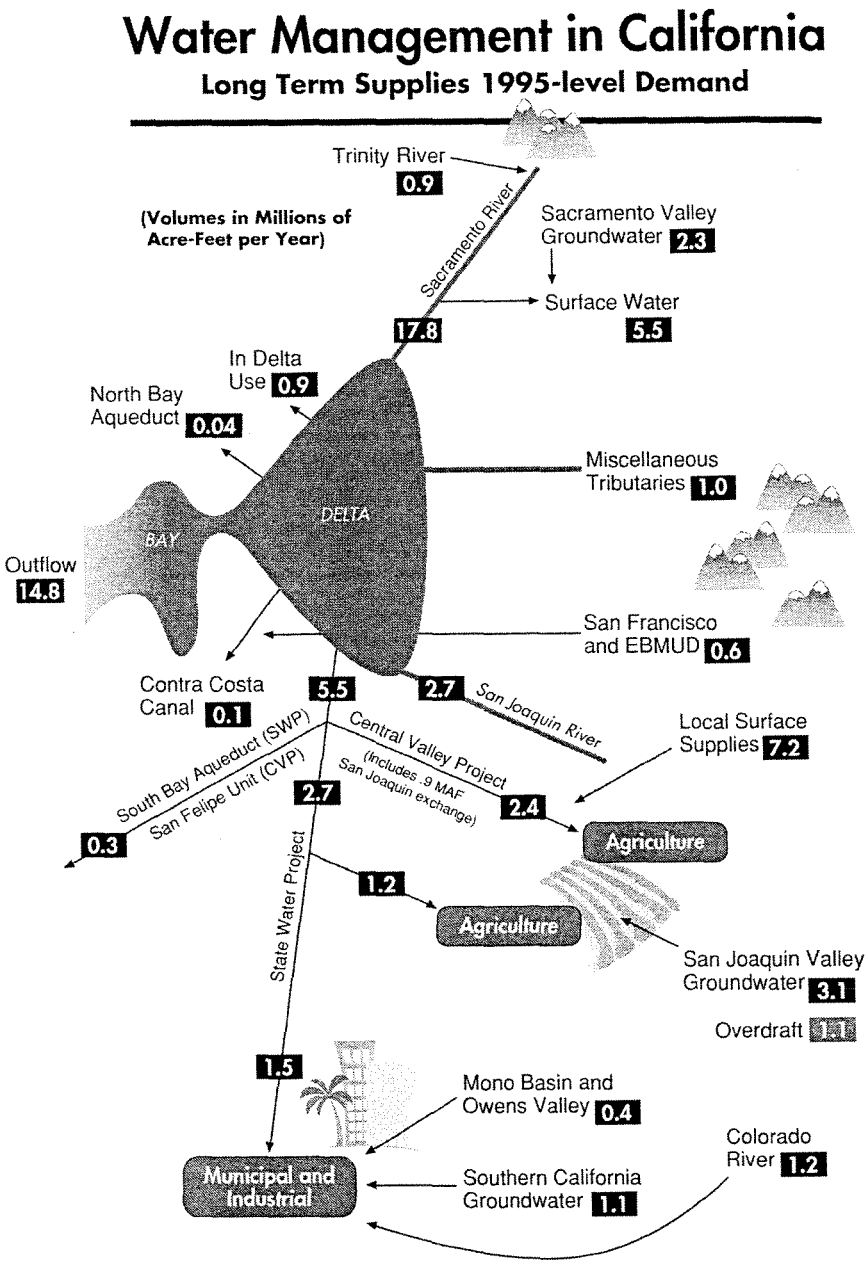
Institutional and Operational Framework

In response to the substantial variations in hydrology and in water demands, California has developed an extremely elaborate water diversion, storage, and delivery system. The broad purpose of this system has been to collect water in times of availability and to deliver it at the time and place of need.

In addition to the physical water system infrastructure, California has also created a legal/management structure governing its water resources. This legal/management structure relies on a complex set of rights, regulations, and contractual relationships that define which water users (both consumptive and environmental) will have access to water at particular times. For consumptive users, this system relies heavily on the doctrine of prior appropriation -- those water users with more senior rights generally have more reliable water supplies than those with more junior rights.

In addition to allocating shortages, the legal/management system also has the effect of allocating water savings. For example, if an upstream diverter introduces some water saving management techniques, the next downstream diverter with senior rights can have more access to water. Sometimes the allocation of savings is more complicated. In the State Water Project, water savings by one project user (Southern California urban users, for example) go back to the Project and are allocated by contractual rights to the next contractual project user (Kern County, for example). Finally, the California constitution, the Public Trust Doctrine, and common law principles govern how water can be used.

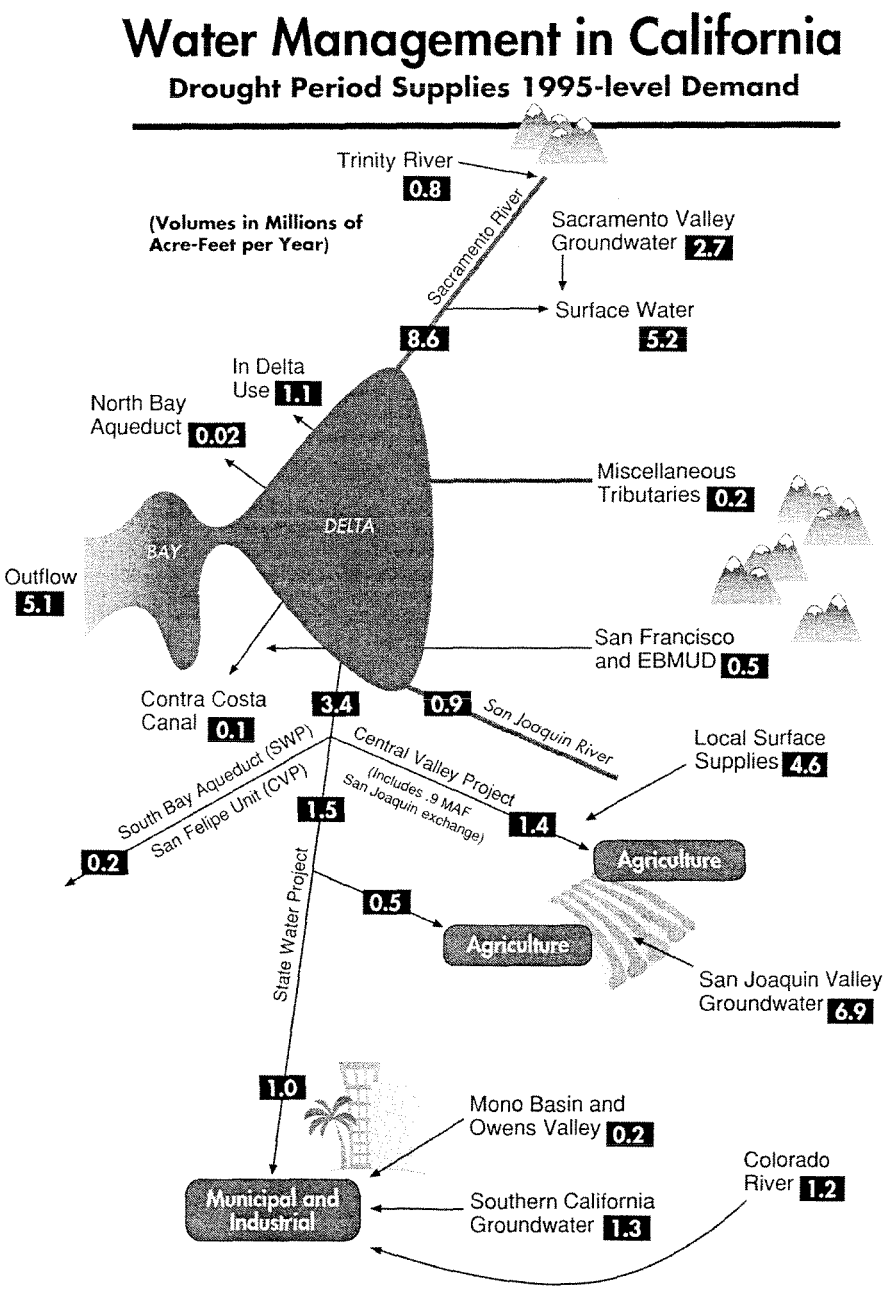
The following two figures illustrate a simplified view of water use in (1) an average year, and (2)in a dry year.



Two aspects of these figures are worth highlighting. First, Delta water use **throughout** the system is substantially lower during the simulated dry year period. This is true for urban and agricultural users which experience water shortages and shift to other sources to meet their demand. It is also true for the environmental uses (as represented by the decreased Delta outflow) because there is simply less water in the system.

Second, the figures show clearly an ongoing problem with groundwater overdraft in the San Joaquin Valley. This is especially true in the dry year scenario, where groundwater pumping has been used to make up for significant shortfalls of imported water. The problem of groundwater overdraft is critical to long term water management in California. Overdraft can cause land subsidence, deterioration of water quality, and increases in groundwater pumping. In addition, concerns about groundwater depletion and degradation are frequently voiced in the debate over water transfers in the State. While many western states have begun to take a coordinated water management approach that includes active management of groundwater resources, California has not. Long-term effective groundwater management throughout California will be essential to the success of a range of CALFED programs. The current lack of comprehensive groundwater management will limit CALFED's ability to improve water management in California, and will hamper efforts to carry out programs such as groundwater banking, conjunctive use, and water

transfers. Groundwater management in California is an institutional challenge that has not yet been fully addressed.



The preceding discussion of the hydrological and institutional framework of California water management is useful in understanding the current conflicts over water resources in the State. In recent years, the water management system has experienced increasing stress as the regulatory process has started addressing the environmental degradation evident in the Bay Delta system. In effect, these regulatory measures have increased Delta outflow and reduced diversions, forcing consumptive water users to place more reliance on other sources (groundwater pumping, water transfers, etc.) Given that the last several years have generally been wet water years, the impacts of these environmental measures have generally been muted. These recent changes (ESA, CVPIA, etc.) in the regulatory regime will reduce water deliveries by the State and federal water projects in the driest of water years and generally indicate reduced operational flexibility.

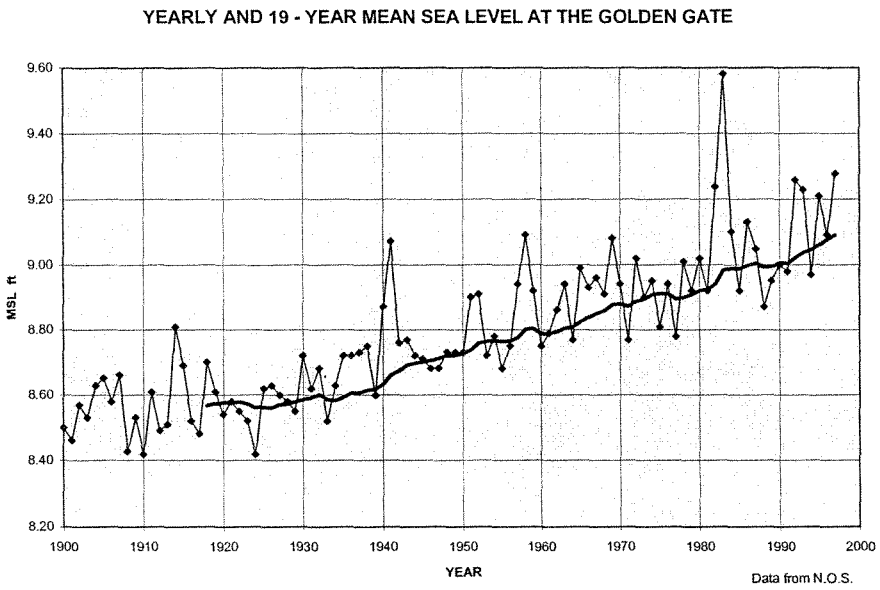
Conflicts over water in the state intensify in the driest water years, when all uses, both environmental and consumptive, are competing for a drastically reduced natural water supply. In addition, the regulatory regime itself has had another effect. Protecting environmental uses

through regulatory constraints has restricted the use of the water delivery system at certain times and has reduced the capability of the system to respond to consumptive user needs.

Adaptive Management

A third fundamental concept of the Program is adaptive management.

No long-term plan for management of a system as complex as the Bay-Delta can predict exactly how the system will respond to Program efforts or foresee events such as earthquakes, climate change, or the introduction of new species to the system.



The possibility of sea level changes induced by global warming or by other long-term climate trends is a good example of the need for an adaptive management approach to CALFED issues. Rising sea levels could have significant adverse impacts on the Delta system (including habitat, water supply, and Delta agriculture). Higher sea levels would increase salinity levels throughout the Delta, impeding habitat restoration projects in the Delta and dramatically reducing the value of water exported from the Delta for urban or agricultural uses. Similarly, long-term changes in temperatures could result in more variability in precipitation and runoff from year to year and season to season. Higher flooding could become more common, and drought periods could become more frequent. Some estimates indicate that California will experience an increase in winter runoff and a decrease in spring and summer runoff, with a resultant decrease in water supply reliability in the Central Valley basin. Given the high level of uncertainty over the direction and magnitude of climate change effects on Bay-Delta hydrological resources, adaptive management is essential.

The fundamental concept of adaptive management is that management prescriptions will be assessed and refined (adapted) according to new information in order to meet program goals and objectives. Adaptive management is an iterative process that involves: 1) identifying clear goals and objectives for the program elements; 2) using models to display our understanding of the

Bay-Delta system and to assess and prioritize a range of potential actions to improve the system; 3) implementing actions and research most likely to achieve goals and objectives and to improve our knowledge of the system; 4) monitoring and assessment of actions to gain information to refine the models and alter future actions in order to meet program goals and objectives; and 5) changing management activities based upon new information.

Adaptive management, as an essential program concept, acknowledges the need to constantly monitor the system and adapt the actions to restore ecological health and improve water management. These adaptations will be necessary as conditions change and as CALFED learns more about the system and how it responds. The Program's objectives will remain fixed over time, but actions can and should be adjusted to assure that the solution is durable.

The concept of adaptive management is an essential part of every CALFED Program element, as well. In every part of the Program, new or more intensive actions are proposed. Along with these proposed actions comes uncertainty. What actions work best to achieve program objectives? How can these actions be modified to work better, cost less, or be simpler to implement? How should the emphasis among actions change over time? Are there new or different actions that should complement or replace those that are being implemented? An adaptive management approach helps to answer these questions and allows CALFED to act upon those answers.

More detailed concepts of an adaptive management approach are included in the implementation plan in Chapter 4.

3. THE CALFED PROGRAM PLAN

CALFED is developing a long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. To achieve this mission CALFED seeks to restore ecological health, improve water quality, improve water supply reliability, and ensure levee and channel integrity. This chapter describes CALFED's **comprehensive resource management strategy** (the program plan being developed for successful implementation of the preferred alternative) and the **Preferred Program Alternative** (a concise description of program actions in Section 3.7).

The comprehensive resource management strategy distinguishes CALFED from previous efforts to solve Bay-Delta problems. The resource problems of the Bay-Delta are all interrelated, and actions to solve these problems are related as well. Thus, the actions that CALFED implements will be selected to yield multiple benefits, providing a comprehensive solution that is more effective and more efficient than single-purpose actions could be. See Chapter 4 for more specific Stage 1 actions.

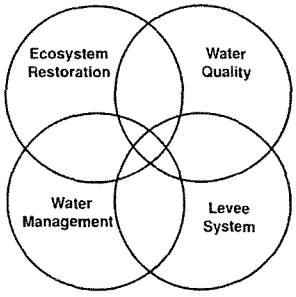
The Preferred Program Alternative is a set of programmatic actions, studies, and conditional decisions. It includes the broadly described actions that set the long-term overall direction of the Program. The description of the alternative is programmatic in nature, intended to help agencies and the public make decisions on the broad methods to meet program purposes. The Preferred Program Alternative description is an important legal element of compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The Preferred Program Alternative description is at the end of this chapter. The alternative is not intended to define the site specific actions that will ultimately be implemented.

3.1 Overview of the Preferred Program Alternative

The most significant aspect of the CALFED Preferred Program Alternative is its comprehensive nature. The Program is more than a collection of diverse actions to achieve four objectives. The preferred alternative 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, 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 will be more available for environmental uses due to improved water supply reliability. Adaptive management is an essential program concept, part of each of these strategies. It is necessary to monitor the system continuously and adapt actions that are taken to restore ecological health and improve water management.

CALFED has developed eight programs, or categories of actions, that contribute to carrying out the strategies. These eight programs include a Long-term Levee Protection Plan, a Water Quality Program, an Ecosystem Restoration Program, a Water Use Efficiency Program, a Water Transfers Program, a Watershed Program, water storage, and Delta conveyance.

Summary of Strategies for the Four Problem Areas



Ecosystem Restoration CALFED's Ecosystem Restoration Program 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.

Water Quality CALFED's objective is to provide good water quality for all beneficial uses, and its strategy includes reducing or eliminating parameters that degrade water quality at their sources. 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 aim to reduce the levels of problem contaminants such as bromide, organic carbon and pathogens in Delta drinking water sources.

Levees Levees are critical to the physical integrity of the Delta and Suisun Marsh, and the integrity of the state's water system. CALFED will work to reconstruct all Delta levees to an adequate base level of protection. 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 has proposed a Water Management Strategy to ensure water supply reliability that recognizes the variability of water supply and demand in California. CALFED's water supply reliability goals are to: increase the utility of available water supplies (making water suitable for more uses and reuses); improve access to existing or new water supplies in an economically efficient manner for environmental, urban and agricultural beneficial uses; and to improve flexibility of managing water supply and demand in order to reduce conflicts between beneficial uses, improve access to water supplies, and decrease system vulnerability.

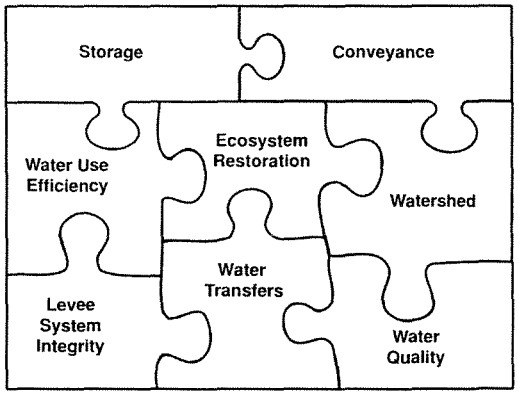
Several general categories of tools are included in the Water Management Strategy, all of which are being used in California to some degree: water conservation; water recycling; water transfers, both short-term and long-term; storage, both groundwater and surface water; water project

operations; Delta conveyance modifications; watershed management; water quality control; and monitoring and real-time diversion management.

A creative new component of this strategy is an Environmental Water Account (EWA). Through the EWA, environmental managers could control a package of assets including water and money that provides greater flexibility in helping fish species recover. With an EWA, decision-makers could react quickly to real-time assessments of fish occurrence and vulnerability instead of relying completely on fixed operational requirements based on "typical" fish behavior patterns. CALFED is continuing to refine the EWA and its role in the final plan.

Program Elements

CALFED developed eight programs to carry out the strategies described above. The Preferred Program Alternative is comprised of these program elements that will be implemented in stages over the next 30 years. Each of the elements contributes to improvements in the four problem areas. The program elements include:



- **Long-Term Levee Protection Plan** - Provides significant improvements in the reliability of levees in the CALFED problem area to benefit all users of Delta and Suisun Marsh water and land.

- **Water Quality Program** - Makes significant reductions in point and non-point source pollution for the benefit of all water uses and the Bay-Delta ecosystem.

- **Ecosystem Restoration Program** - Provides significant improvements in habitat, restoration of critical ecological processes and species populations, and reduces conflict with other Bay-Delta system resources.

- **Water Use Efficiency Program** - Encourages efficient use of water for agricultural, urban, and environmental purposes by providing support and incentives at the local level including expanded planning, technical, and financial assistance.

- **Water Transfers Program** - Provides a framework of actions, policies and processes to facilitate, encourage, and streamline an active and properly regulated water market which will allow water to move between users, including environmental uses, on a voluntary and compensated basis.

- **Watershed Program** - Promotes locally-led watershed management activities and protections relevant to achieving CALFED goals through financial and technical assistance.

- **Storage** - New groundwater and/or surface storage will be developed and constructed, together with aggressive implementation of water conservation, recycling, and a protective water transfer market, as appropriate to meet CALFED Program goals. During Stage 1, CALFED will evaluate and determine the appropriate mix of surface water and groundwater storage, identify acceptable projects, and initiate permitting and construction if program linkages and conditions are satisfied.

- **Delta Conveyance** - CALFED will 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. For example, inability to meet CALFED Program goals for drinking water quality or fishery recovery using this strategy could lead to a decision to move forward with modifications to this strategy including an isolated facility to carry a portion of export water around the Delta and/or other water management options.

All of these program elements will employ an adaptive management approach with careful monitoring of performance to help modify (adapt) future actions as more is learned about the system and how it responds. The implementation of the Preferred Program Alternative is supported by: an Implementation Plan that describes Stage 1 actions, governance, and financing; and a Comprehensive Monitoring, Assessment and Research Program.

Staged Implementation and Staged Decision Making

The selection of a Preferred Programmatic Alternative provides the broad resource framework and strategy for implementing a comprehensive program over a period of thirty years or more. This program will be implemented in stages. The programmatic decision sets in motion the implementation of some actions, as

Staged Implementation

- **Identify certain actions at the outset (for all stages).**

- **Identify possible actions for future stages with associated conditions and linkages to guide the decisions.** This will allow some decisions when more scientific information will be available and the effects of previous actions will be better known.

- **Stage assurances** that include specific agreements among agencies and stakeholders

well as additional planning and investigation to refine other actions. The challenge in implementing the Program in stages is to allow actions that are ready to be taken immediately to go forward, while assuring that everyone has a stake in the successful completion of each stage. Throughout the implementation period, monitoring will provide information about conditions in the Bay-Delta and results of these actions, so that future actions can be adapted accordingly.

The individual actions proposed by CALFED cover a spectrum from those that are small, simple, and well understood to those that would involve major modifications to the Bay-Delta system and need additional refinement before implementation can occur. Actions carried out during Stage 1 of implementation -- the first seven years after the Record of Decision -- will generally be more straightforward actions for which there is strong scientific understanding and justification. These actions can and should be implemented quickly to achieve early program benefits. Other actions implemented early will be designed to test hypotheses and conceptual models. Results will be monitored to determine if the expected results occur. If not, subsequent actions can be modified accordingly.

Actions that will involve greater uncertainty, or will make significant or irreversible modification to the system will be implemented later during Stage 1, or in subsequent stages of the implementation period. These actions will need to be carefully planned and structured because they will be less easily modified through adaptive management.

Staged implementation for the CALFED Preferred Program Alternative involves identifying implementation actions for which there is general agreement and justification, and also developing conditions for future decisions and for moving beyond Stage 1. For some actions, predefined conditions would need to be met before actions could proceed. For example, certain conditions would be linked to decisions to construct major facilities. These linked decisions on several program elements may be required at each stage of implementation. These require assurances that linkages, such as performance measures for each program element, are satisfied before making a decision to proceed.

Like implementation, the decision process will be staged to allow better decisions in adaptive management at the appropriate time. The programmatic nature of the EIS/EIR provides the general direction for long-term implementation but not the specific information necessary for every decision required during the 30 year implementation period. Not all decisions need to, or can, be made at the outset of implementation. Therefore, stages will be identified where there are logical implementation milestones and decision making points. In this way, adaptive management can be applied equally well to a series of incremental actions such as ecosystem restoration or for major single decision projects such as surface storage.

Staged decision making also facilitates the development of program linkages and conditions. CALFED recognizes the critical importance of developing assurances mechanisms to provide stakeholder groups with some certainty that program elements will be implemented over time

and in concert with other program elements. CALFED discusses some potential linkages and conditions in Chapter 4, below, as it describes program implementation in Stage 1. Staged decision making on certain program elements provides an opportunity to evaluate and adjust the linkages and conditions to assure that the program is moving forward in a comprehensive and balanced manner.

Meeting the CALFED mission statement and goals is dependent on improvement in all problem areas (ecosystem, water quality, levee system integrity, and water supply reliability). Linkages between improvement in the problem areas are key to consistent and continuous progress towards meeting the CALFED purposes. The eight program elements and linkages between the elements are the mechanisms to achieve improvement in the four problem areas.

3.2 A Comprehensive Resource Management Program

The most significant aspect of the CALFED Preferred Program Alternative is its comprehensive nature. It is founded upon 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. This integration is also reflected in proposed Program actions. Nearly every action proposed will provide benefits in two or more resource areas at the same time, thus increasing program benefits and minimizing costs. In addition, there is synergy among actions that are geographically or functionally related. This comprehensive and integrated Program is like a braided rope: the intact rope is much stronger than the strands from which it is made.

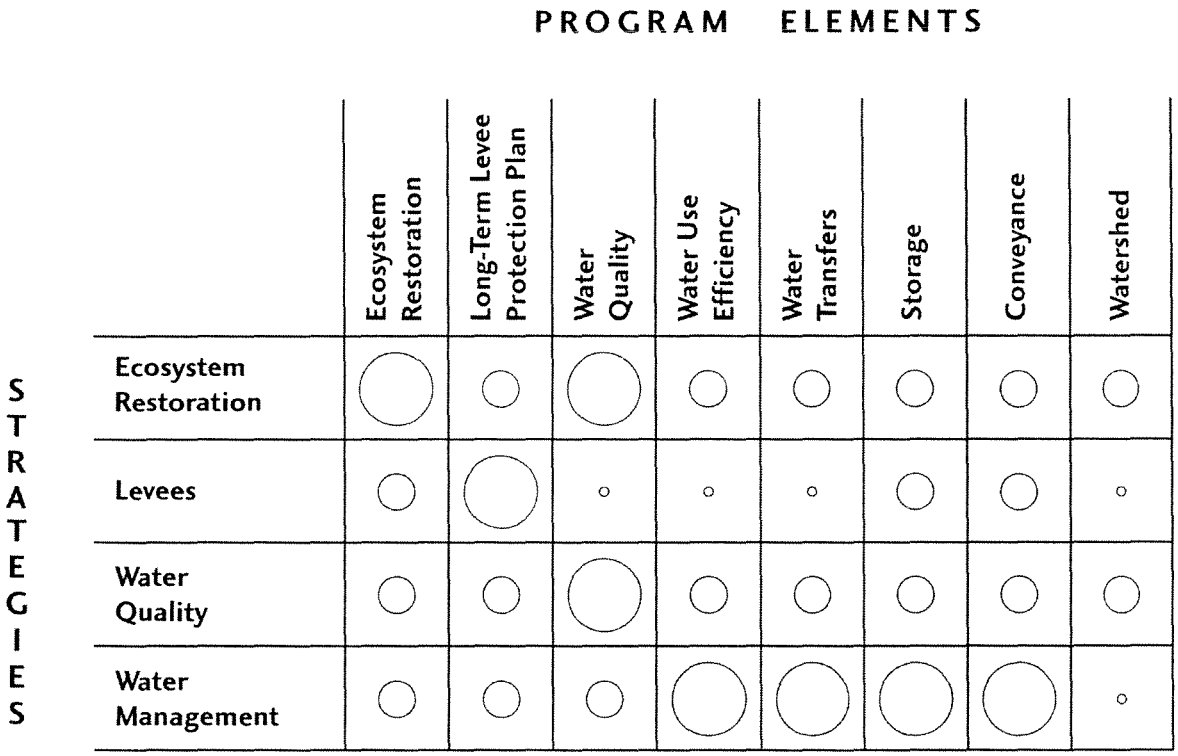
If the Program as a whole is like a rope, then the four strands in the rope are the resource management strategies that CALFED has developed. These four strategies are the ways that CALFED will restore ecosystem health, provide good water quality, maintain the integrity of the levee and channel system, and improve water supply reliability. These strategies, summarized earlier in this chapter, are described in detail below.

These four strategies reflect additional program integration. Each strategy will meet program objectives through implementation of many actions over a period of years. To simplify the discussion of the CALFED programmatic alternative, the actions are grouped under eight program elements: a Long-Term Levee Protection Plan, a Water Quality Program, an Ecosystem Restoration Program, a Water Use Efficiency Program, a Water Transfers Program, a Watershed Program, Storage, and Delta Conveyance. These eight program elements have been depicted as an interlocking jigsaw puzzle. The puzzle, however, provides an incomplete picture of the comprehensive interrelationships of program elements and resource management strategies.

To complete the rope analogy, these eight program elements are like fibers used to make up the four rope strands, which in turn are braided into a complete rope. None of the fibers or strands

by themselves are as strong as the whole rope; the strength comes from the way all the pieces are braided together.

The relationship of the four CALFED resource management strategies and the eight program elements is shown in the figure below. Each row represents a resource management strategy, and each column represents one of the eight program elements. The size of the dots estimates the relative contribution of potential actions in a program element toward meeting the objectives of each resource management strategy. This graphic shows how actions in all eight program elements may be integrated into a single resource management strategy.

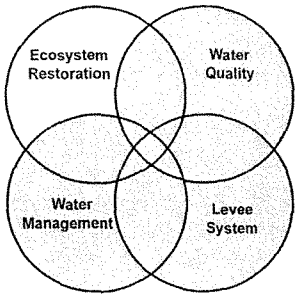


Among the eight program elements, there are comprehensive program plans for six. These plans describe actions related to ecosystem restoration, water quality, levee and channel integrity, water transfers, water use efficiency, and watershed management. These program plans are included as separate appendices to this *Draft Programmatic EIS/EIR*. Among the eight program elements, only storage and conveyance are not described in separate program plans.

Three of these program elements -- ecosystem restoration, water quality, and levees -- correspond to broader resource management strategies. The fourth resource management strategy, CALFED's Water Management Strategy, relies most heavily on program elements for water use efficiency, water transfers, storage, and Delta conveyance. The four strategies are described in the following sections.

3.3 Ecosystem Restoration Strategy

The CALFED ecosystem restoration objective is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plants and animal species. All CALFED program elements will contribute in varying degrees to this objective, with the Ecosystem Restoration Program (ERP) being the principal program element designed to restore the ecological health of the Bay-Delta ecosystem. The ERP includes actions throughout the Bay-Delta watershed, focusing on the restoration of ecological processes and important habitats.



CALFED strives to improve ecosystem quality for the Bay-Delta system in order to reduce conflicts among beneficial uses of California's water. To help plan CALFED efforts to meet the overall objective, CALFED worked with a diverse group of representatives from CALFED agencies, academia and the stakeholder community. They developed a draft Strategic Plan for Ecosystem Restoration. The draft Strategic Plan describes the ecosystem-based, adaptive management approach that will be used to implement the restoration program. Specifically, the draft Strategic Plan:

- Describes an ecosystem based management approach for restoring and managing the Bay-Delta ecosystem.
- Describes an adaptive management process that is sufficiently flexible and iterative to respond to changing Bay-Delta conditions and to incorporate new information about ecosystem structure and function.
- Describes the value and application of conceptual models in developing restoration actions and defining information needs, with examples of their development and use.
- Describes institutional and administrative considerations necessary to implement adaptive management, to ensure scientific credibility of the restoration program and to engage the public in the restoration program.
- Presents goals and objectives for recovery of species and ecosystem restoration.
- Presents broad issues that need to be addressed early in the restoration program.
- Presents decision rules and criteria to help guide the selection and prioritization of restoration actions.

- Describes the opportunities and constraints to be considered in developing a restoration program.

- Outlines a Stage 1 action plan for selecting and implementing restoration actions during the first seven years of implementation.

An important part of the draft Strategic Plan is the set of goals for ecosystem restoration, which CALFED has adopted. The goals provide the basis for a vision of a desired future condition of the Bay-Delta system. They lead to a definition of what is meant by "ecosystem quality" as applied to the Bay-Delta system. These CALFED goals for ecosystem restoration are:

1. Achieve recovery of at-risk native species dependent on the Delta and Suisun Bay as the first step toward establishing large, self-sustaining populations of these species; support similar recovery of at-risk native species in San Francisco Bay and the watershed above the estuary; and minimize the need for future endangered species listings by reversing downward population trends of native species that are not listed.

2. Rehabilitate natural processes in the Bay-Delta system to support, with minimal ongoing human intervention, natural aquatic and associated terrestrial biotic communities, in ways that favor native members of those communities.

3. Maintain and enhance populations of selected species for sustainable commercial and recreational harvest, consistent with goals 1 and 2.

4. Protect or restore functional habitat types throughout the watershed for public values such as recreation, scientific research and aesthetics.

5. Prevent establishment of additional non-native species and reduce the negative biological and economic impacts of established non-native species.

6. Improve and maintain water and sediment quality to eliminate, to the extent possible, toxic impacts on organisms in the system, including humans.

CALFED will continue to revise the Strategic Plan for Ecosystem Restoration and will finalize it before executing the Record of Decision in mid-2000. Consistent with adaptive management, the Strategic Plan will be refined over time as we learn more about the ecosystem and the effects of restoration actions.

Fundamental to the CALFED strategy for ecosystem restoration is the restoration of *ecological processes* associated with streamflow, stream channels, Delta channel hydraulics, watersheds,

and floodplains. These ecological processes create and maintain habitats essential to the life history of species dependent on the Bay-Delta system. 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. In addition, the strategy includes reduction in the effects of stressors that inhibit ecological processes, habitats, and species.

Representative ERP actions include:

- Restoring, protecting, and managing diverse habitat types representative of the Bay-Delta and its watershed
- Restoring timing and magnitude of critical instream flows and providing periodic high flows for channel-forming in Bay-Delta tributaries
- Increasing Delta outflow during key springtime periods
- Reconnecting Bay-Delta tributaries with their floodplains through the construction of setback levees, the acquisition of flood easements, and the construction and expansion of flood bypasses
- Developing assessment, prevention, and control programs for invasive species
- Restoring a healthy sediment regime by relocating instream and floodplain gravel mining, and by artificially introducing gravels to compensate for sediment trapped by dams
- Reducing or eliminating fish passage barriers, including the removal of dams, construction of fish ladders, and construction of best available technology fish screens
- Targeting research to provide information needed to define problems sufficiently and to design and prioritize restoration actions

Because the Bay-Delta ecosystem is large, complex, diverse and variable, it is impossible to know with certainty how it will respond to implementation of the ERP and other program elements. Although we know much about how the Bay-Delta system functions, there are still significant information gaps that hamper our ability to sufficiently define problems and design restoration actions to solve them. To account for this uncertainty, CALFED will use an adaptive management approach to restoring and managing the Bay-Delta ecosystem. In an adaptive management approach, restoration actions are designed and monitored so that they improve our understanding of the system while simultaneously restoring it. This approach allows revision of

restoration activities or better design of future restoration actions based upon the information gathered from projects implemented earlier. It also provides the flexibility required to respond to changing Bay-Delta conditions and to identify and resolve resource conflicts and trade-offs.

The draft Strategic Plan outlines the following steps as part of the adaptive management approach:

- Define the problem or set of problems to be addressed
- Define goals and objectives for resolving identified problems
- Develop conceptual models
- Develop and design alternative restoration or management actions
- Implement restoration actions
- Monitor the ecosystem
- Update restoration and management actions

The Comprehensive Monitoring, Assessment and Research Program (CMARP) will provide the means to measure progress made toward the ecosystem restoration goals and objectives. It will identify the need to make changes through adaptive management and it will provide focus on research needs to reduce scientific uncertainty. CMARP is described in greater detail in Chapter 4.

Throughout the adaptive management process, CALFED will rely on the advice of expert panels, particularly the ERP Science Review Panel that is identified in the draft Strategic Plan. These panels will assess the results of CALFED actions, monitoring and research data from CMARP, and other relevant information to provide advice to CALFED regarding future monitoring, research, and program actions. Such advice will be particularly relevant to decisions on future ecosystem restoration actions, as well as decisions regarding future conveyance and storage actions that will affect ecosystem restoration. CALFED will use this adaptive management process to refine and implement the 600 programmatic restoration actions contained in the ERP.

Relation to Other Program Elements

There are many linkages among the objectives in the four problem areas and among the actions that might be taken to achieve these objectives. Most actions that are taken to meet program objectives, if carefully developed and implemented, will make simultaneous improvements in two, three, or even four of these problem areas.

Water use efficiency measures include conservation of water used in urban areas, in agricultural areas, and on managed wetlands, as well as water recycling. Efficiency measures can reduce water demand, thereby reducing the mismatch between supply and demand. Efficiency measures provide other benefits to the ecosystem as well. Reduction in demand may reduce the diversion

of water from the Bay-Delta system which will improve streamflow and reduce the entrainment of fish. Careful application of water to gardens, lawns and farm fields can result in less runoff of herbicides, pesticides, fertilizers, and salts back into water bodies that provide drinking water sources and aquatic habitats.

The policy framework and regulatory coordination that will come from CALFED's Water Transfers Program will make an important water management tool available. A water transfer that moves water from upstream of the Delta to Delta export regions may provide ecosystem benefits by providing increased instream flows upstream of the Delta, by increasing flow into the Delta or modifying the timing of flows in ways that may benefit the ecosystem. Transfers of water between two users in Delta export areas may reduce the need to pump water from the Delta and reduce the environmental impacts of that Delta pumping. Finally, water can be transferred from diverters to instream uses, restoring beneficial timing of flows and increasing Delta outflow during critical periods. When it is necessary to meet streamflow targets above regulatory baseline flows, CALFED will pursue the acquisition of water from willing sellers. A functional water market, open to environmental buyers, will be essential to maintaining flows and habitats during critical periods.

The Environmental Water Account (EWA), described more fully later in this chapter, can be used to increase operational flexibility to help certain fish species, particularly those protected by state and federal endangered species acts, while simultaneously protecting water supply reliability and water quality. As currently envisioned, the EWA will use water purchases, storage space, and other assets to enhance upstream and in-Delta fish protection. For example, the EWA could alter the timing of water diversions from the south Delta and carry out water transfers in order to reduce entrainment and provide the migratory cues for fishes that are identified in the ERP. The EWA will use the real-time monitoring of the movement of fish in the Delta to trigger alternative water management actions at the south Delta project pumps and the Delta Cross Channel.

Through the Integrated Storage Investigation (ISI), described more fully later in this chapter, CALFED is evaluating the relationship between various types of storage within the Water Management Strategy. Surface and groundwater storage can be used to improve water supply reliability, provide water for the environment at times when it is needed most, provide flows timed to maintain water quality, and protect levees through coordinated operation with existing flood control reservoirs. In areas such as the San Joaquin River system, new storage may be an effective way to augment streamflows during periods of shortage. In the Integrated Storage Investigation, CALFED will also evaluate the modification or removal of some small dams which serve as barriers to fish migration.

The CALFED Preferred Program Alternative includes several Delta conveyance features that will protect fish, including new screens at south Delta water project intakes, an operable barrier at the head of Old River, and operations carefully guided by real-time monitoring. The Preferred

Program Alternative also includes a process for determining the conditions under which any additional conveyance facilities would be needed in the future to meet ecosystem restoration objectives and fish species recovery.

Delta levee improvements reduce the risk that levees will fail during flood periods or as a result of earthquakes or gradual deterioration. This can protect not only lives and property of those who would otherwise have been flooded, but can also protect the Delta's complex habitats and critical ecological processes. In a serious levee failure, the deeply subsided islands would become embayments, channel complexity would be lost, and the rearing and foodweb function of the Delta would be significantly altered. Improvements to Delta levees can be made in ways that accommodate habitat restoration, so that levees can simultaneously protect land uses, protect water quality, and support a variety of wetland, aquatic, and riparian habitats. Waterside berms, channel islands and limited setback levees serve to bolster the integrity of the levees and to provide habitat for fish and upland plants and animals. Levee improvements in the Suisun Marsh will help protect managed wetlands and guard against adverse effects on Delta water quality from catastrophic levee failure.

CALFED actions to improve water quality focus on source control: improving the quality of water that flows through the Bay-Delta system by addressing water quality concerns at their source. In some cases this may involve cleanup of abandoned mines that leach toxic heavy metals from mine tailings. In other cases, water quality may be improved by reducing runoff and erosion on a farm or an urban landscape, improving the quality of runoff that finds its way back into streams. Many of the water quality actions are staged to provide improvements and insights critical to the successful implementation of the ecosystem restoration strategy.

Through the watershed coordination element of the Program, local watershed organizations will be better able to engage in the planning and implementation of the CALFED Program. In the lower watershed, the focus will be on ecosystem restoration and water quality actions. In the upper watersheds, the immediate focus will be on partnership projects with local entities to improve water quality and habitat, decrease erosion, and increase base flows in the tributaries to the Delta. The coordination and outreach role of the Watershed Program will ensure cooperative and durable implementation of the ecosystem restoration strategy. Examples of watershed actions that will further the CALFED ecosystem strategy include those that improve riparian habitat along streams, increase or improve fisheries habitat and passage, restore wetlands, or restore the natural stream morphology affecting downstream flows.

An essential feature of the CALFED Program is the assurances for compliance with the State and federal Endangered Species Acts and the State Natural Community Conservation Planning Act which will derive from the Multi-Species Conservation Strategy (MSCS). The MSCS through a combination of regulation and ecosystem restoration actions will provide regulatory certainty and a framework for the acquisition of permits as the CALFED Program moves forward. The MSCS will eventually become an agreement with the agencies and user public who depend on the Delta,

allowing all elements of the CALFED Program, including the ERP, to progress, by ensuring the recovery and conservation of species and habitats. The ERP will be the primary mechanism to accomplish recovery and conservation of the covered species of the MSCS. In the event that other program actions have negative effects on the ecosystem baseline, the MSCS will require mitigation measures to maintain the ecosystem at the baseline level of health.

Implementation Concerns

Agricultural Resources Many entities have expressed concerns about the effects of the CALFED Program (especially the ERP and Levee Program) on agricultural land. Agricultural resources are an important feature of the existing environment of the state and are recognized and protected under CEQA and State and federal policy. One of the major principles of the State's agricultural policy is to sustain the long-term productivity of the State's agriculture by conserving and protecting the soil, water, and air which are agriculture's basic resources. It is CALFED policy that adverse environmental effects to agricultural resources resulting from CALFED program elements, projects, and actions will be fully assessed and disclosed under CEQA and NEPA, and avoided or mitigated to the extent required by law. Assessment, disclosure, and avoidance, and other mitigation strategies will be developed at the programmatic and project-specific levels in consultation with other State, federal, and local agencies with special expertise or authority over agricultural resources which may be affected by the Program, such as the California Department of Food and Agriculture.

CALFED seeks to preserve as much agricultural land as possible during implementation in Phase III consistent with meeting all program goals. Some of the land needed for program implementation is already owned by the government and that land will be used when appropriate. Partnerships with landowners, including easements with willing land owners, 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.

Numerous activities and programs are ongoing or proposed that would generate a negative impact to agriculture by expanding habitat for fish and wildlife. Examples are actions being taken through the Central Valley Project Improvement Act and the Central Valley Habitat Joint Venture to protect and restore significant areas of land in the Central Valley. To the extent that these activities and programs establish habitat that helps to meet CALFED objectives, that habitat reduces the amount of habitat restoration that CALFED must carry out. Coordination of actions will help minimize impacts. Also, to the extent that these activities and programs propose water acquisition for specific watersheds that is also proposed by CALFED, that water reduces the amount of water that CALFED must acquire. Careful coordination will help ensure that all agencies' restoration programs are carried out in the most efficient way.

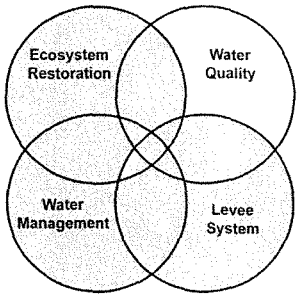
The *Draft Programmatic EIS/EIR* evaluates impacts (both adverse and beneficial) of the CALFED alternatives on agricultural resources.

San Francisco Bay Several entities have expressed concern that CALFED is not directly focusing on promoting the health of San Francisco Bay, particularly the Central and South Bay areas. It is true that the Program has not included San Francisco Bay as part of its defined problem area (which includes the legally defined Delta, Suisun Bay extending to Carquinez Strait, and Suisun Marsh). Nevertheless, because the Bay-Delta system is part of a larger water and biological resource system, solutions to address the problems in the system will include a broader geographic scope extending both upstream and downstream. This solution scope includes San Pablo Bay, San Francisco Bay, and portions of the Pacific Ocean out to the Farallon Islands. In particular, the Program will address interactions between the Delta and San Francisco Bay, such as flow or sediment, by examining the "inputs" and "outputs" from the defined problem area. In addition, given CALFED's solution principle that solutions should have no significant redirected impacts, consideration needs to be given to how each alternative might negatively affect San Francisco Bay. The Draft Programmatic EIS/EIR evaluates impacts (both adverse and beneficial) of the CALFED alternatives on the San Francisco Bay region.

San Joaquin River Many stakeholders have recommended that CALFED give serious consideration to restoring salmon runs below Friant Dam on the San Joaquin River as a means of attaining ERP goals. CALFED will evaluate fishery restoration in the mainstem San Joaquin River as a part of the ERP, while keeping in mind the specific hydrological and water management considerations in the San Joaquin basin. CALFED is aware of the historic agreement reached between stakeholder groups in March 1999 to attempt a negotiated settlement to restore aquatic resources below Friant Dam. CALFED will monitor the progress of these negotiations, with the goal of assuring that CALFED ERP actions are consistent with and supportive of any potential settlement.

More information on the ecosystem restoration program is included in other volumes of the *Draft Programmatic EIS/EIR*, including the *Ecosystem Restoration Program Plan*, volumes I and II, and the *Strategic Plan for Ecosystem Restoration*. Volume I contains vision statements that describe the ecological attributes and desired future Bay-Delta conditions; Volume II outlines over 600 programmatic restoration actions for the 14 ecological management zones delineated within the Bay-Delta ecosystem.

3.4 Water Quality Improvement Strategy



CALFED is committed to achieving continuous improvement in the quality of waters of the San Francisco Bay-Delta estuary with the goal of minimizing ecological, drinking water, and other water quality problems, and to maintaining that quality once achieved. This objective extends to the watersheds of the estuary to the extent that water quality problems in these watersheds affect beneficial uses dependent on the estuary. "Continuous" as used here means a steady or step-wise trend over the 30-year time horizon of the CALFED Program, and does not include short-term fluctuations that may be brought about by wet or dry hydrologic conditions, other shorter term, temporary, events or time needed to initiate and implement improvement measures. Although specific water quality targets have been established to gauge the success of the Water Quality Improvement Strategy, CALFED will seek to achieve water quality that exceeds these targets where feasible and cost effective. At the same time, it is anticipated that periodic re-evaluation of water quality targets will be a feature of adaptive management within this strategy.

Success in achieving the CALFED water quality objective will depend upon close coordination and collaboration among CALFED, responsible State and Federal agencies, and local agencies and interests. The CALFED Program will emphasize voluntary, cooperative, incentive-based efforts to improve water quality, but CALFED will work with regulatory agencies to assure program goals are accomplished where voluntary efforts prove insufficient. Some of the problems identified in this strategy will be subject to a Total Maximum Daily Load (TMDL) process pursuant to the Clean Water Act. CALFED is providing a forum with regulatory agencies and stakeholders to ensure that the TMDL and CALFED efforts are closely coordinated and complementary.

CALFED's primary water quality improvement strategies are for environmental water quality and drinking water quality. They are similar in their fundamental approaches, but are different enough to merit separate description.

Environmental Water Quality Improvement Strategy

CALFED's environmental water quality goal is to provide water in the San Francisco Bay-Delta that is of sufficient quality to protect all ecological beneficial uses of the water. For many water quality parameters, numerical and/or narrative objectives exist in water quality control plans adopted by the SWRCB and Regional Water Quality Control Boards. CALFED will use these objectives where appropriate as its targets for water quality improvement.

Water quality improvement is a key element of the ecosystem restoration strategy. Several water quality components have been found in the Delta at levels that could cause chronic or acute toxicity to aquatic and terrestrial organisms. Toxicity testing in the Delta and the two main tributaries, the San Joaquin River and the Sacramento River, have shown that Bay-Delta water is frequently toxic to some test species. Additionally, State and federal agencies are required to compile a list of those waters that do not meet a standard of water quality that is protective of the beneficial uses of that water body. That list was used to develop a portion of the scope of the Water Quality Program.

CALFED has identified several constituents of concern for which individual actions and studies have been proposed. Similar to the drinking water quality improvement strategy (discussed below), the individual strategies for the environmental constituents of concern contain actions such as source reduction and mine remediation. The studies proposed include source identification, interaction with the environment, and bioavailability. Each strategy is composed of a combination of actions and studies that will be developed and performed under the scrutiny of a public advisory group. Both the studies and actions must be conducted with continuous monitoring and assessment.

The major areas that have been identified for action and the basic programmatic actions are:

- **Low Dissolved Oxygen and Oxygen-Depleting Substances (in the lower San Joaquin River, South Delta, and elsewhere)** - Reduce impairment of rivers and the estuary caused by substances that exert excessive demand on dissolved oxygen. Oxygen depleting substances are found in waste discharges, agricultural discharges, urban storm water, feedlot discharges, sediment, and algae.

- **Mercury (the Sacramento River, Cache Creek, the Delta, and the Bay)** - Reduce mercury in rivers and the estuary by source control at inactive and abandoned mine sites. Determine current mercury levels in water, sediment and fish in the estuary, rivers and affected tributaries. Implement comprehensive monitoring and research program to determine loadings and sources of total and methyl mercury, transport of mercury in sediment, factors affecting mercury transformation and bioaccumulation in the estuary, and concentrations of mercury in indicator species. Use this information to prioritize remediation or cleanup of mercury sources.

- **Pesticides (from urban and agricultural uses of current pesticides)** - Reduce impacts of pesticides (including diazinon and chlorpyrifos) through development and implementation of Best Management Practices, for both urban and agricultural uses, and support of pesticide studies for regulatory agencies while providing education and assistance in implementation of control strategies for the regulated and unregulated pesticide users.

- **Organochlorine compounds (compounds like DDT and PCBs)** - Reduce the load of organochlorine compounds in the system, including residual DDT and chlordane, by reducing runoff and erosion from agricultural lands through Best Management Practices. Sediment control will also protect valuable topsoil and prevent costly maintenance of drainage systems.

- **Salinity (concentrated mostly in the San Joaquin Valley)** - Actions are planned to reduce salt loads in agricultural drainage and in urban and industrial waste water to protect drinking and agricultural water supplies, and to facilitate development of successful water recycling, source water blending, and groundwater storage programs. For the San Joaquin River watershed, a strategy will be developed using a continuous monitoring technology to minimize water quality impacts of salt movement through the system. This strategy will be consistent with CVPIA and Vernalis Adaptive Management Plan (VAMP) requirements. CALFED will not pursue resolution of salinity problems of the San Joaquin Valley through a San Joaquin Valley Drain, which is beyond the scope of the CALFED Program. Long term solutions will be sought through the San Joaquin Valley Drainage Implementation Program, with CALFED support. Salinity in the Delta will be controlled both by limiting salt loadings from its tributaries, and through managing seawater intrusion by such means as using storage capability to maintain Delta outflow and to adjust timing of outflow, and by export management.

- **Selenium (a naturally occurring salt in the San Joaquin Valley that gets concentrated in agricultural drainage, and a component of Suisun and San Pablo Bay petroleum refinery discharges)** - Reduce selenium impacts through reduction of loads at their sources, and through appropriate land fallowing and land retirement programs (including those under the CVPIA). In the San Joaquin River watershed, reduced loads will be accomplished through implementation of on-farm and district source control measures, development of treatment technology, implementation of projects such as the Grasslands Bypass Use Agreement (if shown effective), and appropriate land fallowing and land retirement. Increased assimilative flows are anticipated as a result of Federal Energy Regulatory Commission actions on San Joaquin River tributaries and VAMP flows. Selenium impacts from refinery sources in Suisun Bay will be reduced by improved source control.

- **Trace Metals (from mines, agriculture, and urban areas)** - Reduce impacts of trace metals such as copper, cadmium, and zinc in upper watershed areas, near abandoned mine sites. Reduce impacts of copper through urban storm water programs and agricultural Best Management Practices. Study the ecological

impacts of copper in the Delta, and determine the feasibility of copper load reduction.

- **Turbidity and Sedimentation (predominantly in the upper watershed) -** Reduce turbidity and sedimentation which affect several hydraulic areas in the Bay Delta and its tributaries. Study ecological impacts of sedimentation. Control sedimentation in several watersheds to protect spawning beds and maintain capacity of streams.

- **Toxicity of Unknown Origin (predominantly in the Delta) -** Through research and monitoring, identify parameters of concern in the water and sediment within the Delta, Bay, Sacramento River and San Joaquin River regions and implement actions to reduce their toxicity to aquatic organisms.

Drinking Water Quality Improvement Strategy

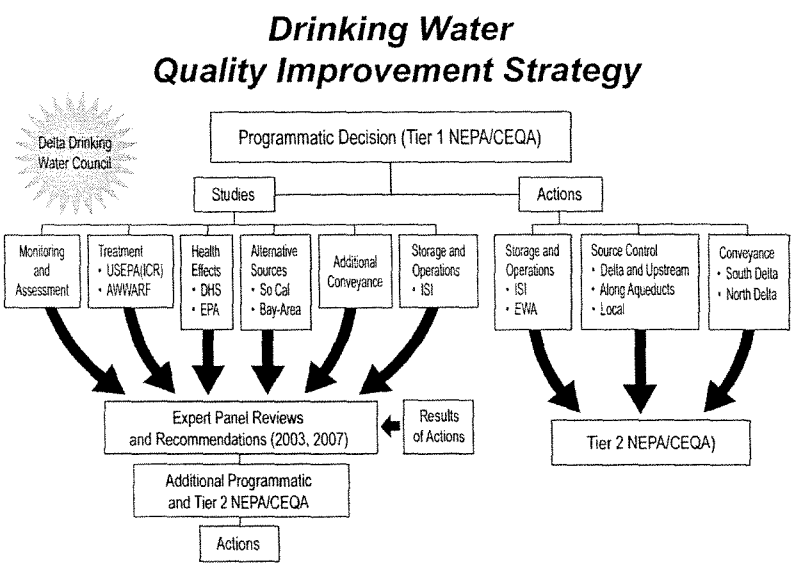
Drinking water supplies from the Delta contain higher bromide concentrations than are found in the drinking water supplies of about 90% of the nation. Bromide reacts with disinfection chemicals to form harmful chemical byproducts that have increasingly raised health concerns for consumers. Most of this bromide comes from the ocean as a result of its connection with the Sacramento-San Joaquin Bay-Delta estuary. Additional pollutants of concern for drinking water include organic carbon, which also has disinfection byproduct ramifications, and pathogens.

The CALFED drinking water quality objective is to continuously improve source water quality that allows for municipal water suppliers to deliver safe, reliable, and affordable drinking water that meets, and where feasible, exceeds applicable drinking water standards. The CALFED strategy for improving drinking water quality is to reduce the loads and/or impacts of bromide, total organic carbon, pathogens, nutrients, salinity, and turbidity through a combination of measures including source reduction, alternative sources of water, treatment, and storage and conveyance improvements.

CALFED's specific target for providing safe, reliable, and affordable drinking water in a cost effective way is to achieve either: a) average concentrations at Clifton Court Forebay and other south and central Delta drinking water intakes of 50 ug/L bromide and 3.0 mg/L total organic carbon; or b) an equivalent level of public health protection using a cost effective combination of alternative source waters, source control, and treatment technologies. CALFED has not adopted a specific numeric target for salinity (other than meeting existing Delta standards) but does have a preliminary objective of reducing the salinity of Delta supplies. Such reduction will increase the capability for blending of supplies from Delta and non-Delta sources, increase opportunities

for recycling and conjunctive use, and reduce the need for additional treatment of industrial process water.

The adjacent figure lays out the drinking water quality improvement strategy to achieve this target. The strategy is composed of a combination of actions and studies developed and performed under the scrutiny of a public advisory group (the Delta Drinking Water Council, comprised of urban water agency, environmental group, business, Delta, and public health agency representatives). Interim milestones will be developed to help measure progress toward CALFED's public health protection objectives. The information generated by these actions and studies will serve as the basis of reviews by panels of independent experts in 2003 and 2007. These panels will be convened to assess the results of drinking water studies, to assess the continued appropriateness of the water quality targets, and to make recommendations on future actions to improve drinking water quality. The results of the expert panel reviews will be reported to CALFED and the State legislature for their use in adaptive management decisions. Based on the recommendations of the expert panels and other available information, CALFED and the Legislature will make decisions on which additional measures or set of measures are most appropriate to implement to meet CALFED's public health protection objectives.



The actions and studies to be performed as components of the strategy are described below:

Actions

- **Source Control** - CALFED will establish an effective source control program for activities in the Delta and upstream. This includes treatment or relocation of agricultural drains in the Delta, management or further treatment of upstream agricultural drainage, control of urban runoff and municipal wastewater treatment discharges in the Delta and upstream, and watershed activities above the reservoirs on the Sacramento and San Joaquin Rivers and their tributaries. Water that is conveyed to municipal water agencies via open aqueducts such as the California Aqueduct, the South Bay Aqueduct, and the Delta-Mendota Canal needs to be protected from degradation in those conveyance facilities by

controlling sources of pollution along the aqueducts. Source control is also necessary in the watersheds that drain to local reservoirs that receive water exported from the Delta or are blended with export waters to insure that high quality is maintained.

- **Conveyance Improvements** - CALFED has proposed a broad array of actions for the lower San Joaquin River and south Delta region to address ecosystem, water quality, and water supply availability concerns, including operable barriers in strategic locations to maintain adequate water quality and stages to facilitate local water supply availability.

- **Storage and Operations** - CALFED is considering flexible management of water operations that may achieve fish protection and ecosystem benefits more efficiently than a completely prescriptive regulatory approach. These management operations may have ancillary benefits for source water quality.

- **Monitoring and Assessment** - Monitoring and assessment as part of CMARP are needed to provide relevant information to scientists, the public and decision makers to ensure that drinking water quality is being improved in an efficient and cost-effective manner.

Studies

- **Treatment** - EPA is engaged nationally in collecting information from water utilities regarding the effectiveness of source control and treatment. This effort is known as the Information Collection Rule. It will provide a basis for considering improvements to existing drinking water treatment technology. The American Water Works Association Research Foundation (AWWARF) is engaged in ongoing research regarding methods to improve drinking water quality. CALFED will work with water utilities to ensure that EPA's and AWWARF's efforts continue to be useful to water suppliers dependent on Delta supplies.

- **Health Effects** - CALFED will work with the California Department of Health Services and EPA to ensure that there is adequate ongoing research on the health effects of drinking water, in particular brominated compounds that are prevalent in drinking water that comes from the Delta.

- **Alternative Sources** - For both Southern California and the San Francisco Bay Area, opportunities exist to engage in water exchanges with agricultural water users and among urban users to shift higher quality supplies to urban users for drinking water while ensuring that agricultural users retain a reliable supply of water. The development of these opportunities depends heavily on the

cooperation of urban users in the two identified regions with each other and with agricultural users in the San Joaquin Valley. Enabling Delta water users to substitute higher quality source water for current Delta water offers important opportunities to improve drinking water supplies. At the same time, however, CALFED will continue its commitment to assure continuous improvement in the quality of Delta water for all uses.

- **Conveyance** - In the north Delta, CALFED has proposed study and evaluation of a screened diversion structure on the Sacramento River (or equivalent water quality actions). Appropriate studies of how additional conveyance improvements, including but not limited to an isolated facility, can be developed and operated need to continue so that CALFED can pursue these conveyance improvement options in a timely manner should it prove necessary to do so.

- **Storage and Operations** - CALFED agencies will conduct an Integrated Storage Investigation to evaluate the relationship between various types and locations of storage and the overall role of storage in water quality improvement as part of the CALFED Water Management Strategy.

- **Monitoring and Assessment** - Again, monitoring and assessment are absolutely necessary to continue to provide relevant information to scientists, the public and decision makers to ensure that drinking water quality is being improved in an efficient and cost-effective manner.

Relation to Other Program Elements

CALFED's strategy is founded on reducing or eliminating parameters that degrade water quality at their sources. However, other components of the CALFED Program can affect water quality. Watershed activities can improve water quality in the Bay-Delta system by helping to identify and control non-point sources of pollution and identify and implement methods to control or treat contaminants in the upper watersheds. CALFED has developed a Watershed Program that has strong linkages to both the water quality improvement strategy and the ecosystem restoration strategy.

The two main components of the Watershed Program are to provide assistance - both financial and technical - to local watershed programs, and to aid in the coordination and integration of local watershed programs with the CALFED Program. CALFED supports and encourages locally-led watershed activities that benefit the Bay-Delta system. Emphasis is placed on local leadership, recognizing that local watershed approaches may vary and that community involvement and support are essential. CALFED strives to strengthen the partnerships and relationships between the public, local watershed organizations, and governments at all levels.

Watershed activities included in the Watershed Program should ensure that adaptive management processes can be applied at multiple scales and across ownerships.

In summary, the draft Watershed Program includes the following elements:

- **Support Local Watershed Activities** - Implement watershed restoration, maintenance, and conservation activities that support the goals and objectives of CALFED.

- **Coordination and Assistance** - Facilitate and improve coordination and assistance between government agencies, other organizations, and local watershed groups.

- **Watershed Monitoring Assessment** - Facilitate monitoring efforts that are consistent with CMARP's protocols and support watershed activities that ensure adaptive management processes can be applied.

- **Education and Outreach** - Support resource conservation education at the local watershed level and provide baseline support to watershed programs.

- **Watershed Processes and Relationships** - Identify the watershed functions and processes that are relevant to the CALFED goals and objectives, and provide examples of watershed activities that could improve these functions and processes.

Surface and groundwater storage along with Delta conveyance improvements can help in the management of inflows to and exports from the Delta. These improvements could be used to improve drinking water quality as well as to provide additional ecosystem protection and enhance water supply reliability. Adaptive management principles will be used to balance operations to meet these objectives. A cooperative study led by CALFED and several urban stakeholders was recently initiated to explore the potential for water quality improvements through management of water project operations. As a starting place, the group considered the potential for water quality improvements using the system flexibility provided by the Delta conveyance improvements expected during Stage 1 of implementation of the CALFED Program. Several potential measures were identified, including increasing Delta outflow in the fall, alteration of export pumping patterns to avoid elevated levels of salinity and TOC, and methods of separating relatively high and low quality supplies during conveyance after export from the Delta. Preliminary results indicate that reductions in salinity of 10 to 20 percent are possible. However, these water quality improvements are possible only when dedicating system flexibility to this objective; when the water projects are operated in this manner, water supply reliability benefits of the Delta conveyance improvements are reduced. The Integrated Storage

Investigation will include more refinement and analysis of operational concepts for water quality improvement.

Water use efficiency measures can improve water quality entering the Delta by reducing some agricultural and non-agricultural discharges containing pollutants. Ecosystem restoration actions may degrade drinking water quality by increasing organic carbon loads; therefore these actions will need to be structured so as to minimize adverse water quality impacts while meeting the objectives of the ERP.

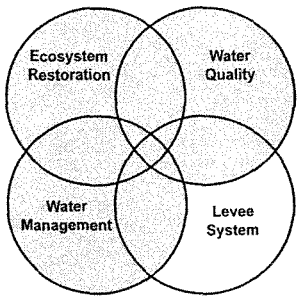
Water quality can affect the ability to expand water use efficiency measures such as conservation, water recycling, and conjunctive use, all of which depend on the availability of high quality water to prevent salt damage of irrigated land or groundwater basins, prevent corrosion of industrial equipment, and to achieve blended water salinity objectives.

In the event of a catastrophic levee failure in the Delta, the amount of saline water entering the system could be such as to make Delta waters unusable for many months. Besides making the water unusable for agricultural, industrial, or domestic purposes, it could also have a detrimental effect on habitat quality. Therefore, it is difficult to overestimate the importance of a successful Delta levee program to achieving and maintaining good water quality for the beneficial uses of Delta waters.

CMARP will be the primary vehicle for measuring the extent to which continuous water quality improvement is achieved. Performance will be measured by comparing ambient water quality (where appropriate) to specific water quality objectives that have been established for the parameters of concern.

More information on CALFED's Water Quality Program is included in another appendix to the *Draft Programmatic EIS/EIR*, the revised *Water Quality Program Plan*.

3.5 Levee System Improvement Strategy



Delta levees and islands are the most visible anthropogenic features of the Delta. Levees are an integral part of the Delta landscape and are key to preserving the Delta's physical characteristics and processes including definition of the Delta waterways and islands. Levees also protect Delta land uses including agriculture, as well as terrestrial habitat in the Delta. Given the numerous public benefits protected by Delta levees, the focus of the CALFED strategy is to improve levee integrity. The principal program element to accomplish this will be the Long-Term Levee Protection Plan. It describes actions that will result in subsidence

reduction, management, and reversal, which helps long-term Delta system integrity; increased reliability for water supply needs from the Delta and in-Delta water quality; increased reliability for in-Delta land use; and increased reliability for in-Delta aquatic and wildlife habitat.

The levee plan will build on the successes of existing programs in achieving its goals. There are five main parts to the levee plan:

- **Base-Level Protection Plan** - Base-level funding will provide equitably distributed funding to participating local agencies in the Delta. One of the primary goals of the CALFED Program is to reconstruct all Delta levees to a particular standard. CALFED has tentatively selected the U.S. Army Corps of Engineers PL 84-99 standard. Base level funding will provide for reconstruction and maintenance of Delta levees to the PL 84-99 standard. Required levee work may include removal of vegetation and debris, maintenance of water control devices, repair or replacement of existing bank protection, addition of material to achieve required cross section, removal of flood deposits, extermination of burrowing rodents and crustaceans (mitten crab), repairing and shaping access roads, repairing slipouts and erosion damage, dredging as required for minor repairs, controlling vegetation on the waterside of the levee, and other actions necessary to maintain levee integrity and appurtenances. This component will be coordinated with the Delta Levee Subventions Program currently administered by DWR.

- **Special Improvement Projects** - The special improvement project funding continues a funding mechanism for special habitat improvement and levee stabilization projects to augment the base-level funding, within specific policy guidelines. Under the special improvement projects, flood protection would be enhanced for key islands that provide statewide benefits to the ecosystem, water supply, water quality, economy, and the infrastructure. Special improvement project funding is based on the benefit to the public, not solely on the need for improvement. This component will be coordinated with and build on the successes of the Special Flood Control Protections Program which is currently administered by DWR.

- **Delta Island Subsidence Control Plan** - Numerous factors including oxidation, compaction and erosion of peat soils have caused some Delta islands to subside several feet below sea level. Today, these islands, and the environmental and water resources dependent upon them, are protected from seawater inundation by a network of Delta levees. The Levee Program will implement current BMPs to control subsidence on levees and coordinate research to quantify the effects and extent of inner-island subsidence as it relates to all CALFED objectives. Subsidence control measures will be implemented through the base-level protection component of the Levee Program and supplemented by research grants

to develop BMPs through the CMARP program. If cost effective and feasible, interior island subsidence and control measures will be recommended by CALFED during Stage 1.

- **Emergency Management Plan** - The most recognizable threat to Delta islands and resources in the Delta is inundation due to winter flood events. In addition, other potential disasters can be caused by high tides and high winds, earthquakes, burrowing animals whose actions can cause levees to fail, toxic spills, failure of Delta levees during low flow periods, and fire. Approximately 20 islands have flooded since the 1960s, including repeated flooding of some islands. The emergency management plan will build upon existing State, federal, and local agency emergency management programs to improve protection of Delta resources in the event of a disaster.

- **Delta Levee Risk Assessment and Risk Management Strategy** - Delta levees and islands are at risk of failure from floods, seepage, subsidence, earthquakes, and other threats. The Levee Program will quantify the risks to Delta levees, evaluate the consequences, and develop an appropriate risk management strategy. See the following text box for more information.

Additionally, CALFED is including the Suisun Marsh levee system in the Levee Program and is considering the following two options for marsh levees:

1. Include all the exterior Suisun Marsh levees (approximately 230 miles) into CALFED's Levee Program. The existing "Suisun Marsh Exterior Levee Standard" would be adopted.

2. Protect part of the levee system. Reconfigure the Marsh to protect existing managed wetlands and develop new tidal wetlands.

By the Record of Decision, CALFED will establish clear direction for this component of the Levee Program.

Identifying and Managing the Risks to Delta Levees

Delta levees and islands are at risk of failure from earthquakes, floods, subsidence, seepage and other threats. The Levee Program is taking steps to identify the risks to Delta levees and present a suite of options to manage this risk.

Over the past 25 years, the existing Delta levee program has reduced the flood and seepage risk by improving Delta levees. Research and demonstration projects are being conducted to quantify the effects of subsidence and determine how to reduce its threat to Delta levees.

Over the past year, a seismic risk assessment was made by a group of experts in the fields of seismology and geotechnical engineering. The results of this investigation found that a "significant seismic risk is present, however, improved preparedness can reduce the potential damage."

In an effort to further quantify the risks to levee dependent systems, CALFED will augment this group based on stakeholder recommendations, and charge them with the following tasks:

1. Design and perform a risk assessment. Identify contributors to levee risk and quantify the risk to levee dependent systems.
2. Provide recommendations for seismic upgrades to critical Delta levees and other measures to reduce levee failures. Include an evaluation of the reduction in levee vulnerability and cost estimates, ($/mile), for various recommendations.
3. Review the Subsidence Subteam's report and comment on the concept of a zone of influence and the influence of inner island subsidence on levee integrity.
4. Review the Levee Program's CMARP scope, particularly the CMARP recommendations for subsidence, emergency response, and seismic risk assessment. Comment on the proposed scopes and develop cost estimates for completing the monitoring, assessment and research.

Once the risk to Delta levees and the systems dependent on them is quantified and the consequences evaluated, CALFED will implement an appropriate risk management strategy.

Several risk management options have been developed for inclusion in the CALFED Preferred Program Alternative. The available risk management options include but aren't limited to:

- Improving emergency response capabilities
- Developing storage south of the Delta
- Reducing the fragility of the levees
- Improving through-Delta conveyance
- Releasing more water stored north of the Delta
- Restoration of tidal wetlands
- Controlling and reversing island subsidence
- Curtailing Delta diversions
- Continued monitoring and analysis of total risk
- Constructing an isolated facility

The final Risk Management Plan may include a combination of these options and others identified as a result of the risk assessment.

Relation to other Program Elements

The CALFED levee system improvement strategy relies principally on the Long-Term Levee Protection Plan. The most important program linkages are with ecosystem restoration, storage, and conveyance.

CALFED seeks to reduce the conflict between protection of wildlife habitat that occurs on levees and maintenance of the levees to prevent their failure, and is working to minimize potential conflicts and identify key areas where ecosystem restoration actions and levee maintenance actions can be coordinated. Another area of overlap between the Levee Program and the Ecosystem Restoration Program concerns efforts to reduce or reverse subsidence and actions to restore habitat. Both the Delta ecosystem and levee system stability can benefit from reducing land surface subsidence adjacent to levees. The creation of shallow-wetland habitat serves to reduce or reverse subsidence.

An area of common concern for levee and channel maintenance and water quality protection is toxicity of sediments and water quality impacts from dredging. Research to resolve dredge permitting issues will provide useful information for protecting water quality. Dredge permits will be required in order to use dredged materials to create shallow-water habitat. Thus, efforts to resolve dredge permitting issues related to levee and channel maintenance also will benefit the ecosystem restoration. Also, the success of the South Delta modifications is dependent on being able to dredge in a timely and effective manner.

Reservoir storage and levees function as a system with regard to flood control. CALFED proposals for setback levees are included in the Ecosystem Restoration and Conveyance actions. These actions may improve levee system integrity.

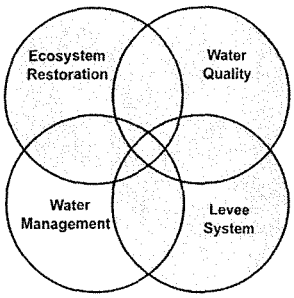
Watershed management actions may reduce the risk of levee failures by moving the timing, variability, and duration of floodplain inundation and water table elevation closer to an undisturbed condition through meadow restoration and wetland development.

Two major Corps of Engineers studies will provide significant inputs to the implementation of the Long-Term Levee Protection Plan. The Sacramento - San Joaquin Delta Special Study may provide project specific recommendations which Congress could authorize for implementation of the Delta levees. The Sacramento and San Joaquin River Basins Comprehensive Study is developing a system-wide flood management plan for the Central Valley to reduce flood damage and integrate ecosystem restoration. Other related Corps studies include project specific investigations on the Lower Sacramento River, the Cosumnes and Mokelumne Rivers, the San Joaquin and Tributaries, and the Western Delta Islands.

More information on the levee program is included in another appendix to the *Draft Programmatic EIS/EIR*, the revised *Long-Term Levee Protection Plan.*

3.6 Water Management Strategy

3.6.1 Developing a Water Management Strategy



CALFED's fourth broad, comprehensive strategy is the Water Management Strategy. This Water Management Strategy will evaluate and compare the many tools and approaches for addressing the issue of water supply reliability in the Bay-Delta system. The Water Management Strategy has three broad purposes:

- Develop a menu of water management tools that can be used to attain CALFED's water supply reliability goals.
- Identify specific water management tools from this menu which will be implemented in Stage 1 of the CALFED Bay-Delta Program.
- Provide a long-term decision making framework for evaluating the success of implementation efforts and for selecting additional tools needed to achieve CALFED's objectives.

Chapter 2 of this Report highlighted the substantial variability of California's hydrological cycles and water demands from agricultural, urban, and environmental uses. To respond to this variability, and in light of the substantial controversy over water use in California, CALFED believes that the Water Management Strategy must identify the appropriate combination of all of the available tools.

CALFED will release a draft Water Management Strategy in the fall of 1999, and will finalize the Strategy along with the Final EIS/EIR and the Certification and Record of Decision in June 2000. The discussion below is intended to highlight the issues associated with the Water Management Strategy and to reflect the progress made in the CALFED Program in evaluating the many water management tools.

Defining Water Supply Reliability Objectives

CALFED's broad objective for water supply reliability is to "Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system." CALFED has amplified this objective by developing a three-part strategy to improve water supply reliability. To guide the implementation of this multi-part strategy, CALFED has identified three primary goals. These goals are as follows:

- **Goal A:** Increase the utility of available water supplies (making water suitable for more uses and reuses).

- **Goal B:** Improve access to existing or new water supplies, in an economically efficient manner, for environmental, urban and agricultural beneficial uses.

- **Goal C:** Improve flexibility of managing water supply and demand in order to reduce conflicts between beneficial uses, improve access to water supplies, and decrease system vulnerability.

As CALFED moves towards a final Record of Decision, these goals will be refined and, where possible, quantified with numeric targets. Although the Water Management Strategy will serve as the single integration point for developing these objectives, much of the work on refining objectives is being done within CALFED's eight program elements.

Evaluating Water Management Tools

The menu of tools that will be used to achieve the goals and objectives of the Water Management Strategy encompasses many of the CALFED program elements. The primary tools include:

- Water Use Efficiency Program (agricultural, urban, and wetland water conservation and water recycling)

- Water Transfer Program

- Conveyance, including South Delta Improvements

- Storage

- Operational strategies, such as real-time diversion management

Each of these primary tools is discussed in detail below. In addition to these primary tools, the Water Management Strategy will rely on additional CALFED Program tools to provide additional benefits. These include the Watershed Program, Water Quality Program, and real-time monitoring through CMARP.

In evaluating and developing an appropriate mix of water management tools, CALFED's Water Management Strategy will consider the relative ability of the tools individually and in combinations to satisfy the CALFED solution principles. Some examples of these considerations are:

Affordability - The different tools differ substantially as to cost. One important measure of cost is the estimated cost per acre-foot of water supply. Some estimates of this cost measure are being generated by CALFED in an economic evaluation of water management alternatives.

Although cost per acre-foot is an important cost measure, other cost factors must also be assessed. For example, the cost of water will further increase depending on improvements required to meet water quality objectives (salinity, mercury, etc.). Depending on the water source, the costs for source control measures and treatment measures will vary. These cost differences are important in deciding the proper mix between watershed actions and treatment actions to attain the water quality goals. Finally, there are also significant regional differences with respect to the suitability and cost of tools.

Reducing Conflicts in the System - Increased flexibility is essential to reducing conflicts in the system. The various water management tools differ as to their flexibility - that is, their adaptability to varying hydrologic conditions and management objectives. For example, many water conservation measures have substantial benefits in reducing overall demand, but, once implemented, don't provide flexibility to react to changes in hydrological circumstances. Surface storage facilities are very effective at providing a rapid reaction in either releasing or collecting large amounts of flow. In contrast, although groundwater storage may hold more volume, it is slower to fill and draw down, and would have to be operated in conjunction with surface storage to attain the same level of flexibility. Thus, it will be important to evaluate not only individual tools, but combinations of tools for flexibility.

Have No Significant Redirected Impacts - Water management tools differ as to their potential effects on environmental resources. Generally, water conservation measures are viewed as more environmentally benign, given that they may reduce demand, increase flows in certain reaches of rivers, and improve water quality. Nevertheless, even water conservation measures may have adverse environmental effects. For example, substantially increasing farm or landscape irrigation efficiency may reduce water runoff that currently sustains aquatic or aquatic-dependent ecosystems or reduce groundwater recharge.

Water storage facilities also differ in their potential effects on environmental resources. Generally, groundwater projects are viewed as having more benign on-site environmental and land use impacts than surface storage. Off-stream surface storage projects are generally viewed as having significantly less environmental impacts than new on-stream projects. However, all surface and groundwater storage projects create some environmental impacts.

CALFED will have a more complete analysis of the performance of the tools and their combinations as part of the draft Water Management Strategy in the fall of 1999.

Economic Evaluation of Water Management Alternatives

A critical analysis in CALFED's emerging Water Management Strategy is the Economic Evaluation of Water Management Alternatives (EEWMA). The EEWMA provides important economic information that can help define potential opportunities for implementing water management tools. As an initial effort, a broad programmatic assessment is being conducted to provide guidance on the proper mix of tools to be included in the Water Management Strategy. This programmatic assessment will be refined by the time of the Programmatic Record of Decision, while more detailed project-specific economic analysis will take place during implementation.

The initial, programmatic evaluation shows how water demands shift with the cost of water, and arrays supply options by costs and by yield for each of five regions within the CALFED solution area. The "supply options" are urban and agricultural water use efficiency, urban recycling, active conjunctive use, new surface storage, and voluntary water transfers made possible through water conservation or agricultural land fallowing. For the programmatic evaluation, estimates were made of the general quantities of water available (yield) at various unit prices for the different supply options. Recognizing that policies, regulations, or other decisions can change the cost, yield, and availability of each water supply tool, the evaluation develops supply and demand scenarios which reflect varying constraint sets suggested by stakeholders. The analysis then displays consequences of these preference-based scenarios for availability and cost of water supplies throughout the system. This approach shows stakeholders and agencies how limiting or emphasizing certain supply options can change the overall cost and feasibility of achieving improvements in water supply availability. Although the analysis includes some costs reflecting differences in water quality for drinking water sources, the EEWMA does not seek to incorporate the full environmental or socioeconomic consequences of various supply options.

The final programmatic EEWMA, will describe the supply and demand relationships for each of the five demand regions by constraint sets, as well as list the most cost-effective water supply options for each region by constraint sets. The evaluation will consider how the demand for water may change as water price increases.

The EEWMA will provide information on the relative effectiveness of the water management tools, but does not present the complete answer. The economic information must be supplemented by other descriptions of the opportunities, limitations, and interrelations of the tools for example, overall operational flexibility and socioeconomic and environmental impacts.

Interrelationships, Opportunities, and Limitations of Tools

As discussed above, no single water management tool or CALFED program element can adequately address all the needs for improving water supply reliability. The strategy is to identify and implement the proper combination of all of the available tools. Later in this chapter,

CALFED's evaluation of the potential and status of each primary water management tool is discussed in detail. First, however, the following discussion will highlight the interrelationships and potential strengths or weaknesses of the various water management tools.

Water Transfers - The term "water transfers" generally means the redirection of water initially acquired pursuant to a water right, a contract, or by groundwater extraction from one user to another on a voluntary and compensated basis. CALFED's Water Transfer Program proposes a framework of actions, policies, and processes that, collectively, will facilitate water transfers and further development of a state-wide water transfer market. Because water transfers can affect third parties (those not directly involved in the transaction) and local groundwater, environmental, or other resource conditions, the framework also includes mechanisms to provide protection from such impacts.

Transfers are closely linked with other water management tools. For example, water saved by implementing water use efficiency measures is potentially available for transfer to another use. Similarly, new storage or conveyance improvements could provide access to additional water available for transfer, and can facilitate additional transfers between users. Water transfers also have the potential for affecting water quality conditions, either positively or negatively, if the transfer changes the timing of a water use or instream flow.

CALFED envisions that voluntary, compensated long-term and short-term water transfers will be the primary source of the water needed under the Ecosystem Restoration Program for restoring critical instream flows and improving Delta outflow during key springtime periods. Also, to function adequately, the proposed Environmental Water Account will require the capability to purchase and transfer water for modifying export pumping, instream flows and Delta flow patterns.

Agricultural Water Conservation - Improved agricultural water conservation can result from management and technical improvements at both the irrigation district and farm level. The potential benefits of conservation include reductions in diversions, reductions in percolation to salt sinks, reductions in evapotranspiration, and/or reductions in contaminated runoff.

As a water management tool, agricultural water conservation can assist in meeting CALFED's water utility and water access goals. Reductions in pollutant discharges can increase the utility of the water for subsequent uses. Water made available through conservation measures can be used to firm up water supply reliability on the farm or potentially can be made available to other users through water transfers or reduced diversions.

Urban Water Conservation - Urban water conservation also helps meet CALFED's water utility and water access goals. Most major California urban areas discharge wastewater into the Pacific Ocean. In these areas, urban water conservation will directly reduce total urban demand for water. While making better use of urban water supplies is an important component of

CALFED's Water Management Strategy, urban water conservation can have a negative effect on system flexibility. As more water conservation measures are implemented as part of the normal water use pattern, additional conservation will be more difficult to achieve, more costly, or behavioral changes will be required of users to conserve more water to respond to shortages.

Managed Wetlands Water Conservation - Managed wetlands are those wetland areas controlled by private owners or public agencies that rely on delivered water for some or all of their water supplies. Managed wetlands water conservation can help meet CALFED's water utility and water access goals.

Water Recycling - Water recycling can help attain CALFED's water utility and water access goals. Water recycling involves reusing water that is not consumptively used during a previous application. Recycled water can be used to recharge groundwater, with a level of treatment, or can be used as a substitute supply with a lesser level of treatment in areas where high quality is not needed (e.g. golf courses). Urban areas have a very high potential for reuse, on the order of 1-2 MAF/year, though the cost can be quite high. However, it is a very reliable source of water and can have among the least environmental impacts of any of the water management tools.

Other CALFED water management tools have a direct effect on the success of water recycling programs. The ability to recycle water is highly dependent on the total dissolved solids (TDS) in the water. Each use of water adds salts to the water, so lower TDS source water provides more opportunities for recycling or blending with other sources than source water higher in TDS. Water quality control measures, operational changes, and improvements in storage and conveyance can all increase the recycling potential.

Storage - Surface and groundwater storage can make major contributions to each of the water supply reliability goals, but is especially helpful in improving overall system flexibility. As a water management tool, storage also has some negative aspects, including its cost and adverse environmental impacts of site development and of water diversion to storage.

> **Groundwater and Conjunctive Use** - Groundwater storage is usually the least expensive type of storage, the type that can be implemented most rapidly, and the type with the least environmental impacts. However, groundwater storage is less flexible than surface storage. Fill rates are constrained by the size of distribution systems and by the rate at which water can be introduced into the ground or recharged in-lieu. Extraction rates are limited by the rate at which water can be pumped from the ground. In addition, groundwater storage projects frequently generate concerns about effects on nearby groundwater quantity and quality. Under many groundwater conjunctive use operations, surface water is used more in wetter years allowing underlying groundwater aquifers to recharge naturally, and from percolation from applied water. During dry years, water is pumped from storage to meet consumptive uses, allowing less reliance on surface water supplies.

Surface Storage - Surface storage is generally more flexible than groundwater storage, depending on operating criteria. Water in surface storage can be quickly stored and quickly released when needed, although offstream surface storage fill and release rates can be quite constrained. The environmental impacts (both on-site and from diversion) and relatively significant costs of new surface storage are the main disadvantages.

Hydropower Reoperation - AB 1890 (Chapter 854, Statutes of 1996, Public Utilities: electrical restructuring) has triggered an evaluation and potential divestiture of some or all of the existing facilities in the Bay-Delta system dedicated to the generation of hydroelectric power. 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 the re-operation of existing hydroelectric facilities to help achieve CALFED water management objectives. The evaluation will include consideration for conjunctive operation with existing surface storage and/or groundwater storage.

Conveyance - Improved conveyance can potentially contribute to each of CALFED's water supply reliability goals, but makes its major contribution to system flexibility. As discussed below, CALFED has incorporated the South Delta Improvements program to address conveyance improvements and related problems in Stage 1.

Watershed Management - As a water management tool, the CALFED Watershed Program can help meet the goals for improving the utility of water and access to water. By reducing natural and artificial pollutant loads in waterways, the Watershed Program can increase the utility of water for downstream uses of all kinds. Similarly, watershed restoration activities can improve the ability of a watershed to retain water for all uses and to reduce adverse effects of flood events.

Water Quality Improvements - Water quality improvements are essential to meeting CALFED's goal of increasing water utility. The CALFED Water Quality Program includes actions to address parameters of concern for urban, agricultural, and environmental uses of Bay-Delta waters. As discussed above, other water management tools can help achieve water quality goals. New or reoperated storage and conveyance facilities can capture higher quality flows for future uses. Water transfers can be used creatively to direct higher quality water to the more sensitive beneficial uses. Water use efficiency measures can directly reduce the volume of pollutants entering the system. Levee maintenance and improvements can assure maintained water quality for Delta water users.

Operational Strategies - CALFED anticipates that the Water Management Strategy will place an increasing reliance on real-time monitoring to achieve its goals of system flexibility and water utility. For example, the majority of fish entrainment for a particular species at water diversion facilities typically may occur during only a short period of time. If that time can be predicted in advance through a monitoring program, diversions can be curtailed and entrainment dramatically

reduced with a relatively low reduction in diversion levels. Similarly, greater water diversions could be appropriate during periods when monitoring shows that entrainment is not a major issue. Real-time monitoring can also significantly improve water utility by helping coordinate operational changes for biological benefits with other needs such as water quality. Monitoring is essential for the success of every water management tool so that progress can be measured and adjustments made where necessary. CALFED intends to rely on the Comprehensive Monitoring, Assessment and Research Program (CMARP) to provide appropriate real-time monitoring to enhance the effectiveness of the CALFED Water Management Strategy.

The chart on the following page indicates on an approximate, comparative or relative basis, how well the different water management tools contribute to meeting the goals for water supply reliability. Some tools are very important for meeting one goal and others are important for meeting the other objectives. However, none of the individual water management tools meet all of the goals. Each tool provides somewhat different opportunities and limitations considering the interrelation with the other water management tools.

Water Supply Reliability Goals & Objectives	Water Management Tools													
		Water Conservation				Storage (ISI)								
	Long-Term and Short-Term Water Transfers	Agricultural	Urban	Wetlands	Water Recycling	Groundwater & Conjunctive Use	New Surface Storage	Hydropower Reop.	Fish Barrier Assessment	Conveyance (South Delta Improvements)	Watershed Management	Water Quality Control	Operational Strategies, Monitoring, Diversion Management
Goal A: Increase the utility of available water supplies	•	●	●	•	●	●	●	•		•	•	●	●
Goal B: Improve access to existing or new water supplies, in an econimically efficient manner, for environmental, urban and agricultural beneficial uses	●	●	●	●	●	●	●	•	•	●	•	•	•
Goal C: Improve flexibility of managing water supply and demand to reduce conflicts between beneficial uses, improve access to water supplies, and decrease system vulnerability	●	•	•	•	•	●	●	●		●	•	•	●

blank = tool provides negligible or no contribution to meeting objectives
• = tool provides minor contribution to meeting objectives
● = tool provides moderate contribution to meeting objectives
● = tool provides strong contibution to meeting objectives

Implementation of the Water Management Strategy

Given that the CALFED Program will be implemented in stages over 30 years or more, the Water Management Strategy will develop guidelines for timing implementation of various tools so the strategy progresses in the most effective manner. Within the Water Management Strategy CALFED must develop two different strategies - one for Stage 1 of the CALFED Program, when not all tools are available to the same degree, and another strategy for the long term.

The following guidelines for early implementation help identify actions that would be especially useful during Stage 1 of the Program:

- Implement actions with **early** and lasting benefits for water supply reliability.
- Implement actions with **multiple** benefits. These can include multiple benefits for water supply reliability and help meet objectives for other CALFED resource areas.
- Implement actions which are **economical**.
- Use incentives for **local** participation and leverage where possible.
- Institute **operational**, administrative and fiscal actions where possible due to time delay for new facilities.
- Continue active, substantial **progress** for actions with long-lead times or for those requiring additional evaluation before decisions can be made.

These guidelines recognize the fact that many of the water management strategy tools take longer to implement than other tools. Also, for some actions, CALFED has enough information to proceed with implementation while other actions require additional evaluation before a decision on their implementation can be made. CALFED's Environmental Water Account (EWA) is an example of a package of water management tools that must be implemented early in Stage 1 of the Program. On the other hand, the Integrated Storage Investigation (ISI) is an example where additional evaluation is needed before many implementation decisions can be made. Both the EWA and the ISI are discussed in more detail later in this chapter.

Environmental Water Account (EWA) - The EWA is based on the concept that flexible management of water will achieve fishery and ecosystem benefits more efficiently than a completely prescriptive regulatory approach. The account is dependent on monitoring and real-time diversion management and will be funded each year with dollars, water, and rights to storage and conveyance. These assets will be used to enhance upstream and in-Delta fish protection. For example, the EWA could modify export pumping to avoid times more critical for fish species.

Integrated Storage Investigations (ISI) - The ISI will evaluate the relationship between various types of storage and the overall role of storage as part of the Water Management Strategy. The ISI will provide the analyses necessary for CALFED's determination of the proper mix of groundwater and surface storage facilities. Additionally, these investigations will provide a comprehensive assessment and prioritization of critical fish migration barriers for modification or removal.

The Long Term Water Management Strategy must account for expected changes in environmental, urban, and agricultural water demands over the next 30 years. The foundation of the long term Water Management Strategy will continue to be CALFED's commitment to identify, evaluate, and implement an appropriate mix of all the available water management tools. The components of the Water Management Strategy as it evolves from Stage 1 to the longer term are shown in the following table.

Water Management Strategy Framework Summary		
Tool	**Initial Implementation**	**Future Decisions for Modification**
Water Transfers	All actions in Water Transfer Program *(no quantity targets)*.	Changes to functioning water market by current state and federal jurisdictional entities (DWR, USBR, SWRCB) or by the legislature.
Agricultural conservation	Actions in Water Use Efficiency Program which are economically feasible locally and statewide *(performance targets before ROD)*.	Additional actions based on economics, market conditions and technical advances.
Urban conservation	Actions in Water Use Efficiency Program which are economically feasible locally and statewide *(performance targets before ROD)*.	Additional actions based on economics, market conditions and technical advances.
Wetlands conservation	Finalize and implement appropriate actions of the Interagency Coordinated Program (ICP) Plan.	Continue to implement appropriate actions from the ICP Plan, modified through adaptive management.
Wastewater recycling	Actions in Water Use Efficiency Program *(performance targets before ROD)*.	Additional actions based on economics, market conditions and technical advances.
Groundwater & conjunctive use	Start pilot projects, develop local partnerships to implement groundwater projects. ISI to identify appropriate mix of storage.	Implement as per WMS, with appropriate conditions and linkages.
Hydropower reoperation	Study in ISI to identify appropriate mix of storage.	Implement as per WMS, with appropriate conditions and linkages.
New surface storage	Study in ISI to identify appropriate mix of storage.	Implement as per WMS, with appropriate conditions and linkages.
Fish barrier assessment	Study in ISI to identify modification priorities for barriers.	Implement in conjunction with the ERP and mitigation of water supply and other impacts.
Conveyance	South Delta Improvements. Study North Delta ecosystem/flood control improvements. Study Hood diversion. Study isolated facility, other water management alternatives to improve drinking water quality.	If appropriate, implement Hood diversion based on study. Present results of study to improve drinking water quality and fishery protection and implement actions.
Watershed management	All actions in Watershed Program (including financial and technical support).	Monitor and adjust actions.
Water quality control	Source control and operational changes. Study operational improvements in ISI. Study other physical improvements and water management options.	Adjust operational guidelines and funding as experience is gained.
Monitoring	Comprehensive Monitoring, Assessment and Research Program.(CMARP)	Adjust CMARP as experience is gained.
Environmental Water Account (EWA)	Provide assets to the EWA ($50 Million/yr, access to storage and water and ability to flex E/I).	Adjust operational guidelines and funding as experience is gained.

3.6.2 Water Management Strategy Tools: Water Use Efficiency

The CALFED Water Use Efficiency Program (WUE) is one of the cornerstones of CALFED's Water Management Strategy. The CALFED policy toward water use efficiency is a reflection of the State of California legal requirements for reasonable and beneficial use of water: existing water supplies must be used efficiently, and any new water supplies that are developed by the Program must be used efficiently as well.

The CALFED Water Use Efficiency Program is based on the recognition that implementation of efficiency measures occurs mostly at the local and regional level. The CALFED Water Use Efficiency Program will 1) establish quantifiable objectives, 2) offer support and incentives through expanded programs to provide planning, technical, and financial assistance; 3) monitor progress towards objectives; and, 4) if these objectives are not met, re-evaluate objectives and management options. CALFED agencies will also support institutional arrangements that give local water suppliers an opportunity to demonstrate that cost-effective efficiency measures are being implemented. Some potential water use efficiency benefits, such as water quality improvements, may be regional or statewide rather than local. These are situations in which CALFED planning and cost-share support may be particularly effective.

Potential benefits of the water use efficiency program include:

- Reduces net demand for water
- Can reduce demand for Delta exports, and can reduce related entrainment effects on fish when exports are reduced
- Can help in timing of diversions which can reduce entrainment effects on fish
- Could make water available for transfers to water users and for environmental flows
- May improve overall Delta and tributary water quality
- Could reduce the total salt load to the San Joaquin Valley

CALFED has made an affirmative commitment to implement a robust, incentive-based Water Use Efficiency Program which will assure that water will be used efficiently in the CALFED solution area. The water use efficiency approach integrates State legal requirements and the practical need for local implementation through a combination of technical assistance, incentives, and directed studies for the four WUE program elements: Agricultural Water Conservation, Urban Water Conservation, Water Recycling, and Managed Wetlands. CALFED actions will build on existing efficiency efforts.

Although details of these elements are currently being refined, implementation is scheduled to begin during 2000. Technical assistance programs and directed studies will begin for all four elements in early 2000. Partial implementation of the agricultural incentive program will begin in mid-2000. The remaining incentive programs will begin in late 2000. Incentive programs

will be designed to award CALFED grant funding for projects that demonstrate potential to provide CALFED water supply reliability, water quality, or ecosystem restoration benefits.

In many ways, urban water conservation is already a success story. Implementation of water use efficiency measures in Southern California has enabled many areas to hold water use constant while supplying a rapidly growing population. For example, Los Angles is now using approximately the same amount of water that it did in 1970, even though its population has increased by 32 percent. CALFED will encourage continuation of the considerable progress already being made in urban water use efficiency. To do so, CALFED will rely substantially on the water use efficiency certification program that is evolving out of the consensus California Urban Water Conservation Council process. This process, which has substantial support from both water agencies and public interest groups, provides for peer review and certification of urban water agency implementation of established Best Management Practices. CALFED will support this urban effort though expanded programs to provide planning, technical, and financial assistance.

In the agricultural sector, CALFED will also rely heavily on the existing Agricultural Water Management Council endorsement process. In developing its program, CALFED organized both an expert review panel and a facilitated stakeholder focus group effort. The review panel and focus group both recommended that CALFED develop regionally-specific strategic plans containing water use efficiency quantifiable objectives. These regional plans are currently being developed, and will include targeted benefits, quantifiable objectives, and regional implementation strategies. The quantifiable objectives will be available before the CALFED Record of Decision in 2000. CALFED will use the quantifiable objectives and strategic plans in concert with the Agricultural Water Management Council endorsement process to identify and expand planning, technical, and financial programs for water use efficiency in the agricultural sector.

Water use efficiency measures can make available additional water supplies for environmental or consumptive users, and can serve as a useful tool for solving many of the problems in watershed management. Improvements in water use efficiency are anticipated from a wide range of CALFED program elements, and not all of these are reflected in this discussion of the Water Use Efficiency Program. As with other program elements, actions and activities undertaken throughout the CALFED Program can have corollary benefits in other CALFED program areas. For example, CALFED expects to generate substantial water use efficiency incentives through improvements in the water market and through willing-seller water acquisitions for Ecosystem Restoration Program instream flows. In addition, improvements in water quality in the Water Quality Program can assist in meeting water use efficiency goals by reducing the need for water to meet soil leaching requirements and by enhancing water reclamation opportunities. Similarly, actions taken under the Water Use Efficiency Program are expected to have ancillary benefits for other CALFED objectives. Reducing unnecessary surface runoff from farms and urban areas can enhance water quality by reducing the discharge of unwanted substances into watercourses. In

addition, WUE measures can improve water supply reliability by increasing the number of opportunities available to water managers. Finally, through the planning and implementation of WUE measures, the cost effectiveness of various storage components will become better defined.

Based on analysis provided in the Water Use Efficiency Program Plan, estimates of potential reduction of water application and irrecoverable losses are summarized in the following table. Values in the table represent potential reductions of water application and irrecoverable losses that are most likely to occur for future conditions regardless of the outcome of a CALFED solution (termed no-action) as well as the incremental savings expected from a CALFED solution. Representative values shown in this summary table are all midpoints in value ranges contained in the *Water Use Efficiency Program Plan.*

The purpose of this table is to give a perspective of the order of magnitude of the potential effects of water use efficiency improvements both with and without the CALFED solution. The values presented are not goals or targets. Rather, they are intended to provide the relative magnitude of potential results of expected efficiency actions. As a result of the proposed substantial investment in agricultural and urban water use efficiency programs, CALFED estimates that up to 2.6 MAF could be recovered from what are now irrecoverable losses. This water can be used to firm up water supply reliability, or potentially can be made available to other users through water transfers or reduced diversions. Because stakeholders disagree on the magnitude and/or the feasibility of achieving these values, the values will be further refined before the CALFED Programmatic EIS/EIR is finalized. Stakeholders do agree, however, that water conservation can provide significant benefits for multiple purposes and therefore is a significant contribution to the CALFED solution. Consistent with a programmatic analysis, specific actions or programs that would have to be implemented to achieve these results have not been specified.

The table describes three types of potential reductions:

- Recovered Losses with Potential for Rerouting Flows - These losses currently return to the water system, either as groundwater recharge, river accretion, or direct reuse. Reduction in these losses would not increase the overall volume of water, but might have other benefits such as making water available for irrigation or instream flows during dry periods, improving water quality, reducing energy used for groundwater pumping, decreasing diversion impacts or improving flow between the point of diversion and the point of reentry.

- Potential Irrecoverable Losses - These losses currently flow to a salt sink, deep aquifer, or the atmosphere, and are unavailable for reuse. Reduction in these losses would increase the volume of useable water.

- Potential Reduction of Application - This is the sum of the previous reductions.

	No Action Alternative [1] (in absence of CALFED)			CALFED Increment (result of CALFED actions)			Total Conservation Potential		
	Recovered Losses with Potential for Rerouting Flows (A=C-B) [3]	Potential for Recovering Currently Irrecoverable Losses (B) [3]	Total Potential Reduction of Application (C) [3]	Recovered Losses with Potential for Rerouting Flows (A=C-B) [3]	Potential for Recovering Currently Irrecoverable Losses (B) [3]	Total Potential Reduction of Application (C) [3]	Recovered Losses with Potential for Rerouting Flows (A=C-B) [3]	Potential for Recovering Currently Irrecoverable Losses (B) [3]	Total Potential Reduction of Application (C) [3]
Urban (total delivered water: 12.0 MAF)	397	530	927	355	680	1,035	752	1,210	1,962
Agricultural (total applied water: 31.5 MAF)	2,235	220	2,455	1,676	165	1,841	3,911	385	4,296
Urban recycling [2]	55	455	510	188	567	755	243	1,022	1,265
Total	2,687	1,205	3,892	2,219	1,412	3,631	4,906	2,617	7,523

[1] All figures are in thousand acre-feet and represent forecasts for year 2020. This table comes CALFED's Water Use Efficiency Program Plan

[2] No Action urban recycling values do not include existing recycling levels of 485,000 acre-feet (the March 1998 *Phase II Interim Report* inadvertently included the existing values).

[3] The values in Column B (Potential for Recovering Irrecoverable Losses) and Column C (Total Potential Reduction of Application) were computed explicitly from regional values of applied water, depletion, evapotranspiration of applied water, and other factors. The values in Column A (Recovered Losses with Potential for Rerouting Flows) were computed as the difference between values in Columns B and C.

The draft Water Use Efficiency Program includes water conservation and water recycling actions to facilitate efficient use of water at the regional and local level. The programmatic WUE actions include the following:

Water conservation related actions include:

- Work with the California Urban Water Conservation Council and the Agricultural Water Management Council to identify appropriate urban and agricultural water conservation measures, set appropriate levels of effort, and, in the case of the urban effort, to identify a proper entity and process to certify or endorse water suppliers that are implementing cost-effective feasible measures.

- Expand state and federal programs to provide sharply increased levels of planning, technical, and financing assistance and develop new ways of providing assistance in the most effective manner.

- Help urban water suppliers comply with the Urban Water Management Planning Act.

- Help water suppliers and water users identify and implement water management measures that can yield multiple benefits including improved water quality and reduced ecosystem impacts.

- Identify and implement practices to improve water management on managed wetlands.

- Gather better information on water use, identify opportunities to improve water use efficiency, and measure the effectiveness of conservation practices.

- Develop, in consultation with the Agricultural Water Management Council, a program of technical and financial incentives to achieve local-level implementation of water use efficiency measures in the agricultural sector. The financial incentives should generally take the form of loans for actions that have been identified as cost-effective for the district in a water management plan approved by the Agricultural Water Management Council. The financial incentives should generally take the form of incentive grants for water use efficiency measures that are supplemental to measures that are cost-effective at the district level.

- Identify, in region-specific Strategic Plans for Agricultural Areas, quantifiable objectives to assure improvements in water management. Quantifiable objectives are objectives for improvements in water management which can be measured or otherwise tracked to assure that such improvements occur. Objectives will include outcome indicators based on actual water use. Objectives must be related to specific CALFED objectives and are expected to vary by region.

Water recycling actions include:

- Help local and regional agencies comply with the water recycling provisions in the Urban Water Management Planning Act.

- Expand state and federal recycling programs in order to provide sharply increased levels of planning, technical, and financing assistance (both loans and grants), and develop new ways of providing assistance in the most effective manner.

- Provide regional planning assistance that can increase opportunities for use of recycled water.

As part of its Water Use Efficiency Program, CALFED will propose, after consultation with CALFED agencies, the Legislature, and stakeholders, State legislation that requires appropriate measurement or metering of water use for all water users in the State of California. In developing this legislation, important technical and stakeholder issues will be addressed to define "appropriate measurement," which is expected to vary by region. Aspects of this definition include the nature of regional differences, appropriate point of measurement, and feasible level of precision.

Assurances will play a critical role in the Water Use Efficiency Program element. The assurance mechanisms are structured to ensure that urban and agricultural water users implement the appropriate efficiency measures. As a prerequisite to obtaining CALFED Program benefits (for example, participating as a buyer or seller in a water transfer, receiving water from a drought water bank, or receiving water made available solely because of supply enhancements such as new, expanded, or reoperated facilities) water suppliers will need to show that they are in compliance with the applicable urban or agricultural council agreements and applicable State law. This requirement will result in careful analysis and implementation of cost-effective conservation measures identified in those agreements.

A high level of water use efficiency will also be required as a condition for permitting of any new surface storage projects. Widespread demonstration of efficient use by local water suppliers and irrigation districts will be a prerequisite to CALFED implementation of new storage projects. Regulatory requirements and some proposed compliance strategies are described more fully in Chapter 5.

CALFED will facilitate adoption of water use efficiency measures by providing a high level of technical support and financial incentives. Adequate funding for assistance programs will be an important assurance for local agencies. CALFED's broad programmatic level cost estimate for water use efficiency for Stage 1 is $2 billion. No decisions have been made regarding the appropriate level of State and federal investment as a portion of that $2 billion. However, State and federal cost sharing via loans and grants of approximately $1 billion is not unrealistic. Both the Stage 1 cost estimate and the proposed level of cost sharing will be refined by the time of the ROD. (See Finance Section)

Economic analyses are underway that will compare water use efficiency options (including conservation, recycling, and transfers) and new facilities and identify least-cost ways of meeting CALFED objectives. These analyses are expected to better define the mix of demand management options and water supplies from new facilities. CALFED will work with stakeholders on technical and implementation issues as these analyses proceed.

More information on the Water Use Efficiency Program is contained in the revised *Water Use Efficiency Program Plan*, which is included as another appendix to this *Draft Programmatic EIS/EIR.*

3.6.3 Water Management Strategy Tools: Water Transfers

Water transfers are an important part of water management in California and offer the potential to play an even more significant role in the future. Transfers can provide an effective means of moving water between users on a voluntary and compensated basis, as well as a means of providing incentives for water users to implement management practices which will improve the effectiveness of local water management.

Every year, hundreds of thousands of acre-feet of water are transferred between willing parties. Most of these transfers consist of in-basin exchanges or sales of water among Central Valley Project (CVP) or State Water Project (SWP) contractors. For example, in 1997 nearly 288,000 acre-feet of CVP water was transferred by CVP contractors south of the Delta. Since 1993, nearly 1.6 million acre-feet of CVP water has been transferred north and south of the Delta by contractors within the various divisions of the CVP. In addition, approximately 230,000 acre-feet of non-CVP water has been purchased and transferred by the CVP Interim Water Acquisition Program to meet instream flow objectives. In addition to internal CVP or SWP transfers which do not require approval by the State Water Resource Control Board (SWRCB), the SWRCB has reviewed and approved over 1.7 million acre-feet of short-term water transfer proposals throughout the state since 1990.

Generally, past transfers have been successful, and CALFED does not intend to interfere with the historical ability to transfer water. However, some transfers have caused concerns regarding adverse impacts to other water users, to rural community economies and to the environment. They have also highlighted contradictory interpretations of state law, the lack of reliable ways to transport the transferred water across the Delta, and complicated approval processes. Before the value of water transfers as a water management tool can be fully realized, these problems need to be addressed.

Water Transfer Issues

Over the course of the past two years, CALFED work groups have identified a number of issues which constrain the water transfer market. These were sorted into three broad categories to aid in developing resolution:

1. *Environmental, socio-economic, and water resource protection issues* - including:
   - Third party socio-economic impacts
   - Groundwater resource protection
   - Transfers to augment instream flow
   - Environmental protection in source areas
   - Area of origin/watershed priorities
   - Rules/guidelines for environmental water transfers

2. *Technical, operational, and administrative rules* - including:
   - Transferrable water and the "no injury rule"
   - Saved or conserved water
   - Operating criteria and/or carriage water requirements
   - Reservoir refill criteria
   - Streamlining the transfer approval process

3. *Wheeling and access to state/federal facilities (especially for cross-Delta transfers)* - including:
   - Predictability of access for transferred water in existing state and federal project facilities
   - Priority of transferring water in new facilities
   - Wheeling costs

Plan for actions, policies and processes

The Water Transfer Program Plan describes a **strategic plan** of actions, policies and processes which collectively will encourage the development of a more effective water transfer market that facilitates water transfers and streamlines the approval process, while protecting water rights, environmental conditions and local economic interests. The plan will provide direction and prioritization for implementation of CALFED's Water Transfer Program, and includes the following actions, policies, and processes:

1. Environmental, Socio-economic, and Water Resource Protection

a. Establishment of a California Water Transfers Information Clearinghouse to ensure that decisions regarding proposed water transfers can be made with all parties in possession of complete and accurate information and to provide information to facilitate assessment of potential third party impacts. The Clearinghouse would not function as a regulator, a market broker, or as a water bank. The Clearinghouse would facilitate or perform:

- the collection and dissemination of data and information relating to water transfers and potential transfer impacts, and
- research using historic data to understand water transfer impacts

b. Coordination among CALFED agencies to require additional water transfer analysis regarding third party impacts, under their existing authorities. This would require all transfer proposals which are subject to approval by the SWRCB or that depend on access to state/federal conveyance facilities to include information regarding potential socioeconomic, groundwater, and cumulative impacts at the time of submission for approval by the respective CALFED

agency. It is anticipated that the required analysis would differ according to the category of proposed transfer (short term/long term, in basin/out of basin, large/small, etc.). Information would be provided by the transfer proponents and disclosed through the California Water Transfers Information Clearinghouse. The additional analysis would be required as part of the transfer review and approval process. The results of the analysis would be used to approve, condition or deny a water transfer to the extent permitted under current rules and procedures.

c. **An expedited process for CALFED agencies to work with the Legislature and stakeholders to determine whether additional legislation to protect water rights, including area of origin priorities, is necessary.**

d. **A process for CALFED agencies to work with stakeholder representatives to develop appropriate protection provisions for water transferred for instream uses.** This will include (1) developing methodology for monitoring instream transfers and associated tracking measures, (2) developing appropriate implementation procedures or regulations for California Water Code Section 1707 transfers, and (3) evaluation as to whether additional statutory or regulatory protection of water transfers for instream purposes is necessary. The provisions are designed to ensure that water transferred to the environment is available to meet its stated instream purpose throughout its designated reach. This process should provide mechanisms for assuring that water transferred for instream use be supplementary to water used to meet regulatory requirements, unless otherwise explicitly provided by the terms of the transfer. The intended provisions should also clarify the circumstances under which water transferred for instream use may be subsequently diverted for other purposes downstream.

e. **CALFED agencies will work with stakeholders, the Legislature, and local agencies to identify appropriate assistance to enable local agencies to develop and implement groundwater management programs to protect groundwater basins in water transfer source areas.** As part of the Water Management Strategy, a groundwater assistance program will be established to fund studies to gather groundwater data and to enable local entities to develop and implement local groundwater management/monitoring programs. The data generated by these studies will be used to help evaluate an area's potential for implementing conjunctive use projects designed to help meet CALFED objectives. The groundwater management programs will help ensure that conjunctive use projects will protect the local groundwater resources and local correlative rights.

2. Technical, Operational, and Administrative Rules

a. **Development by CALFED agencies of a streamlined water transfer approval process including preparation of a Guidebook.** This effort will produce a guidebook which includes a standardized checklist and analysis procedure to be followed for each proposed water transfer that undergoes review by the SWRCB, DWR or USBR. Initially, the guidebook will describe the **existing procedures, rules, and criteria** used by these agencies during the review and approval of water transfers (the most recent version of a guidebook document will be available soon for viewing at *www.waterrights.ca.gov*). During the initial years of Stage 1, the guidebook will be expanded to provide information regarding required analysis, procedures to be followed, a "checklist" of necessary information to be provided by a transfer applicant for each proposed transfer, and detailed information regarding the jurisdictional requirements for approving a specific transfer proposal (i.e., who has the authority to approve, disapprove or condition a proposed transfer). Information regarding an agency's approval criteria, such as how the amount of water deemed transferrable is likely to be determined, would also be provided (see the associated recommendation regarding "transferrable water definitions").

b. **Development of a process for CALFED agencies to work with the SWRCB and stakeholders to consider the need for additional expedited approval processes for certain transfers.** Certain types of water transfer proposals can already be expedited through the SWRCB approval process. This action will evaluate what other types of transfers might be appropriate for expedited review and approval. This will include determining which categories of transfers have not caused appreciable concerns from the standpoint of protected legal interests (including the environment) and are thus eligible for expedited approvals, including categorical exemptions from CEQA. This also will include determining what kind of environmental documentation is required, what the protest opportunities will be, and how to allocate burdens of proof.

c. **A process for CALFED agencies to work with stakeholder representatives to clarify and define what water is deemed transferrable under what conditions**. The objective of this process will be to develop a standardized set of rules on transferable water. Clarification of the CALFED agencies' criteria for quantifying transferrable water, including potential variations in the accepted criteria for time or location (i.e., one-year transfers versus multi-year and in-basin versus out-of-basin) is a key outcome. The guidebook being developed (see previous action) will explain the agencies' current criteria and will identify areas of technical agreement. The initial focus of this process would be to address areas of disagreement between agencies and stakeholders. This should result in a set of differing water transfer scenarios and accompanying definitions. Results of this

effort may include adoption of water rights orders or formal rules by the SWRCB during the initial years of CALFED's Stage 1 implementation.

d. **A process for CALFED agencies to work with stakeholder representatives to resolve conflicts over carriage water criteria.** (Carriage water is defined as the additional water that may be necessary to accompany a cross-Delta water transfer to maintain water quality or other standards imposed on Delta export operations.) During the remainder of 1999 and continuing as needed into 2000, CALFED will facilitate a technical review by CALFED agencies and key stakeholders to help answer the following questions: 1) When is a carriage water requirement properly imposed on a cross-Delta water transfer? 2) When carriage water is required, what is the best method for calculating or quantifying the amount of carriage water? This effort will focus on clarifying agency policies and rules governing the transport of water across the Delta. The technical team will consists of experts already engaged on this issue.

e. **A process to establish a refill criteria policy for reservoir storage based water transfers.** CALFED will work with the SWRCB, DWR, USBR, and stakeholder interests to establish a consistent approach to be used by the agencies in the application of reservoir refill criteria for transfers based on the release of stored water.

3. **Wheeling and Access to State/Federal Facilities**

a. **Improved disclosure by DWR and USBR of potential conveyance capacity** to provide transfer proponents more timely information regarding the potential availability of conveyance capacity for cross-Delta water transfers and probabilities of it being available. Forecasts would occur on a monthly basis (in conjunction with water supply forecasts). Forecasts could also be provided for other portions of project conveyance facilities, as needed. Forecasts would be based on the best information available to project operators, but could not guarantee that the capacity would be available because of the numerous operating variables, including but not limited to: hydrologic conditions, ESA requirements, Delta water quality standards, discretionary actions, and physical capacity limitations.

b. **A process for CALFED agencies to work with stakeholder representatives to consider modification of policies and procedures for transporting transferred water through existing water conveyance facilities.** The purpose is to review and possibly modify existing policies and procedures governing the determination of transport system availability. Such policies and procedures include how to determine priorities, how to process requests, and how to calculate unused

capacity. CALFED will initially work with DWR and USBR to identify potential policy modifications. Stakeholder discussions will begin after an initial set of options and assessments of each option is developed. During the next several months, CALFED staff will facilitate these efforts.

c. **A process for CALFED agencies to work with stakeholder representatives to develop cost criteria associated with transporting transferred water through state or federal conveyance facilities**. This issue is currently the subject of draft legislation which is being negotiated outside the CALFED process. If legislation is enacted which establishes new rules for cost allocations associated with wheeling transferred water, the new rules will be incorporated into the applicable agencies' procedures. If the legislative effort does not resolve this issue, CALFED may facilitate further discussion among CALFED agencies and stakeholders in an effort to agree upon a set of criteria governing the determination of transport costs such that transfer proponents can factor such costs into proposals early in the development phase of a potential water transfer.

More detailed information on the issues and the recommendations is included in the *Water Transfer Program Plan*, another appendix to this *Draft Programmatic EIS/EIR.*

3.6.4 Water Management Strategy Tools: Conveyance

The Delta water conveyance component of CALFED's Water Management Strategy has been the focus of sustained and substantial public interest. In fact, this component has served as the primary variable program component in the CALFED alternatives analysis. As such, conveyance options have undergone considerable review and refinement in the Program.

Developing Conveyance Alternatives

At the beginning of Phase II of the CALFED Bay-Delta Program, seventeen alternative variations were developed around the three broad alternatives (existing system conveyance, modified through-Delta conveyance, and dual Delta conveyance) resulting from the Phase I work. Five alternative variations were eliminated due to technical problems or to reduce duplication where two or more alternatives achieved the same Delta conveyance function. The remaining twelve alternative variations were described in the *Project Alternatives Technical Appendix* to the *Draft Programmatic EIS/EIR* in March 1998.

To help the comparison of alternatives, the twelve alternative variations were grouped into three broad categories:

Alternative 1 - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 1 proposes the use of existing Delta channels, with some modifications, and various storage options.

Alternative 2 - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 2 proposes significant modifications of interior Delta channels to increase water conveyance across the Delta, combined with various storage options.

Alternative 3 - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 3 includes Delta channel modifications coupled with a conveyance channel that takes water around the Delta, combined with various storage options.

Distinguishing Characteristics

Looking simultaneously at all the information on how well the alternatives meet the objectives and how well they satisfy the solution principles would be nearly impossible due to the large amount of information. Furthermore, many aspects of the alternatives do not vary from one alternative to another. They all include program elements that make significant progress toward meeting program objectives and reducing conflict in the system.

On the other hand, there are aspects that do differ among the alternatives and it is these aspects, or distinguishing characteristics, that guided the evaluation. These characteristics are important when assessing the performance, impacts and overall merits of each alternative. Following are the eighteen identified distinguishing characteristics:

- **In-Delta Water Quality** - provides a measure of **salinity** and **flow circulation** for four areas of the Delta. The measure focuses on water quality for in-Delta agricultural uses.

- **Export Water Quality** - provides a measure of **salinity**, **bromide**, and **total organic carbon** for four export diversion locations from the Delta. The measure focuses on municipal/industrial uses for the North Bay Aqueduct and Contra Costa Intake and for agricultural and municipal/industrial uses for the SWP and CVP export pumps in the south Delta.

- **Diversion Effects on Fisheries** - intended to include only the **direct effects on fisheries due to the export diversion intake and associated fish facilities**. These will vary depending on diversion location, size, type, method of handling

bypassed fish, and annual volume of water diverted. The effects on flow patterns in the Delta as a result of the diversion are addressed in the distinguishing characteristic for "Delta Flow Circulation". The loss of fish due to diversion to another route is covered in this effect.

- **Delta Flow Circulation** - is intended to include the **direct and indirect effects of water flow circulation on fisheries due to the export diversions and changes in cross-Delta water conveyance facilities.** These will vary depending on diversion location, size, type, and operation of conveyance facilities, and annual volume of water diverted.

- **Storage and Release of Water** - provides a measure of the environmental benefit or adverse effects of storing water in new Program storage facilities and releasing that water at a later time of need. Storing the water will generally result in some degradation of environmental conditions while releasing that water, for whatever use, will generally result in some environmental benefits.

- **Water Supply Opportunities** - is a measure of the change provided by the alternatives for water supply for the environment and for agricultural and urban uses.

- **Water Transfer Opportunities** - is an estimate of how well each alternative can carry water that may be generated through market sales or trades at different locations in the system. This estimate assumes that a certain amount of conveyance capacity has already been allocated for state and federal project water.

- **Operational Flexibility** - provides an indication of how well each alternative can shift operations as needed from time to time to provide the greatest benefits to the ecosystem, water quality, and water supply reliability.

- **South Delta Access to Water** - is a measure of how the alternatives affect local beneficial use of water in the vicinity of the state and federal Delta export facilities due to changes in water levels and water quality in the channels.

- **Risk to Export Water Supplies** - is intended to provide a measure of which alternatives best reduce the risk to local and export water supplies from a catastrophic earthquake.

- **Total Cost** - will include the initial capital costs for the Program as well as annual costs. Initial costs will include study, design, permitting, construction, mitigation, acquisition, and other first costs of the Program. Annual costs will include

operation and maintenance, monitoring, recurring annual purchases, and other annual costs.

- **Assurances Difficulty** - is an estimate on how difficult it will be to formulate an assurance package and get consensus among agencies and stakeholders. It is not an assessment on the perceived effectiveness of the assurance package.

- **Habitat Impacts** - is an assessment of the adverse habitat impacts due to implementation of the CALFED actions.

- **Land Use Changes** - is primarily a measure of the amount of agricultural land that would change to other uses by implementation of the Program.

- **Socio-Economic Impacts** - include adverse and beneficial impacts on commercial and recreational fishing, farm workers, power production, and others indirectly affected by Program actions.

- **Consistency with Solution Principles** - provides a qualitative measure of how well the alternatives meet the Program solution principles. Alternatives which violate the solution principles are not likely to be practicable or implementable. The solution principles provide insight in considering tradeoffs among the other distinguishing characteristics in a balanced manner.

- **Ability to Phase (Stage) Facilities** - provides an indication on how easy it will be to stage implementation of storage and conveyance facilities over time.

- **Brackish Water Habitat** - In the Bay-Delta system there is a salinity gradient between fresh and salt water. The western Delta is an area of important aquatic habitat with salinity levels of approximately 2 parts per thousand. The location of this salt concentration, known as X2, is an indicator of effects on this critical brackish water habitat among the alternatives.

Evaluation of Conveyance Alternatives

The March 1998 *Phase II Interim Report* provided a summary of preliminary analyses with these eighteen distinguishing characteristics. In these analyses, two key distinguishing characteristics were particularly important in identifying how well the alternatives perform. **Export Water Quality** and **Diversion Effects on Fisheries** are highly dependent on the alternative selected. Therefore, irrespective of whether these two characteristics are the most important to selection of the Preferred Program Alternative, they are the characteristics most dependent on that decision.

Based on the assumptions made for evaluations in the March 1998 *Phase II Interim Report*, the dual Delta conveyance with an isolated facility appeared to provide greater technical performance than the other alternatives. At the same time, however, there are still major assurances issues associated with this approach, and CALFED needs to obtain better scientific information plus information on an array of other water management options to assess the need for the dual Delta conveyance. In addition, while the dual Delta conveyance may have technical advantages over other Delta conveyance, it would likely take a decade or more to plan, design, permit, and construct.

To address the assurances, need for better scientific information, and long lead time required for the dual Delta conveyance, CALFED more fully integrated adaptive management throughout the program elements. This led to structuring implementation in stages over time. Each stage begins implementation of certain actions, gathers scientific information to help future decisions on other actions, and provides greater assurances that actions within each stage will move forward together and will be operated as intended. With this approach, a more informed decision on the need for the dual Delta conveyance can be made in the future.

The CALFED strategy regarding conveyance must consider fisheries and water quality for in-Delta uses and drinking water. These factors are critical to conveyance decisions both now and in the future as part of adaptive management. The existing Delta channels will be an integral part of CALFED's strategy 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, which also protects in-Delta agricultural uses. Some modifications to these through-Delta channels can improve all of these Delta resources.

Because of the many complex interactions within the Bay-Delta system, successfully implementing a through-Delta strategy requires careful balancing of actions to address a wide range of concerns, including water quality, flood control, fisheries, water levels, circulation patterns, channel scour and sediment deposition. Actions which improve water quality and flow direction in one region of concern, for example, may in turn create adverse impacts elsewhere. The understanding of these complex hydrodynamic, biological, and chemical interactions is still incomplete so it will be necessary to approach the optimization of CALFED's strategy with a high degree of cooperation, rigorous monitoring, scientific analysis, and an open-minded approach to solution options. It will also be essential that the implementation of proposed solution actions be linked so that the appropriate balance of benefits and impacts is maintained throughout the implementation period.

CALFED's Delta Conveyance Strategy

CALFED's 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. The initial through-Delta conveyance will be continually monitored, analyzed, and improved to maximize the potential of the through-Delta approach to meet CALFED goals and objectives, consistent with the CALFED Solution Principles. If the through-Delta conveyance fails to meet the CALFED goals and objectives, there will be a reassessment of the reasons and the need for additional Delta conveyance and/or water management actions.

As noted above, CALFED has identified two factors, export water quality and diversion effects on fisheries, as especially important for evaluating the effectiveness of the CALFED conveyance alternative. These and other factors will be continually reevaluated during Stage 1 as part of the adaptive management process. Under the Preferred Program Alternative, some additional actions may be taken to enhance the through-Delta alternative. For example, proceeding with a pilot screened diversion facility at Hood on the Sacramento River is a potential additional action that could proceed after project-level environmental documentation, feasibility studies, and successful resolution of project-specific fishery impact issues. Other actions to enhance the CALFED conveyance strategy, such that CALFED goals and objectives could be achieved, would require consideration of a variety of alternatives and evaluation of available new information. This evaluation would take place in a supplemental programmatic evaluation focused on the goals and objectives that have not been achieved in addition to project-level evaluations. For example, if ongoing evaluation indicates that CALFED is not achieving its goals and objectives using the through-Delta alternative, supplemental programmatic evaluation of a number of water management options, including an isolated conveyance facility, would be conducted and a decision made based on this evaluation.

As noted above, CALFED recognizes the need to develop solutions to the conveyance issues that provide appropriate balance in meeting all of CALFED's goals and objectives. CALFED believes that benefits to water quality and water supply reliability gained by conveyance improvements in Stage 1 and beyond must be shared between both consumptive and environmental water uses. Defining how the benefits are shared for particular projects will be determined during the implementation process.

Details of the initial Delta conveyance improvements will be determined after comprehensive, project-level environmental analyses and technical studies are completed, but they are expected to include the following actions and considerations:

In the south Delta region--

CALFED recommends a comprehensive three barrier approach to resolving south Delta concerns at this time. The following list of actions reflects this comprehensive approach, in that it includes actions to improve ecosystem function, water quality, and water supply reliability. This recommendation is not a final determination; it simply provides guidance to CALFED agency staffs as they work together to conduct supporting technical

studies, complete environmental documentation, and seek regulatory approval. A final decision to proceed with a specific mix of facilities, operational constraints, and other actions would be based on completed project-level environmental documentation, including the requisite EIR/EIS, Section 404 Alternatives Analysis, ESA consultation, CESA consultation, and all applicable permit approvals.

The specific elements included in the recommended approach are:

- Implement regional Ecosystem Restoration Program goals (specific actions for early implementation need to be identified).

- Consolidate and screen local agricultural diversions based on an appropriate priority and initiate a screen maintenance program.

- Develop a strategy to resolve regional water quality problems including actions to improve San Joaquin River dissolved oxygen conditions and San Joaquin River drainage as described in the CALFED Water Quality Program. Also evaluate, and if demonstrated to be feasible, release accumulated salts during high flow periods. Evaluate the feasibility of recirculation of water pumped from the Delta by the CVP and SWP. If feasible, and consistent with CALFED ecosystem restoration goals and objectives, implement a pilot program.

- Implement the Vernalis Adaptive Management Plan. Include development of a long-term plan describing actions of the San Joaquin River Group Authority to improve water management practices.

- Construct a 500 cfs test facility at the Tracy Pumping Plant to develop best available fish screening and salvage technology for the intakes to the SWP and CVP export facilities.

- Construct a new screened intake for Clifton Court Forebay for the full export capacity of the SWP.

- Implement Joint Point of Diversion for the SWP and CVP.

- Evaluate and decide on whether to retain a separate CVP intake facility or to consolidate with the SWP facility. An intertie between Clifton Court Forebay and the Tracy Pumping Plant will be required if the export location is consolidated at Clifton Court and will be evaluated if exports continue at both locations. Also evaluate and potentially implement an intertie between the projects downstream of the export pumps.

- Obtain permits to use full SWP capacity of 10,300 cfs for operational flexibility, consistent with all applicable operational constraints, for water supply and environmental benefits. Facilitate interim SWP export flexibility up to 8500 cfs, with appropriate constraints.

- Expedite construction of three permanent operable barriers at the Head of Old River, Old River at Tracy, and Middle River upstream from Victoria Canal. Phase out all temporary barrier installations as soon as feasible.

- Dredge segments of south Delta channels to limit scour velocities, for water supply for local agricultural intakes, and to improve navigation.

- Extend and screen agricultural intakes as required to assure local water supply availability.

- Form a Barrier Operations Coordination Team, consisting of USFWS, NMFS, DFG, DWR, USBR, and stakeholder representatives to operate the barriers.

- Monitor barrier effects on fish, stages, circulation, and water quality.

- Implement mitigation actions for direct and indirect project features and actions.

- Retain the potential future option of constructing a Grant Line Canal Barrier after the Barrier Operations Coordination Team operates and evaluates the three barriers included in the recommended alternative. Implementation of such an option would only be undertaken if the actions described above, including detailed field studies and analyses, fail to provide an appropriate balance of fisheries, water quality, and water supply availability benefits.

- In coordination with regional ERP actions, improve flood control through levee improvements, levee setbacks, channel dredging, and flood plain restoration.

In the north Delta region--

- Develop operational criteria for the Delta Cross Channel that balances flood control, water quality, water supply reliability, and fisheries concerns.

- Study and evaluate a screened diversion structure on the Sacramento River (or equivalent water quality actions) as a measure to improve drinking water quality in the event that the Water Quality Program measures do not result in adequate improvements toward CALFED drinking water quality goals. This evaluation would consider how to operate the Delta Cross Channel in conjunction with this

new diversion structure to improve drinking water quality, while maintaining fish recovery.

- If the Water Quality Program measures are consistently not achieving water quality goals, and the evaluation demonstrates that a screened diversion of up to 4,000 cfs would help achieve those goals without adversely affecting fish populations; a pilot screened diversion would be constructed. This pilot would likely include a fish screen, pumps and a channel between the Sacramento and Mokelumne Rivers. The design, size and operating rules for this pilot facility would allow for analyses of impacts to upstream and downstream migrating fish as well as impacts from habitat shifts resulting from increased flows in the eastern Delta on Delta species. Following evaluation of the pilot facility operations, a final decision would be made on whether the diversion channel and structure should continue to be used, and if so, what the operational rules and optimum size of the diversion should be.

- Construct new setback levees, dredge and/or improve existing levees along the channels of the lower Mokelumne River system from Interstate 5 downstream to the San Joaquin River to improve conveyance and resolve flood concerns in this region. These actions would be carefully coordinated with ecosystem restoration actions to create additional tidal wetlands and riparian habitat to assure that a balanced solution to local and regional concerns would be achieved.

- Balance the above actions to provide a solution to water quality, flood control, water supply reliability, and fisheries concerns.

Throughout the Delta region--

- Conduct localized channel dredging as needed to restore and maintain sufficient channel capacities to support balanced beneficial uses, including flood control, navigation, recreation, fisheries, water quality, water levels, and circulation.

Future Conveyance Actions

CALFED will evaluate progress towards achieving its water quality and species recovery goals and objectives during Stage 1 with the advice and assistance of expert panels as described in the Water Quality and Ecosystem Restoration sections of this report. The deliberations of those panels will be part of the open, public decision making process CALFED will follow to determine if different conveyance and/or other water management actions should be evaluated in order to achieve water quality and species recovery goals and objectives.

CALFED will use the advice of water quality expert panels and the ERP Science Review Panel to conduct program reviews in 2003 and 2007 with stakeholder involvement to assess whether Stage 1 actions to meet CALFED goals and objectives have been successful and determine whether modifications in conveyance and/or additional water management actions should be evaluated to simultaneously achieve species recovery, water quality improvement, levee system integrity, and water supply reliability. CALFED will present the results of these reviews to the Legislature and Congress, along with its recommendations, if any, for legislative action.

In the event of a finding that a through-Delta conveyance system is inadequate to achieve CALFED goals and objectives, additional actions, including an isolated facility, source water blending or substitution, and other actions will be intensively evaluated through supplemental programmatic analysis for their ability to solve these problems, and a decision made to proceed with the most appropriate actions. If an isolated facility were ultimately found to be necessary for achieving CALFED's goals and objectives, it would be designed with each of the following assurances:

1. An agreement limiting the amount, or proportion, of water that can be exported (linked to water year types and flexible enough to allow additional exports when conditions allow) and needed assurances for compliance

2. Commitment to continuous improvement of in-Delta water quality sufficient to protect existing beneficial uses (Delta standards or contracts including assurances for implementation, permits, financing, and Operations and Maintenance)

3. Commitment to avoid potential seepage and flood impacts of an isolated facility along its alignment

4. Long-term funding for Delta levees (perhaps tied to quantity of water moved in the isolated facility or other institutional assurances) and commitment to provide at cost, suitable excess excavated material from facility construction for levee and habitat improvements

5. Reaffirm commitment to protect all area of origin water rights and to continue implementation of the 1959 Delta Protection Act

6. Completion of all environmental documentation and permitting requirements

7. Demonstrated commitment to finance by beneficiaries

8. Agreement on operating authority and operating criteria

9. A determination that the through-Delta conveyance with the other program elements cannot meet CALFED goals and objectives, and that an isolated conveyance facility is the most cost-effective and least environmentally damaging measure to correct this deficiency in meeting the goals and objectives

10. A decision to proceed with implementation of the Program will come through State and potentially federal legislative action. CALFED intends that this legislative action will not include legislative overrides or exemptions from State or federal environmental laws (including, but not limited to, the federal and State ESA, the Clean Water Act, NEPA or CEQA).

3.6.5 Water Management Strategy Tools: Storage

Storage of water in surface reservoirs or groundwater basins can provide opportunities to improve the timing and availability of water for all uses. The benefits and impacts of surface and groundwater storage vary depending on the location, size, operational policies, and linkage to other program elements. By storing during times of high flow and low environmental impact, more water is available for release for environmental, consumptive, and water quality purposes during dry periods when conflicts over water supplies are critical. Storage which is properly managed and integrated with other water management tools can achieve significant improvements for a number of CALFED's water management objectives: reduce conflicts, decrease drought impacts on all beneficial uses, increase supply availability, increase operational flexibility, and improve water quality.

The particular attributes of storage in CALFED's Water Management Strategy vary by the type and location of storage. Water storage located upstream of the Delta functions differently than storage located south of the Delta in the export area. Generally, groundwater projects are viewed as having more benign on-site environmental and land use impacts than surface storage. Surface storage is more suited to rapidly discharging or receiving large volumes of water, an advantage in real-time management of high river flow periods or environmental storage releases. Offstream surface storage projects are generally viewed as having significantly less environmental impacts than new on-stream projects. Nevertheless, both surface and groundwater storage projects create additional environmental impacts, including on-site impacts and direct and cumulative impacts caused by water diversions into the storage projects. Further, inappropriate public investments in new surface or groundwater storage may reduce incentives to invest in water conservation programs and other water management strategies.

Considering the magnitude of conflicts over available water in California, CALFED believes that it must continue to evaluate and implement a broad range of water management options to achieve the Program's objectives. Therefore, new storage will be developed and constructed, together with aggressive implementation of water conservation, recycling, and a protective water

transfer market, as appropriate to meet CALFED Program goals. During Stage 1, CALFED will undertake an Integrated Storage Investigation as part of its Water Management Strategy. As discussed below, the ISI will evaluate the relationship between and relative value of various types of storage and the overall role of storage. Based on the Water Management Strategy, including the ISI, CALFED will identify acceptable projects, and initiate permitting and construction if program linkages and conditions are satisfied.

Linkages and assurances are critical to the process of evaluating and constructing new storage in the CALFED Program. Before the final EIS/EIR and Record of Decision (ROD), CALFED will develop these linkages and assurances, including measures of success for the Program's Water Use Efficiency and Transfer Programs, and lay out a process and schedule for defining and pursuing the appropriate mix of new storage in Stage 1. As part of the assurance package, these linkages will be reflected in a memorandum of agreement to be executed no later than the ROD, articulating a Clean Water Act Section 404 compliance strategy and conditional programmatic assurance on the need for storage facilities, based on the necessary technical and economic analyses. The 404 compliance process is discussed in more detail in Chapter 5

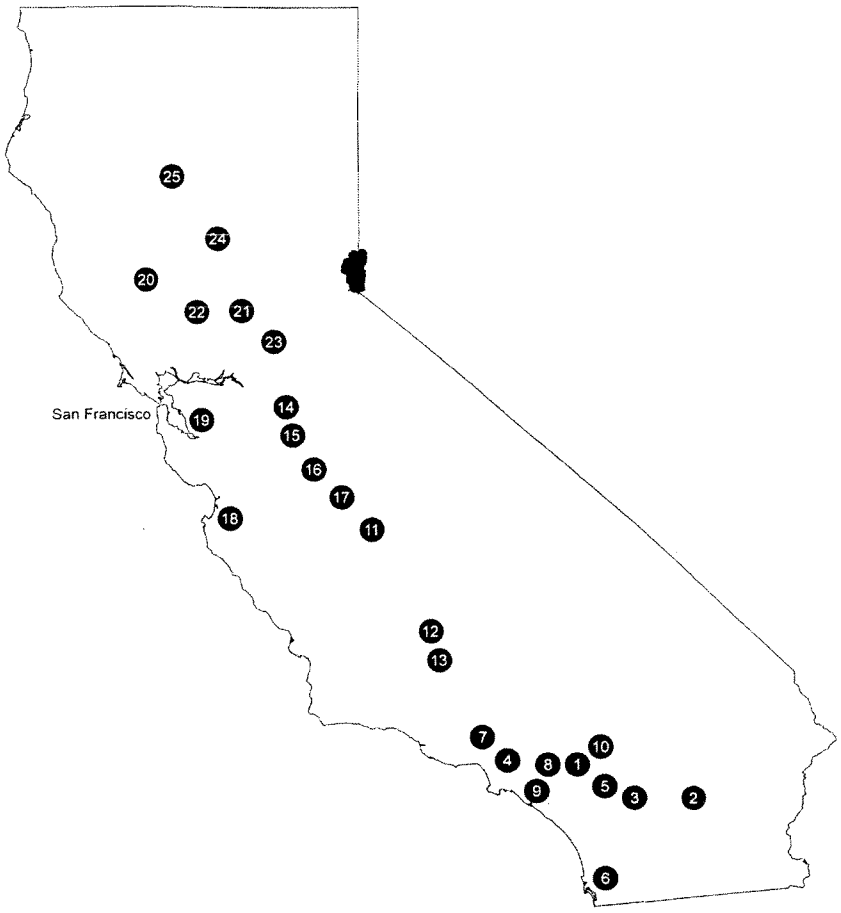
Based on a programmatic evaluation of potential water supply benefits and practical consideration of acceptable levels of impacts and total costs, the range of total new storage considered for evaluation in Phase II was from zero up to about 6 MAF. This was considered a reasonable range for study purposes and impact analysis; more detailed study and significant interaction with stakeholders will be required before specific locations and sizes of new storage are proposed. However, most water supply benefits of Sacramento River off-stream or enlarged on-stream surface storage are achieved with about 3 MAF of storage, while most water supply benefits of south of Delta off-aqueduct surface storage are attained with about 2 MAF of storage. Other types of surface storage considered in Phase II include San Joaquin River tributary storage and in-Delta storage. In addition, there may be significant opportunities for enhanced surface and groundwater storage within service areas dependent on Delta water for some or all of their supplies.

Appropriate and effective groundwater management and protection is essential to an effective water management strategy and to the success of a broad range of CALFED programs, including water transfers, groundwater banking, watershed management and water use efficiency programs. CALFED recognizes the critical role of local government agencies in protecting and managing groundwater resources, and will actively pursue cooperative partnerships with local agencies to achieve CALFED's objectives for groundwater banking and conjunctive use programs.

CALFED is developing guiding principles for conjunctive use programs to ensure that local concerns and potential impacts are fully addressed. During Phase II, CALFED considered groundwater banking and conjunctive use opportunities in the Sacramento and San Joaquin Valleys and in Southern California. An initial inventory of potential groundwater storage

opportunities was completed in 1997. More recently, CALFED formed the Conjunctive Use Advisory Team with staff from CALFED agencies and stakeholders. An initial task of the team was to ask about local interest for CALFED support on conjunctive use projects. Positive responses were received throughout the state including Southern California. Conjunctive use opportunities described in responses received as of publication of this document are shown in the following figure and table. CALFED will continue to evaluate these and other groundwater opportunities before deciding which projects it may support. If a loan or grant program is established, a public solicitation process to receive proposals will be initiated.

The practical storage capacity available for groundwater storage will be determined only after detailed study of specific projects and full consideration of local concerns. For study purposes, groundwater storage volumes of 250 TAF in the Sacramento Valley and 500 TAF in the San Joaquin Valley were considered in CALFED's programmatic evaluation. Potential storage in Southern California has not been estimated at this time. During the first stage of the Program, the CALFED agencies intend to support the construction of at least two to three groundwater banking facilities with a target volume of 500,000 acre feet of storage. Projects will be developed in close cooperation with local interests, and will be subject to full environmental review prior to implementation.

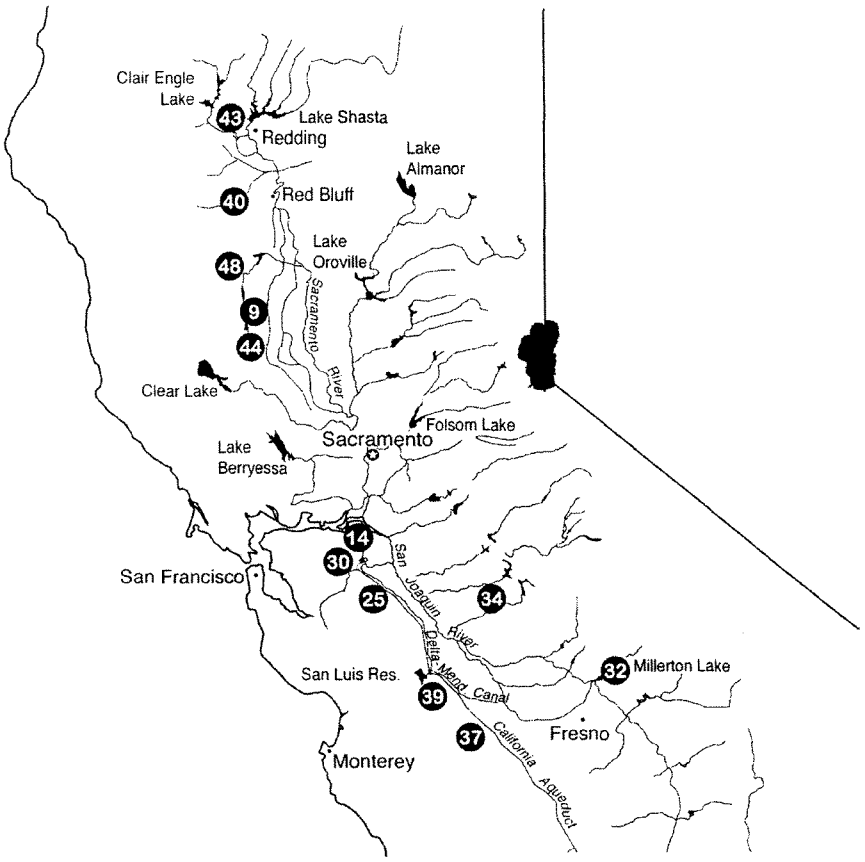


The Implementation Plan in Chapter 4 includes proposed groundwater banking and conjunctive use actions for Stage 1.

Current Local Interest for CALFED Groundwater Support

Project Name	County	Groundwater Basin	Map No.
Chino Basin Water Quality/Conjunctive Use Project	San Bernardino	Chino	1
Dike 4 Spreading Grounds Expansion of Coachella Canal Distribution System Martinez Canyon Spreading Grounds	Riverside	Coachella Valley	2
EMWD Conjunctive Use Plan	Riverside	Perris, Lakeview & San Jacinto	3
Main San Gabriel Basin Water Quality/Conjunctive Use Walnut Creek Restoration Project	Los Angeles	Main San Gabriel	4
Riverside Colton Conjunctive Use	Riverside	Riverside & Colton	5
Lower Sweetwater River Demineralization Facility	San Diego	San Diego Formation Lower Sweetwater River	6
Verdugo Basin	Los Angeles	Verdugo	7
Six Basins Conjunctive Use Program Spadra Basin Aquifer Storage/Recovery Pilot Proj.	Los Angeles	Canyon, Claremont Heights & Pomona Spadra	8
San Juan Basin Desalter Project	Orange	San Juan Creek	9
San Bernardino Valley Conjunctive Use	San Bernardino	CA DWR PSA 100	10
Kings River	Fresno	Kings	11
4-Districts Regional Groundwater Study	Tulare & Kern	Tulare Lake	12
Cummings Valley Importation Project Kern Delta	Kern	Cummings San Joaquin	13
East San Joaquin Recharge San Joaquin County Water Bank Stanislaus/Farmington Demonstration Recharge Stanislaus, Farmington, Calaveras & Mokelumne Recharge Farmington Conjunctive Use Study	San Joaquin	Eastern San Joaquin Delta-Central Sierra	14
Delta-Mendota Canal Aquifer Storage & Recovery	San Joaquin & Stanislaus	Tracy & Delta Mendota	15
Pilot Groundwater Recharge Facility Stevinson Wetland Improvement & Conjunctive Use	Stanislaus & Merced	Turlock Merced	16
Chowchilla Groundwater Recharge	Merced	Chowchilla Groundwater	17
Seaside Injection Project	Monterey	Seaside	18
East Bay Groundwater Injection/Extraction Project	Alameda	East Bay Plain	19
Adobe Creek Groundwater Recharge Project	Lake	Kelseyville	20
American River Cooperating Agencies	Sacramento & Placer	Sac. County	21
In-lieu Groundwater Recharge	Yolo	N/A	22
Rancho Murieta Aquifer Storage & Recovery	Sacramento	N/A	23
Glenn-Colusa Irrigation District Conjunctive Use Sac. River Settlement Contractors Conjunctive Use	Glenn & Colusa Various Counties	Sacramento Valley	24
Shasta County Water Resources Plan	Shasta	Redding Groundwater	25

CALFED will focus on off-stream reservoir sites for new surface storage, but will consider expansion of existing on-stream reservoirs. CALFED will not pursue storage at new on-stream reservoir sites. Under the ecosystem restoration program element, some dams and stream obstructions will be removed to open additional areas of aquatic habitat to anadromous fish.



For the purposes of the programmatic Phase II evaluation, an inventory of fifty-two potential new surface storage projects was compiled. Those projects that appeared most feasible (see adjacent figure of potential surface storage sites) were evaluated to provide representative information on costs and benefits. A more complete screening process for surface storage opportunities, taking into account engineering feasibility, potential environmental impacts, costs, and benefits, will proceed over the coming months and will be documented in a future report. Due to endangered species concerns, CALFED has screened out two sites that were shown in the December 1998 *Revised Phase II Report*. While screening remains to be completed, CALFED has narrowed the number of potential sites for additional CALFED consideration to the twelve in the following table. These include potential sites to provide benefits for water supply, flood control, water quality, and the ecosystem.

Reservoir Sites Retained for Additional CALFED Consideration (Retained for Future Evaluation and Screening)			
Project	**Location**	**Type**	**Gross Storage Capacity**
Colusa Reservoir Complex (Site 9)	Colusa/Glenn Counties Funks Creek	Off-Stream Storage	3,300 TAF
In-Delta Storage (Site 14)	Sacramento/San Joaquin Delta	Island Storage in the Delta	230 TAF
Ingram Canyon (Site 25)	Stanislaus County Ingram Creek	Off-Stream Storage	333 to 1,201 TAF
Los Vaqueros Enlargement (Site 30)	Contra Costa County Kellogg Creek	Off-Stream Storage	Additional 965 TAF
Millerton Lake Enlargement (Site 32)	Fresno County San Joaquin River	On-Stream Storage	Additional 720 TAF
Montgomery Reservoir (Site 34)	Stanislaus County Dry Creek	Off-Stream Storage	240 TAF
Panoche Reservoir (Site 37)	Fresno County Silver Creek	Off-Stream Storage	160 to 3,100 TAF
Quinto Creek Reservoir (Site 39)	Merced/Stanislaus County Quinto Creek	Off-Stream Storage	332 to 381 TAF
Schoenfield Reservoir portion of the Red Bank Project (Site 40)	Tehama County S.F. Cottonwood Creek	Off-Stream Storage	Schoenfield-250 TAF
Shasta Lake Enlargement (6.5-foot raise of existing dam) (Site 43)	Shasta County Sacramento River	On-Stream Storage	Additional 290 TAF
Sites Reservoir (Site 44)	Colusa and Glenn Counties Funks & Stone Corral Cks	Off-Stream Storage	1,200 to 1,900 TAF
Thomes-Newville Reservoir (Site 48)	Glenn County Thomes & Stoney Creek	Off-Stream Storage	1,840 - 3,080 TAF

Of course, the relationship of water supply benefits to groundwater and surface storage volume is highly dependent on operating assumptions. Much more detailed information about specific locations of new storage, potential allocation of storage benefits, and operational goals and constraints would be necessary to determine an optimal volume of storage from a water supply perspective. In addition, long-term effective groundwater management throughout California will be essential to a range of CALFED Programs, including water transfers, groundwater banking, watershed management, and water use efficiency programs.

A fundamental principle of the CALFED Program is that the costs of a program should be borne by those who benefit from the program. That principle is especially relevant in the decision

about new storage facilities. CALFED will seek public financing for the planning and evaluation of storage projects to ensure a comprehensive and fair comparison of storage options. However, should a storage project proceed to construction, then the public funds used for planning and evaluation will be reimbursed by the project beneficiaries. This "beneficiary pays" principle is critical to the overall CALFED goal of increasing the efficiency of water use in California.

The following linkages and conditions will guide development of groundwater/conjunctive use and new surface water storage. Agency and stakeholder input is needed to make the linkages and conditions for new storage more specific, and to develop appropriate "bundles" of actions so that all CALFED goals progress together.

- Completion of memorandum of agreement articulating a Clean Water Act Section 404 compliance strategy and programmatic assurance on the need for storage facilities
- Completion of all environmental documentation and permitting requirements
- Demonstrated commitment to finance by beneficiaries
- Demonstrated progress in meeting the Program's water use efficiency, water transfer program targets, and/or measures of success of other water management tools. These measures of success will be fully defined before the Final EIS/EIR and Record of Decision are issued.

In addition, groundwater/conjunctive use programs will be developed in tandem with the following actions:

- Groundwater monitoring, and modeling programs are established
- Full recognition is given to the rights of landowners under existing law
- Guidelines are in place to protect resources, address local concerns, and avoid potential impacts prior to and during implementation of a conjunctive management operation.

The CALFED Program has no specific objectives for hydropower generation. However, CALFED does seek to minimize negative impacts on resources, such as hydropower generation, during and after implementation. The Program may result in temporary or long-term changes in river and reservoir operations, which may affect the quantity, timing and value of hydropower produced within the Bay-Delta system. CALFED is coordinating with the Western Area Power Administration to assure that issues are identified and properly framed, so consequences and options are clear to stakeholders, the public, and CALFED.

Integrated Storage Investigation

As part of its ongoing evaluation of the appropriate role of storage alternatives in the CALFED solution, CALFED has initiated the Integrated Storage Investigation. The ISI will coordinate existing storage investigations by individual 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 reoperation and the potential for conjunctive operation of these different types of storage. These investigations, as part of the Water Management Strategy, will contribute to compliance with the Clean Water Act Section 404 Guidelines requirement to select the least environmentally damaging practicable alternative to constructing new storage facilities. The ISI will provide the analyses necessary for CALFED's determination of the proper mix of groundwater and surface storage facilities, and CALFED's Water Management Strategy will rely heavily on these analyses as it identifies an appropriate combination of water management tools for attaining CALFED's water supply reliability goals and objectives. Additionally, these investigations will provide a comprehensive assessment and prioritization of critical fish migration barriers for modification or removal.

The study elements within the Integrated Storage Investigation include:

Overall Storage Strategy: In the ISI, CALFED will describe the role of storage in the Water Management Strategy and its programmatic utility and limitations. It will identify the potential to achieve water quality, water supply reliability and ecosystem benefits, and it will determine the proper mix of surface and groundwater storage and the general operational strategy necessary to meet CALFED objectives, technical assumptions developed with assistance from CALFED agencies and stakeholders, and linked economic and hydrologic modeling.

Surface Storage Investigations:. 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, although it has already provided preliminary guidance for more detailed investigations, continues to be refined to assure consistency with current planning conditions and available environmental data. The following study elements have already been identified and will be integrated through system hydrologic modeling, economic analysis, and regional evaluations:

> **Surface Storage Facilities Screening:** Narrow the range of candidate surface storage sites based on engineering, economic, and environmental considerations. This screening effort is necessary to ensure that consideration is only given to sites with some viability and is essential to better defining specific operational criteria and expected costs.

North of Delta Off-Stream Storage Investigation: This DWR study was initially authorized under the Safe, Clean, Reliable Water Supply Act of 1996 and is continuing under augmented funding provided through the State budget. The proposed projects would rely on a mix of local runoff and/or diversions from the Sacramento River to develop additional water supply reliability.

In-Delta, Adjacent to Delta and Off-Aqueduct Storage Studies: Delta area storage could provide significant operational flexibility to enhance water supply reliability, water quality, and ecosystem benefits. Delta area storage may have several unique operational attributes for water quality and real time system operation which must be specifically evaluated as part of the ISI. Similarly, off-aqueduct storage can enhance operational flexibility by providing additional opportunities to export Delta water when biological and water quality conditions warrant. A primary impact concern of in-Delta storage is loss of agricultural land.

On-Stream Storage Enlargement Studies: The USBR has completed an initial assessment of potential Shasta Lake enlargement alternatives. Raising the dam elevation by about 6 feet may prove to be a cost-effective option for expanding capacity by about 290,000 acre-feet. The primary impact concerns would include additional inundation of streams entering the lake, loss of terrestrial habitat, changes in the timing of reservoir releases, and impacts on recreation facilities on the existing shoreline. There has also been considerable interest in exploring an enlargement of Millerton Reservoir by modifying Friant Dam for potential improvements in flood control, water supply reliability, and ecosystem restoration. Given the potential for multiple benefits from such enlargements, these efforts are included in the ISI for further development in the context of the other options.

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 use of pilot studies to methodically assess opportunities and impacts before full implementation. In addition, DWR and USBR are pursuing cooperative partnerships with local agencies to study and implement specific groundwater banking and conjunctive use opportunities. DWR's North of Delta Off-Stream Storage Study also includes evaluation of opportunities for exchanges and groundwater management in conjunction with surface storage. 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 Reoperation Evaluation: Regulatory reform in the electrical power industry has presented a unique opportunity to evaluate whether existing hydroelectric facilities can be acquired and reoperated for water supply purposes. CALFED's initial evaluation is that, after

considering the effects of reoperation on downstream users, water quality, environmental resources, power production, and recreation, the opportunities may be limited, especially at the smaller reservoirs. Nevertheless, these facilities already exist, and could offer benefits for local water supplies or for an Environmental Water Account, as well as providing additional operational flexibility.

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. There is a need for a more systematic approach to identifying and prioritizing barriers for future action. The scope of ISI provides an opportunity for such a comprehensive assessment.

3.6.6 Water Management Strategy Tools In Action: The Environmental Water Account

CALFED's proposed Environmental Water Account (EWA) is a good example of how to provide fisheries protection and recovery while providing ancillary benefits for water quality and water supply reliability to help achieve CALFED's overall water management goals. The EWA is based upon the concept that flexible management of water could achieve fishery and ecosystem benefits more efficiently than a completely prescriptive regulatory approach. By managing EWA "assets" on a real-time basis, the overall cost of environmental protection can be lower than under a purely prescriptive approach. This would help attain water supply reliability objectives for other water users. In addition, by managing the EWA in close coordination with other parts of the water management strategy, multiple benefits can be achieved from the use of EWA assets. For example, the EWA could time water releases to achieve both fishery enhancement and water quality benefits.

The importance of a successful EWA program to the overall CALFED water management strategy cannot be overemphasized. If the EWA fails to improve environmental conditions as envisioned, additional regulatory measures under State and federal laws will continue to reduce the ability of the system to provide necessary water supply benefits. Further, Delta improvements may be difficult to implement given the many regulatory permit programs that protect environmental resources. CALFED intends to develop the specific details of an EWA in the immediate future, so that this water management strategy can be operational at the beginning of Stage 1.

As envisioned by CALFED, the EWA would need to make use of many of the water management tools described above. Especially in its first few years of operation, a substantial portion of the water needed for an EWA will need to be acquired through voluntary purchases on the water transfer market. CALFED's analysis of the EWA concept also suggests that the EWA "performance" increases as the EWA's access to surface and groundwater storage increases.

Flexibility in project operations and improvements in conveyance facilities can both help deliver environmental water at the desired place and time and can help "create" new EWA "assets." Finally, the EWA cannot function without a comprehensive monitoring program such as CALFED's CMARP.

As developed by CALFED, during Stage 1 the EWA would work from a foundation of the existing regulatory regime. The EWA would not be a substitute for prescriptive standards. It would not change or relax existing water quality standards. The EWA would provide fisheries benefits above and beyond the existing 1994 Bay-Delta Accord, CVPIA, 1995 Delta Water Quality Control Plan, and ESA biological opinions without adding new regulatory requirements. At the same time, the EWA would take advantage of the flexibility provisions already provided in those regulatory programs to provide both ecosystem and water supply reliability benefits. Current regulations allow flexibility in applying the "Export/Inflow Ratio" standard protecting anadromous fish (which mandates a certain maximum ratio of water exported from the Delta compared to water entering the Delta). When monitoring indicates that fish are not likely to be affected, the E/I Ratio can be "flexed" to provide water for the EWA and to improve water supply reliability. This EWA additional water could provide additional protection at more sensitive times. CALFED intends to implement and evaluate the EWA in Stage 1, and, based on its performance, will consider whether and to what extent the EWA can subsequently be applied to a broader range of regulatory programs protecting Delta resources.

How an Environmental Water Account Could Work

There are a variety of potential approaches to defining and operating an EWA. All approaches provide resources to the EWA which can be used to alter project operations. For example, the account might have the right to directly reduce project exports for a set number of days or a set volume of exports as part of a broad regulatory

EWA Versus Prescriptive Standards

The EWA concept and traditional prescriptive standards represent fundamentally different approaches to natural resource protection, and both have strengths and weaknesses. Compared to prescriptive standards, an EWA allows for more creative, flexible and adaptive responses to real-time developments in the environment. In addition, by requiring EWA managers to budget EWA assets, the EWA encourages a more efficient use of environmental water supplies. At the same time, however, EWA must have adequate assets -- money, storage space, and water -- and must rely on a functional water market to effectively translate EWA assets into environmental protection measures, and inefficiencies in the water market can translate into an inefficient EWA. In addition, the EWA's reliance on real-time information about resource responses requires an extensive, and expensive, monitoring program.

Compared to an EWA, prescriptive standards have certain advantages. Whereas the EWA approach focuses on protecting one or a few targeted species, prescriptive standards can provide broad ecosystem protection to a wider range of species. Prescriptive standards generally provide a greater assurance of the intended protection, in that they do not rely on real-time decisions by asset managers. Nevertheless, prescriptive standards can be rigid and inefficient; they can be overly broad, in which case they are an inefficient use of natural resources, or they can be overly narrow, in which case they do not adequately protect the intended resources.

These considerations suggest that the optimum approach would include a combination of prescriptive standards and an EWA. The prescriptive standards would be used to provide the broad baseline level of ecosystem protection, and to address specific species needs that are well established and predictable. The EWA can then be used to "fine-tune" ecological protection, reallocating EWA assets to provide additional protection to targeted species as indicated by real-time events.

control over project operations -- a "credit" approach. Alternatively, part of the yield of new facilities or regulatory flexibility might be converted into a standard contract for the delivery of water each year. However, the approach CALFED has evaluated most closely to date is the "gallon-for-gallon" approach. Under this approach, the EWA would acquire, move, store, and expend its own water supplies in a variety of locations, and would track the use of those water supplies on a "gallon-for-gallon" basis. EWA water could be acquired through purchases, through flexible application of some prescriptive standards, or through sharing the use of new facilities. Many EWA operations could be carried out using surplus capacity in existing project facilities.

Once assets are acquired, the EWA could then draw on its water "savings account" to provide additional species protection ranging from flows in upstream tributaries to reduced exports from the Delta. The EWA manager would work closely with the project operators in using an EWA to modify project operations in real-time. For example, if fish were detected in the vicinity of the export pumps, EWA managers could request reductions in export pumping to protect the fish. In return, the water projects could be compensated for water supply losses out of EWA assets. Although the EWA would affect more than just the Delta export facilities, examples of how an EWA may operate in relation to Delta exports over the course of several years are presented below:

- If export reductions are needed to protect salmon and delta smelt, San Luis Reservoir would be drawn down to provide water to the State and federal projects water users.

- The EWA would repay water to the projects with EWA water already sitting in surface storage, groundwater storage, anticipated efficiency supplies, or water purchases. The EWA may not need to pay back the water during the current water year, but could carry its obligation over to the next year in the hopes that favorable conditions would allow for payback with minimal cost to the EWA. But, if San Luis water supply is already low, then payback might be required in the current year.

- Another result of export reductions might be lower releases and higher storage in State and federal reservoirs upstream of the Delta (because Delta outflows can now be sustained with lower Delta inflows). Just as the EWA would be responsible for paying back the reduction in San Luis storage, it would gain control over the increased upstream storage. Releases from this upstream storage could be used to improve instream conditions below the reservoirs in the fall, and then either transferred to pay off the "debt" in San Luis Reservoir or left instream to increase Delta outflow.

Given the complexity of the water system in California, real operations of the EWA would be much more complicated, with the EWA managers spending assets to protect fish part of the year;

diverting water to rebuild assets over other parts of the year; shifting water between surface storage and groundwater storage, and trying to anticipate and accommodate biological needs. While EWA strategies will be developed through a coordinated operations approach among the SWP, CVP, affected stakeholders and other agencies, CALFED envisions that final authority will rest with agencies responsible for assuring compliance with endangered species protections, including DFG, USFWS, and NMFS.

As noted above, water quality concerns must also be considered in managing the EWA. Operational changes to enhance the protection of aquatic resources and export supplies have the potential to affect water quality, either positively or negatively. Management of the EWA must be coordinated closely with operation of the State and federal water projects and the CALFED Water Quality Program to assure that EWA operations do not adversely affect and, potentially, be used to enhance the Program's ability to meet its water quality goals.

EWA Gaming Exercises

To gain insight into whether and how an EWA could improve fish conditions while protecting water quality and water supply benefits, a group including CALFED Agency staff and stakeholders simulated four EWA operations scenarios. These EWA gaming exercises allowed project operators, fishery agency biologists and stakeholders to work together as they reacted to the constant change in hydrological and biological conditions that is typical of the Delta. The gaming allowed them to see how conditions responded to the decisions they made as to how to build and apply EWA assets.

The group conducted several simulations to better understand how an EWA might have been operated if it had existed during the 1991 through 1995 water years. These five years included a variable hydrologic sequence of wet years and dry years to test the EWA, but these years do not reflect all the variation that EWA management could encounter. The simulations were conducted only once each time, in an attempt to reduce the group's foresight as to hydrological or biological conditions. In each simulation, the EWA had access to a different collection of facilities, contracts, rights, and income. The EWA controlled a network of high and low priority storage rights in surface and groundwater storage. The EWA controlled a series of contracts giving it the right to purchase water in any given year. It had the right to allow variances in application of the Export/Inflow standard in order to generate environmental water. Finally, it had an income of $30-$40 million per year for water purchases. Three scenarios used the "gallon for gallon" approach with assumed assets in place at the start, middle, and end of Stage 1. The fourth scenario used a "credit" approach with assets assumed at the middle of Stage 1.

Gaming Group Comments. Changes in operations were simulated using a set of assumed assets of the EWA and historic fish salvage records on top of a basic model of project operations with current regulatory conditions. The group then could evaluate the effects of their decisions on fish resources, water quality, water supply reliability, and the EWA account. Drawing on the outcomes of their decisions, the gaming group developed some preliminary conclusions as to

how an EWA might be best structured and operated. Note that CALFED has not definitively adopted either these conclusions or the assumptions underlying particular gaming exercises as part of the proposed CALFED EWA. As noted above, CALFED will refine the EWA and have an operational EWA ready for implementation at the beginning of Stage 1. In its deliberations, CALFED will evaluate the following preliminary comments from the gaming group.

An EWA can provide important Delta fishery benefits, if properly implemented. Having the ability to adjust flows and exports at key times offers the potential to reduce fish entrainment losses at the export pumps with only a minimal cost to export supplies. Such flexibility improved overall survival as well as reduced vulnerability to export loss/entrainment for both Delta resident and anadromous fish.

An EWA can improve instream flow patterns upstream of the Delta. The ability for the EWA to move (back up) its south of Delta water into upstream reservoirs allowed the EWA to later release the water to create beneficial upstream flow patterns for salmon.

An EWA can provide indirect benefits to water quality and water supply. The availability of water in the EWA provided synergistic benefits to water quality and water supply. During the simulations the group observed that operating the EWA for fish benefits often helped water supply get through the summer "low-point" in San Luis reservoir. EWA water releases and export reductions often provided ancillary benefits to water quality by increasing Delta outflow and reducing chlorides and bromides in the Delta water supply. Water quality, water supply reliability and ecosystem each can borrow or count on the resources of the other to help meet objectives within a highly variable and unpredictable system.

Adequate assets are essential. Water for the EWA must be available at the beginning of Stage 1. Funding must be assured through time and adequate to secure needed water through Stage 1. Any water purchases needed by the EWA must be feasible and timely.

More experience improves efficiency in use of EWA assets. As the EWA gamers proceeded through each game, they learned how to use their water assets more efficiently to improve conditions for fish, and they improved their ability to anticipate fish needs.

Access to storage provides value to EWA. A key element of the EWA was access to both groundwater and surface storage upstream, downstream, and in the Delta. Storage provides flexibility and valuable assets. In all scenarios, it was very beneficial to the EWA to use available storage in existing SWP, CVP and other reservoirs. Surface storage facilities allow more flexibility than groundwater storage. Groundwater recharge rates limit opportunities to refill the account, while groundwater extraction rates limit use of the account.

The balance between financial and water assets can shift with time. Funds for water purchases are essential to the EWA, with higher annual funding needed in the early years of implementation before additional facilities provide new assets independent of purchases. As certain facilities come on-line, the purchases can be replaced with water in storage or water moved to key locations.

Monitoring data provided through CMARP will be essential. Effective decisions depend on accurate, timely information. CMARP and the EWA must function together to help anticipate the impacts of project operations so these impacts can be reduced or avoided. Sufficient knowledge to allow proper assessment of conditions and needs will require more thorough monitoring of aquatic resources in the future.

Impacts May Shift. Operation of the EWA may shift impacts to different species, life stages, and habitats from those that the EWA is trying to protect.

Competition for Water Transfers Will Increase. As the EWA purchases exported and stored water, it will compete with existing and future purchasers of water.

More conflicts than expected occurred during wet years. While there is more water generally available during wet years, there is more potential for conflict over the use of conveyance and storage facilities.

Issues To Be Resolved

In addition to considering the comments from the gaming group, CALFED will need to resolve a number of major issues before it can implement an effective EWA. These issues include:

Initial Assets/Structure. In order for the EWA to be effective in the first years of Stage 1, its assets will need to be substantial, particularly financial assets that allow water purchases. CALFED estimates that the EWA will require approximately $50 million/year in Stage 1. The first step to developing those assets is determining the EWA's asset needs, particularly in relationship to environmental protections provided through prescriptive standards.

Sharing System Flexibility. In the gaming exercises, the EWA took advantage of a substantial portion of the overall water delivery system's operational flexibility. To make the EWA function in Stage 1, CALFED will need to determine how operational flexibility will be shared between the EWA and water users.

Operations. In order to plan the EWA's operations over the long-term, CALFED will need to craft the outlines of how the EWA will build, apply and renew its assets. What share of facility improvements will the EWA gain? How will the EWA manager account for the assets?

Governance. Effective management of the EWA will be critical to its success. How will the assets be managed? How will biological needs be determined? How will the public participate? How will the EWA's fishery activities be linked to other CALFED activities?

Coordination of Funding Sources. CALFED must evaluate the extent to which funds and expenditures for upstream ERP water acquisitions can be integrated into the EWA water acquisitions. Similarly, CALFED must develop mechanisms for coordinating water purchases under the ERP and EWA with other ongoing environmental water acquisition programs such as the CVPIA Anadromous Fish Restoration Program.

Before issuing the Record of Decision, CALFED will resolve these and other issues necessary for implementation of the EWA early in Stage 1.

3.7 The Preferred Program Alternative

The Preferred Program Alternative consists of a set of broadly described programmatic actions which set the long-term, overall direction of the CALFED Program. The description is programmatic in nature, intended to help agencies and the public make decisions on broad methods to meet Program purposes. The preferred program alternative is made up of the Levee System Integrity Program, Water Quality Program, Ecosystem Restoration Program, Water Use Efficiency Program, Water Transfers Program, Watershed Program, Storage and Conveyance.

Even in this broad programmatic description, actions are intended to take place in an integrated framework and not independently of the other programs. While each program element is described individually, it is understood that only through coordinated, linked, incremental investigation, analysis and implementation can we effectively resolve problems in the Bay-Delta system.

Levee System Integrity Program

The focus of the Levee System Integrity Program is to improve levee stability to benefit all users of Delta water and land. Actions described in this program element protect water supply reliability by maintaining levee and channel integrity. Levee actions will be designed to provide simultaneous improvement in habitat quality, which will indirectly improve water supply reliability. Levee actions also protect water quality, particularly during low flow conditions when a catastrophic levee breach would draw salty water into the Delta.

There are five main parts to the levee program plus Suisun Marsh levee rehabilitation work:

- Delta Levee Base Level Protection Plan - Improve and maintain Delta levee system stability to meet the Corps' PL 84-99 levee standard.
- Delta Levee Special Improvement Projects - Enhance flood protection for key islands that provide statewide benefits to the ecosystem, water supply, water quality, economics, infrastructure, etc.
- Delta Levee Subsidence Control Plan - Implement current best management practices (BMPs) to correct subsidence adjacent to levees and coordinate research to quantify the effects and extent of inner-island subsidence.
- Delta Levee Emergency Management and Response Plan - The emergency management and response plan will build on existing state, federal, and local agency emergency management programs.
- Delta Levee Risk Assessment- Perform a risk assessment to quantify the major risks to Delta resources from floods, seepage, subsidence and earthquakes, evaluate the consequences, and develop recommendations to manage the risk.
- Suisun Marsh Levees- Rehabilitate Suisun Marsh levees.

Water Quality Program

The CALFED Program is committed to achieving continuous improvement in the quality of the waters of the Bay-Delta System with the goal of minimizing ecological, drinking water and other water quality problems, and to maintaining this quality once achieved. Improvements in water quality will result in improved ecosystem health, with indirect improvements in water supply reliability. Improvements in water quality also increase the utility of water, making it suitable for more uses.

The Water Quality Program includes the following actions:

- Drinking water parameters - Reduce the loads and/or impacts of bromide, total organic carbon, pathogens, nutrients, salinity, and turbidity through a combination of measures that include source reduction, alternative sources of water, treatment, storage and if necessary, conveyance improvements such as a screened diversion structure (up to 4000 cfs) on the Sacramento River near Hood. The Conveyance section of this document includes a discussion of this potential improvement.
- Pesticides - Reduce the impacts of pesticides through (1) development and implementation of BMPs, for both urban and agricultural uses; and (2) support of pesticide studies for regulatory agencies, while providing education and assistance in implementation of control strategies for the regulated pesticide users.
- Organochlorine pesticides - Reduce the load of organochlorine pesticides in the system by reducing runoff and erosion from agricultural lands through BMPs.

- Trace metals - Reduce the impacts of trace metals, such as copper, cadmium, and zinc, in upper watershed areas near abandoned mine sites. Reduce the impacts of copper through urban storm water programs and agricultural BMPs.
- Mercury - Reduce mercury levels in rivers and the estuary by source control at inactive and abandoned mine sites.
- Selenium - Reduce selenium impacts through reduction of loads at their sources and through appropriate land fallowing and land retirement programs.
- Salinity - Reduce salt sources in urban and industrial wastewater to protect drinking and agricultural water supplies, and facilitate development of successful water recycling, source water blending, and groundwater storage programs. Salinity in the Delta will be controlled both by limiting salt loadings from its tributaries, and through managing seawater intrusion by such means as using storage capability to maintain Delta outflow and to adjust timing of outflow, and by export management.
- Turbidity and sedimentation - Reduce turbidity and sedimentation, which adversely affect several areas in the Bay Delta and its tributaries.
- Low dissolved oxygen - Reduce the impairment of rivers and the estuary from substances that exert excessive demand on dissolved oxygen.
- Toxicity of unknown origin - Through research and monitoring, identify parameters of concern in the water and sediment and implement actions to reduce their impacts to aquatic resources.

Ecosystem Restoration Program

The goal of the Ecosystem Restoration Program is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta system to support sustainable populations of diverse and valuable plant and animal species. In addition, the Ecosystem Restoration Program, along with the water management strategy, is designed to achieve or contribute to the recovery of listed species found in the Bay-Delta and, thus, achieve goals in the Multi-species Conservation Strategy. Improvements in ecosystem health will reduce the conflict between environmental water use and other beneficial uses, and allow more flexibility in water management decisions.

The Ecosystem Restoration Program identifies programmatic actions designed to restore, rehabilitate, or maintain important ecological processes, habitats, and species within 14 ecological management zones. Implementation of these programmatic actions will be guided by six goals presented in the Strategic Plan for Ecosystem Restoration. Nearly 100 restoration objectives have been developed which are directly linked to one of the six goals. Each objective further defines the restoration approach for each ecological process, habitat, species or ecosystem stressor. One to several restoration targets have been developed for each objective to set more specific or quantified restoration levels.

Long-term implementation of the Ecosystem Restoration Program will be guided by the adaptive management approach described in the Strategic Plan for Ecosystem Restoration. This approach to restoration will require review by an Ecosystem Restoration Science Review Panel and will rely on information developed in the Comprehensive Monitoring, Assessment, and Research Program.

Representative Ecosystem Restoration Program actions include:

- Protecting, restoring, and managing diverse habitat types representative of the Bay-Delta and its watershed.
- Acquiring water from sources throughout the Bay-Delta's watershed to provide flows and habitat conditions for fishery protection and recovery.
- Restoring critical in-stream and channel-forming flows in Bay-Delta tributaries.
- Improving Delta outflow during key periods.
- Reconnecting Bay-Delta tributaries with their floodplains through the construction of setback levees, the acquisition of flood easements, and the construction and management of flood bypasses for both habitat restoration and flood protection.
- Developing assessment, prevention and control programs for invasive species.
- Restoring aspects of the sediment regime by relocating in-stream and floodplain gravel mining, and by artificially introducing gravels to compensate for sediment trapped by dams.
- Modifying or eliminating fish passage barriers, including the removal of dams, construction of fish ladders, and construction of fish screens that use the best available technology.
- Targeting research to provide information that is needed to define problems sufficiently, and to design and prioritize restoration actions.

Water Use Efficiency Program

The Water Use Efficiency Program includes actions to assure efficient use of existing and any new water supplies developed by the Program. Efficiency actions can alter the pattern of water diversions and reduce the magnitude of diversions, providing ecosystem benefits. Efficiency actions can also result in reduced discharge of effluent or drainage, improving water quality.

The Water Use Efficiency Program will build on the work of the existing Agricultural Water Management Council and California Urban Water Conservation Council process, supporting and supplementing those processes through planning and technical assistance and through targeted financial incentives (both loans and grants). The Water Use Efficiency Program has identified potential recovery of currently irrecoverable water losses of over 1.4 million acre-feet of water annually by 2020 as a result of CALFED actions. Before execution of the

Record of Decision, CALFED will identify measurable goals and objectives for its urban and agricultural water conservation program, water reclamation programs and managed wetlands programs.

Water conservation-related actions include:

- Implement agricultural and urban conservation incentives programs to provide grant funding for water management projects that will provide multiple benefits which are cost-effective at the state-wide level, including improved water quality and reduced ecosystem impacts.
- Identify, in region-specific strategic plans for agricultural areas, measurable objectives to assure improvements in water management.
- Expand state and federal programs to provide increased levels of planning and technical assistance to local water suppliers.
- Work with the Agricultural Water Management Council (AWMC) to identify appropriate agricultural water conservation measures, set appropriate levels of effort, and certify or endorse water suppliers that are implementing locally cost-effective feasible measures.
- Work with the California Urban Water Conservation Council (CUWCC) to establish an urban water conservation certification process and set appropriate levels of effort in order to ensure that water suppliers are implementing cost-effective feasible measures.
- Help urban water suppliers comply with the Urban Water Management Planning Act.
- Identify and implement practices to improve water management for wildlife areas
- Gather better information on water use, identify opportunities to improve water use efficiency, and measure the effectiveness of conservation practices.
- Conduct directed studies and research to improve understanding of conservation actions.

Water recycling actions include:

- Help local and regional agencies comply with the water recycling provisions in the Urban Water Management Planning Act.
- Expand state and federal recycling programs to provide increased levels of planning, technical, and financing assistance (both loans and grants) and to develop new ways of providing assistance in the most effective manner.
- Provide regional planning assistance that can increase opportunities for the use of recycled water.

Water Transfer Program

The Water Transfer Program proposes a framework of actions, policies, and processes that, collectively, will facilitate water transfers and the further development of a state-wide water transfer market. The framework also includes mechanisms to provide protection from third party impacts. A transfers market can improve water availability for all users, including the environment. Transfers can also help to match water demand with water sources of the appropriate quality, thus increasing the utility of water supplies.

The Water Transfer Program will include the following actions and recommendations:

- Establish a California Water Transfer Information Clearinghouse to provide a public informational role. The clearinghouse would 1) ensure that information regarding proposed transfers is publically disclosed and, 2) perform on-going research and data collection functions to improve the understanding of water transfers and their potential beneficial and adverse effects.
- Require water transfer proposals submitted to the Department of Water Resources, the U.S. Bureau of Reclamation, or the State Water Resources Control Board to include analysis of potential groundwater, socio-economic, or cumulative impacts as warranted by individual transfers.
- Streamline the water transfer approval process currently used by the Department of Water Resources, the U.S. Bureau of Reclamation, or the State Water Resources Control Board. This would include clarifying and disclosing current approval procedures and underlying policies as well as improving the communication between transfer proponents, reviewing agencies, and other potentially affected parties.
- Refine quantification guidelines used by water transfer approving agencies when they are reviewing a proposed water transfer. This will include resolving issues between stakeholders and approving agencies regarding the application of current agency-based quantification criteria.
- Improve the accessibility of state and federal conveyance and storage facilities for the transport of approved water transfers.
- Clearly define carriage water requirements and resolve conflicts over reservoir refill criteria such that transfer proponents are acutely aware of the implications of these requirements.
- Identify appropriate assistance for groundwater protection programs through interaction with CALFED agencies, stakeholders, the legislature and local agencies. This is intended to assist local agencies in the development and implementation of groundwater management programs that will protect groundwater basins in water transfer source areas.
- Establish new accounting, tracking, and monitoring methods to aid instream flow transfers under California Water Code Section 1707.

Watershed Program

The Watershed Program provides assistance, financial and technical, to local watershed programs that benefit the Bay-Delta system. Watershed actions can improve reliability by shifting the timing of flows, increasing base flows and reducing peak flows. This also helps to maintain levee integrity during high flow periods. Other watershed actions will improve water quality by reducing discharge of parameters of concern.

The Watershed Program includes the following elements:

- Support local watershed activities - Implement watershed restoration, maintenance, and conservation activities that support the goals and objectives of the Program including improved river functions.
- Facilitate coordination and assistance - Facilitate and improve coordination and assistance between government agencies, other organizations, and local watershed groups.
- Develop watershed monitoring and assessment protocols - Facilitate monitoring efforts that are consistent with the CALFED's protocols and support watershed activities that ensure that adaptive management processes can be applied.
- Support education and outreach - Support resource conservation education at the local watershed level, and provide organizational and administrative support to watershed programs.
- Define watershed processes and relationships - Identify the watershed functions and processes that are relevant to the CALFED goals and objectives, and provide examples of watershed activities that could improve these functions and processes.

Storage

Groundwater and /or surface water storage can be used to improve water supply reliability, provide water for the environment at times when it is needed most, provide flows timed to maintain water quality, and protect levees through coordinated operation with existing flood control reservoirs. Decisions to construct groundwater and/or surface water storage will be predicated upon complying with all program linkages, including:

- An assessment of groundwater storage, surface storage, re-operation of power facilities and a fish barrier assessment as part of the Integrated Storage Investigation.
- Demonstrated progress in meeting the Program's water use efficiency, water reclamation and water transfer program targets under the Water Management Strategy.

- Implementation of groundwater monitoring and modeling programs.
- Compliance with all environmental review and permitting requirements.

Subject to the above conditions, new groundwater and/or surface water storage will be developed and constructed, together with aggressive implementation of water conservation, recycling and a protective water transfer market, as appropriate to meet CALFED Program goals. During Stage 1, through the Water Management Strategy (including the Integrated Storage Investigation) CALFED will evaluate and determine the appropriate mix of surface water and groundwater storage, identify acceptable projects and initiate permitting and construction if program linkages and conditions are satisfied.

The total volume of surface and groundwater storage being assessed for this alternative range up to 6.0 million acre feet, and facility locations being considered are located in the Sacramento and San Joaquin Valleys and in the Delta. A list of sites for further consideration is included in the Draft Programmatic EIS/EIR.

Conveyance

The preferred program alternative employs a through-Delta approach to conveyance. Modifications in Delta conveyance will result in improved water supply reliability, protection and improvement of Delta water quality, improvements in ecosystem health, and reduced risk of supply disruption due to catastrophic breaching of Delta levees. The proposed through-Delta conveyance facility actions include:

- Construction of a new screened intake at Clifton Court Forebay with protective screening criteria.
- Construction of either a new screened diversion at Tracy with protective screening criteria; and/or an expansion of the new diversion at Clifton Court Forebay to meet the Tracy Pumping Plant export capacity.
- Implementation of the Joint Point of Diversion for the SWP and CVP, and construction of interties.
- Construction of an operable barrier at the head of Old River to improve conditions for salmon migrating up and down the San Joaquin River.
- Construction of operable barriers taking into account fisheries, water quality and water stage needs in the south Delta.
- Operational changes to the SWP operating rules to allow export pumping up to the current physical capacity of the SWP export facilities.
- Study and evaluate a screened diversion structure on the Sacramento River (or equivalent water quality actions) as a measure to improve drinking water quality in the event that the Water Quality Program measures do not result in adequate improvements toward CALFED's drinking water quality goals. This evaluation would consider how to operate the Delta Cross Channel in conjunction with this

new diversion structure to improve drinking water quality, while maintaining fish recovery.

- If the Water Quality Program measures are consistently not achieving drinking water quality goals, and the evaluation demonstrates that a screened diversion of up to 4000 cfs would help achieve those goals without adversely affecting fish populations; a pilot screened diversion would be constructed. This pilot would likely include a fish screen, pumps and a channel between the Sacramento and Mokelumne River. The design, size and operating rules for this pilot facility would include an analysis of impacts to upstream and downstream migrating fish as well as impacts from habitat shifts resulting from increased flows in the eastern Delta on Delta species. Following evaluation of the pilot facility operations, a final decision would be made on whether the diversion channel and structure should continue to be used, and if so, what the operational rules and optimum size of the diversion should be.
- Construct new setback levees, dredge and/or improve existing levees along the channels of the lower Mokelumne River system from Interstate 5 downstream to the San Joaquin River.

The Preferred Program Alternative also includes a process for determining the conditions under which any additional conveyance facilities and/or other water management actions would be taken in the future. The process would include:

- An evaluation of how water suppliers can best provide a level of public health protection equivalent to Delta source water quality of 50 ppb Bromide and 3 ppm TOC.
- An evaluation based on two independent expert panels' reports–one on CALFED's progress toward these measurable water quality goals and the second on CALFED's progress toward ecosystem restoration objectives, with particular emphasis on fisheries recovery.

4. PROGRAM IMPLEMENTATION

Phase II of the CALFED Bay-Delta Program will culminate with the federal Record of Decision and the State Certification of the Final Programmatic EIS/EIR (expected to be completed in mid-2000). At that time, Phase III of the CALFED Bay-Delta Program will begin implementation of the Preferred Program Alternative. Phase III is expected to extend 30 years or more.

Program implementation during Phase III will be guided by the implementation plan. The plan focuses on the early years of implementation when needed actions are better known but also reflects a long-term vision for continuing implementation over the next several decades.

The implementation plan cannot be completed until the final programmatic EIS/EIR is completed and the complete "decision" is defined. Therefore, this draft implementation plan, like other chapters of the *Revised Phase II Report*, is a work in progress. This chapter contains the following parts:

- **Stage 1 Actions** - A list of proposed actions for the first seven years of implementation following the Record of Decision and Certification of the EIS/EIR.
- **Near Term (Stage 1a) Actions** - A more detailed list of proposed actions to be initiated in the first two years following the Record of Decision and Certification of the EIS/EIR. The actions are grouped into bundles of actions to provide both regional and programmatic balance.
- **Governance Plan** - Describes Program implementation functions and recommends an interim governance structure for CALFED. A recommendation for the long-term will be completed by the time of the ROD.
- **Financing Plan** - Plan for funding the implementation of the preferred alternative including financing principles, cost allocation and cost sharing considerations, and Program element cost estimates.
- **Restoration Coordination** - Describes early implementation of ecosystem restoration actions. Actions are selected for their benefits to the long-term program regardless of the final configuration of the Preferred Program Alternative.
- **Comprehensive Monitoring, Assessment and Research Program** - Plan for monitoring and research that provides the data and necessary information to evaluate the performance of completed actions for use in supporting the adaptive management of future actions.
- **Adaptive Management** - Plan to use the monitoring and research to adjust future implementation as more is learned about the system and how it responds to restoration efforts.

4.1 Stage 1 Actions

Stage 1 is defined as the seven year period commencing with the final decision on the Programmatic EIS/EIR. Agreement on Stage 1 actions is only one part of the decision for a Preferred Program Alternative, but it is important that these actions achieve balanced benefits and lay a solid foundation for successful implementation of the Program.

The following pages provide more detail on potential actions for Stage 1. To the extent that such actions require additional authorizing legislation, such authorization will be developed and pursued in cooperation with stakeholders.

Adaptive management is an essential part of the implementation strategy for every program element to allow necessary adjustments as conditions change in future stages of implementation and as more is learned about the system and how it responds to restoration efforts. Consistent with the concept of adaptive management, some actions may need to be refined within the time frame of Stage 1 to reflect changing conditions or new information.

The outcome of and certain sites for Stage 1 decisions will not be known until additional information, including need for mitigation, is available and until the options to carry out these Stage 1 proposals have undergone environmental review. Consequently, the outcome could be altered as a result of that second tier environmental review and mitigation measures imposed as a part of those actions. However, where the impacts from the actions in Stage 1 have been included in the Programmatic EIS/EIR, the subsequent environmental documents can tier off the Programmatic document for cumulative and long-range impacts of the programmatic decision.

Each potential action in the following Stage 1 list includes an estimate (in parentheses) of when the action may occur within Stage 1. For example, "(yr 1)" indicates the action is expected to occur in the first year following the final decisions on the Programmatic EIS/EIR.

With extensive input from CALFED agencies and stakeholders, CALFED has begun work on grouping high priority Stage 1 actions into a series of bundles to provide regional and programmatic balance, as described below. CALFED will continue to work with all interested parties between the Revised Draft EIS/EIR and the Final EIS/EIR on refining the early implementation actions (Stage 1a). Linking the actions would help assure that they all move forward together. These may be linked within the same project EIS/EIR, tied by contractual documents, bond language, appropriation legislation, or other means.

Additional detail is provided in another appendix to the *Draft Programmatic EIS/EIR*, the *Implementation Plan.*

Levees

The focus of the long-term levee protection element of the Program is to reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees. The Levees program includes the Delta and Suisun Marsh. However, the level of flood protection to be provided by Suisun Marsh levees remains to be resolved. Levee protection is an ongoing effort which builds on the successes of ongoing programs and consists of:

- *Base-level funding to participating local agencies*
- *Funding of special improvement projects for habitat and levee stabilization to augment the base-level funding*
- *Implementation of subsidence control measures to improve levee integrity*
- *Implementation of an emergency management and response plan to more effectively plan for and deal with potential levee disasters*
- *A risk assessment and risk management strategy*

The first stage continues the decades-long process to improve reliability of Delta levees.

1. Initiate the Levee Program Coordination Group. Develop and implement an outreach, coordination, and partnering program with local landowners including individuals, cities, counties, reclamation districts, resource conservation districts, water authorities, irrigation districts, farm bureaus, other interest groups, and the general public to assure participation in planning design, implementation, and management of levee projects (yr 1).
2. Obtain short-term federal and state funding authority as a bridge between the existing Delta Flood Protection Authority (AB 360) and long-term levee funding (yr 1-5).
3. Obtain long-term federal and state funding authority (yr 1-7); e.g., the Corps of Engineers' current Delta Special Study could develop into a long-term Delta levee reconstruction program and the state would be the local cost-sharing partner.
4. Conduct project level environmental documentation and obtain appropriate permits for each bundle of Stage 1 actions (yr 1-7).
5. Implement demonstration projects for levee designs, construction techniques, sources of material, and maintenance techniques that maximize ecosystem benefits while still protecting lands behind levees. Give priority to those levee projects which include both short (i.e., construction) and long-term (i.e., maintenance and design) ecosystem benefits, and which will provide increased information (yr 1-7).
6. Adaptively coordinate Delta levee improvements with ecosystem improvements by incorporating successful techniques for restoring, enhancing or protecting ecosystem values developed by levee habitat demonstration projects or ecosystem

restoration projects into levee projects. Continue to develop techniques as major levee projects are implemented (Years 1-7).

7. Fund levee improvements up to PL 84-99 in first stage (yr 1-7); e.g., proportionally distribute available funds to entities making application for cost sharing of Delta levee improvements.
8. Further improve levees which have significant statewide benefits in first stage (yr 1-7) ; e.g., statewide benefits to water quality, highways, etc.
9. Coordinate Delta levee improvements with Stage 1 water conveyance, water quality improvements and with potential conveyance improvements in subsequent stages (yr 1-7).
10. Enhance existing emergency response plans, approximately $29 million in Stage 1 (yr 1-7); e.g., establish $10 million revolving fund, refine command and control protocol, stockpile flood fighting supplies, establish standardized contracts for flood fighting and recovery operations, outline environmental considerations during emergencies.
11. Implement current Best Management Practices (BMPs) to correct subsidence effects on levees Assist CMARP activities to quantify the effect and extent of inner-island subsidence and its linkages to all CALFED objectives (yr 1-7).
12. Complete total risk assessment for Delta levees (yr 1-7) and develop and begin implementation of risk management options as appropriate to mitigate potential consequences.
13. Complete the evaluation of the best method for addressing the Suisun Marsh levee system and begin implementation (yr 1-2).

Water Quality

The water quality program will consist of a wide variety of actions to provide good water quality for environmental, agricultural, drinking water, industrial, and recreational beneficial uses of water. The majority of current water quality actions rely on comprehensive monitoring, assessment, and research to improve understanding of effective water quality management and on the ultimate control of water quality problems at their sources. The Stage 1 water quality efforts focus on reducing constituents contributing toxicity to the ecosystem and affecting water users; reducing total organic carbon loading, salinity, and pathogens that degrade drinking water quality; and reducing oxygen depleting substances and sediment loads that degrade ecological water and habitat quality. In addition, research and pilot studies are recommended to obtain information prior to implementation of some actions. CALFED is pursuing Stage 1 actions to protect public health through continuous improvements in drinking water quality. The Stage 1 actions also include studies and investigations that will contribute to an assessment and decision on the need for additional conveyance actions and/or other means of providing better quality source water.

1. Prepare project level environmental documentation and permitting as needed (yr 1-7).
2. Coordinate with other CALFED program elements to ensure that in-Delta modifications maximize potential for Delta water quality improvements (yr 1-7).
3. Continue to clarify use of and fine-tune water quality performance targets and goals (yr 1-7).
4. Conduct the following mercury evaluation and abatement work:

   Cache Creek
   - Risk appraisal and advisory for human health impacts of mercury (yr 1-5).
   - Support development and implementation of TMDL for mercury (yr 1-7).
   - Determine bioaccumulation effects in creek and Delta (yr 1-4).
   - Source, transport, inventory, mapping and speciation of mercury (yr 1-7).
   - Information Management/Public Outreach (yr 5-7).
   - Participate in Stage 1 remediation (drainage control) of mercury mines as appropriate (yr 3-5).
   - Investigate sources of high levels of bioavailable mercury (yr 4-7).

   Sacramento River
   - Investigate sources of high levels of bioavailable mercury, inventory, map, and refine other models (yr 3-7).
   - Participate in remedial activities (yr 7).

   Delta
   - Research methylization (part of bioaccumulation) process in Delta (yr 1-2).
   - Determine sediment mercury concentration in areas that would be dredged during levee maintenance or conveyance work (yr 3-7).
   - Determine potential impact of ecosystem restoration work on methyl mercury levels in lower and higher trophic level organisms (yr 3-5).
5. Conduct the following pesticide work:
   - Develop diazinon and chlorpyrifos hazard assessment criteria with DFG and the Department of Pesticide Regulations (yr 1).
   - Support development and implementation of a TMDL for diazinon (yr 1-7).
   - Develop BMPs for dormant spray and household uses (yr 1-3).
   - Study the ecological significance of pesticide discharges (yr-1-3).
   - Support implementation of BMPs (yr 2-7).
   - Monitor to determine effectiveness (yr 4-7).
6. Conduct the following heavy metals work:
   - Determine spatial and temporal extent of metal pollution (yr 3-7).
   - Determine ecological significance and extent of copper contamination (yr 1-3).
   - Review impacts of other metals such as cadmium, zinc, and chromium (yr 1).

- Participate in Brake Pad consortium to reduce introduction of copper (yr 1-7).
- Partner with municipalities on evaluation and implementation of stormwater control facilities (yr 2-5).
- Participate in remediation of mine sites as part of local watershed restoration and Delta restoration (yr 2-7).

7. Conduct the following salinity reduction work in coordination with the San Joaquin Valley Drainage Program:
   - Develop and implement supply water quality management activities to improve supply quality (yr 1-7).
   - Develop and implement a management plan to reduce drainage and reduce total salt load to the San Joaquin Valley (yr 1-7).
   - Encourage source reduction programs including tiered pricing, expansion of drainage recirculation systems, land management and, where other options are infeasible, land retirement (yr 1-3).
   - Complete ongoing pilot projects to evaluate the feasibility of water reuse, through agroforestry, of various concentrations of saline water and implement where feasible (yr 1-6).
   - Study feasibility of desalination methods including reverse osmosis (yr 7).
   - Study cogeneration desalination (yr 7).
   - Implement real time management of salt discharges (yr 3-7).
8. Conduct the following selenium work:
   - Conduct selenium research to fill data gaps in order to refine regulatory goals of source control actions; determine bioavailability of selenium under several scenarios (yr 1-5).
   - Research interactions of mercury and selenium (yr 2-3).
   - Evaluate and, if appropriate, implement real-time management of selenium discharges (yr 1-7).
   - Expand and implement source control, treatment, and reuse programs (yr 1-7).
   - Coordinate with other programs (yr 1-7); e.g., recommendations of San Joaquin Valley Drainage Implementation Program, CVPIA for retirement of lands with drainage problems that are not subject to correction in other ways. (CVPIA alone will retire approximately 70,000 acres of land with selenium-caused water quality problems during time period of Stage 1.)
9. Conduct the following sediment reduction work/organochlorine pesticides:
   - Participate in implementation of USDA sediment reduction program (yr 1-7).
   - Promote sediment reduction in construction areas and urban stormwater, and other specific sites (yr 1-7).
   - Implement stream restoration and revegetation work (yr 4-7).

- Quantify and determine ecological impacts of sediments in target watersheds, implement corrective actions (yr 4-7).
- Coordinate with ERP on sediment needs (yr 1-3).

10. Conduct the following work addressing dissolved oxygen (DO) and oxygen depleting substances (including nutrients):
    - Complete studies of causes for DO sag in San Joaquin River (yr 1-2).
    - Define and implement corrective measures for DO sag (yr 1-7).
    - Encourage regulatory activity to reduce nutrients discharged by unpermitted dischargers (yr 1-7).
    - Develop inter-substrate DO testing in conjunction with ERP (yr 2-4).
    - Study nutrient effects on beneficial uses (yr 4-7).
    - Develop, implement, and support measures to reduce pollutant (oxygen depleting substances, nutrients, and ammonia) discharges from concentrated animal feeding operations (yr 1-7).
11. Conduct the following unknown toxicity work:
    - Participate in identifying unknown toxicity and addressing as appropriate (yr 1-7).
12. Other actions specific to drinking water improvements:
    - Control TOC contribution through control of algae, aquatic weeds, agricultural runoff, and watershed improvement (yr 1-7).
    - Study brominated and chlorinated disinfection byproduct operational controls at water treatment plants and implement incremental improvements as warranted (yr 1-7).
    - Control of pathogens through control of cattle operations, urban storm water, sewage, boat discharge, and possibly recreational swimming; includes various projects depending on area of impact (yr 3-7).
    - Study recreational swimming impacts, wild animal impacts (yr 4).
    - Evaluate and, if appropriate, relocate Barker slough intake (yr 7+).
    - MTBE reductions in various areas (yr 3-5).
    - Address water quality problems in terminal reservoirs (yr 3-5).
    - Perform public health effects studies, as needed, to more specifically identify the potential health effects of bromide-related disinfection byproducts (yr 1-3).
    - Investigate alternative sources of and means of providing high quality water supply for urban users of Delta water in cooperation with those users and other appropriate parties (yr 1-7).
    - Investigate, as needed, advanced treatment technologies for the removal of salt, bromide, total organic carbon, and pathogens in urban water supplies (yr 1-7).
    - Investigate combinations of new supplies and technologies that can minimize salt content of urban water supplies and provide greater public health protection (yr 1-7).

- Determine sources and loadings of constituents of concern for drinking water, including pathogens, nutrients, salinity, and TOC within the Delta and in Delta tributaries. Analyze significance for treatment of drinking water (yr 1-3).
- Convene a Delta Drinking Water Council to consider relevant technical data to inform CALFED in its consideration of solutions to identified public health issues for urban users of Delta water (yr 1-7).
- Develop a plan to achieve CALFED's public health protection targets for drinking water (by yr 7).

13. Conduct the following turbidity and sediment work:
    - Implement protection actions in the upper watershed to reduce sedimentation of fish spawning habitat (yr 1-7).
    - Implement erosion control BMPs in the upper watershed (yr 1-7).
    - Construct sedimentation basins in urban and suburban areas (yr 1-7).
    - Evaluate use of a head control structure on lower Dominici Creek (yr 2-4).
    - Perform quantitative analysis of river sediment loads, budgets, and sources (yr 1-7).

Ecosystem Restoration

The CALFED ecosystem restoration program (ERP) is designed to maintain, 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. The ERP is also designed to achieve recovery of listed species dependent on the Delta and Suisun Bay as identified in the Multi-species Conservation Strategy, and support the recovery of listed species in San Francisco Bay and in the watershed above the estuary. A foundation of this program element is the restoration of ecological processes associated with streamflow, stream channels, watersheds, and floodplains. Implementation of the ERP over the 30 year implementation period will be guided through an ecosystem-based, adaptive management approach. ERP goals and objectives for ecosystem, habitat, and species rehabilitation are designed to produce measurable and progressive improvements to the Bay-Delta ecosystem resulting in a high level of ecosystem health and species recovery that exceeds existing regulatory requirements. The Stage 1 restoration efforts are structured to accomplish significant improvement in Bay-Delta ecological health through a large scale adaptive management approach in which the actions inform management decisions in later stages of implementation. All Stage 1 actions will undergo an appropriate level of environmental documentation, will be subject to various permit requirements, and will be dependent on budget allocations.

Success of ERP Stage 1 actions is also critically dependent on other program elements, including water quality improvement actions throughout the Bay-Delta watershed, levee system integrity

actions, and integration with a watershed management strategy and a water transfers market. The general priorities for restoration activities will be first on existing public lands as appropriate, second to work with landowners in voluntary efforts to achieve habitat goals including the acquisition of easements, third a combination of fee and easement acquisition, and fourth on acquisition of fee title as necessary to achieve program objectives. Acquisition will be on a willing seller basis and with emphasis on local coordination and partnerships and include appropriate mitigation for agricultural resource impacts. The intent is to maximize habitat benefits while minimizing land use impacts.

1. Develop and implement an outreach, coordination, and partnering program with local landowners and individuals, cities, counties, reclamation districts, the Delta Protection Commission, resource conservation districts, water authorities, irrigation districts, farm bureaus, other interest groups, and the general public to assure participation in planning design, implementation, and management of ecosystem restoration projects (yr 1-7).
2. Conduct project level environmental documentation and permitting as needed for each bundle of Stage 1 actions (yr 1-7).
3. Full coordination with other ongoing activities which address ecosystem restoration in the Bay-Delta system (yr 1-7); e.g., CVPIA, Four Pumps Agreement, Non-native Invasive Species Task Force, etc.
4. Implement habitat restoration in the Delta, Suisun Bay and Marsh, and Yolo Bypass to improve ecological function, facilitate recovery of endangered species. Habitat restoration efforts in Stage 1 will: restore 2,000 acres of tidal perennial aquatic habitat, restore 200 acres of deep open water nontidal perennial aquatic habitat, restore 300 acres of shallow open water nontidal perennial aquatic habitat, enhance and restore 50 miles of Delta slough habitat, enhance and restore 50 to 200 acres of midchannel islands, restore 8,000 to 12,000 acres of fresh emergent (tidal) wetlands, restore 4,000 acres of fresh emergent (non-tidal) wetlands, restore 25 miles of riparian and riverine aquatic habitat, restore 1,000 to 2,000 acres of perennial grassland, and establish 8,000 to 12,000 acres of wildlife-friendly agricultural habitat (yr 1-7). This reflects approximately one-fourth of the acreage identified in the ERP to be restored during the 30-year implementation period. These actions are key to the adaptive management process and will help determine the feasibility and desirability of implementing larger scale habitat restoration in future stages.
5. Implement large-scale, restoration projects on select rivers (possibly Clear Creek, Deer Creek, and the Tuolumne River) that would include implementation of all long-term restoration measures in coordination with the watershed management common program and monitoring of subsequent ecosystem responses to learn information necessary for making decisions about implementing similar restorations in later stages (yr 1-7).

6. Implement an Environmental Water Account (EWA) that acquires water for critical ecosystem and species recovery needs, substantially through voluntary purchases in the water transfer market in its first few years and developing additional assets over time(yr 1-7).
7. Pursue full implementation of ERP streamflow targets through voluntary purchases by the end of Stage 1, which will require at least 100,000 acre-feet (at a potential annual cost of $20 million). Evaluate how the ERP water acquisitions and EWA water acquisitions will be integrated most effectively(yr 1-7).
8. Complete targeted research and scientific evaluations needed to resolve the high priority issues and uncertainties (e.g., instream flow, exotic organisms, and Bay-Delta food web dynamics) to provide direction for implementing the adaptive management process and information necessary for making critical decisions in later stages (yr 1-7).
9. Establish partnerships with universities for focused research (yr 1-7).
10. Complete the remaining 60% of the easements and/or acquisition for the Sacramento River meander corridor identified under the SB 1086 Program. Provide assurances for and participation by Sacramento River users and landowners that provides indemnification of affected parties against flooding impacts on neighboring landowners and impacts on water diverters (yr 1-7).
11. Acquire flood plain easements, consistent with ecosystem and flood control needs along the San Joaquin River in coordination with the Corps of Engineers' Sacramento and San Joaquin River Basins Comprehensive Study (yr 4-7).
12. Continue high priority actions that reduce direct mortality to fishes (yr 1-7):
    - Aggressively screen existing unscreened or poorly screened diversions in the Delta, on the Sacramento River, San Joaquin River, and tributary streams based on a systematic priority approach.
    - Remove select physical barriers to fish passage.
13. Continue gravel management; e.g., isolate gravel pits on San Joaquin River tributaries and relocate gravel operations on Sacramento River tributaries. Most gravel work would be implemented in subsequent stages with designs and plans for ecosystem reclamation of gravel mining sites (yr 1-7).
14. Develop and begin implementing a CALFED comprehensive non-native (exotic) invasive species prevention, control, and eradication plan (yr 1-7) including the following:
    - Implement invasive plant management program in Cache Creek.
    - Develop ballast water management program.
    - Develop early-response invasive organism control programs.
    - Evaluate CALFED implementation actions and how those actions may benefit non-native species to the detriment of native species or the Bay-Delta ecosystem.
15. Provide incremental improvements in ecosystem values throughout the Bay-Delta system in addition to habitat corridors described above (yr 1-7); e.g., pursue

actions that are opportunity-based (willing sellers, funding, permitting, etc.), provide incremental improvements on private land through incentives, develop partnerships with farmers on "environmentally friendly" agricultural practices, etc.

16. Incorporate ecosystem improvements with levee associated subsidence reversal plans (yr 1-7).
17. Evaluate the feasibility of harvest management to protect weaker stocks (yr 1-7).
18. Implement projects on selected streams to provide additional upstream fishery habitat by removing or modifying barriers (yr 1-7).
19. Working with the CALFED agencies, assist in the preparation of detailed, ecosystem-based restoration and recovery plans for any priority species identified in the ERP Strategic Plan and the Multi-species Conservation Strategy for which up-to-date plans are not available (yr 1-7). Begin implementing appropriate additional restoration actions identified in these plans (yr 2-7).

Water Use Efficiency

The CALFED water use efficiency element focuses on formulation of policies which support implementation of efficiency measures at the local and regional level. The CALFED Water Use Efficiency Program will: 1) establish quantifiable objectives; 2) offer support and incentives through expanded programs to provide planning, technical, and financial assistance; 3) monitor progress towards objectives; and, 4) if these objectives are not met, re-evaluate objectives and management options. CALFED agencies will also support ongoing urban and agricultural sector processes for certifying local agency implementation of cost-effective efficiency measures. The first stage implements the processes which will continue in subsequent stages.

1. **Develop Agricultural Reference Conditions** - Establish reference conditions in order to evaluate future progress. There will be an independent review conducted in conjunction with the Agricultural Water Management Council (AWMC) for this purpose (yr 1-3).

2. **Agricultural Financial Incentive Program** - Develop, in consultation with the AWMC, a program of technical and financial incentives for the implementation of water use efficiency measures in agricultural sector. This program will consider several factors, including: (a) potential for reducing irrecoverable water losses; (b) potential for attaining environmental and/or water quality benefits from water use efficiency measures which result in reduced diversions; (c) regional variation in water management options and opportunities; (d) availability and cost of alternative water supplies; and (e) whether the recipient area experiences recurrent water shortages due to regulatory or hydrological restrictions. The financial incentives should generally take the form of loans for actions or activities that have been identified as cost-effective for the district in a water management plan

approved by the Agricultural Water Management Council. The financial incentives should generally take the form of incentive grants for water use efficiency measures that are supplemental to measures that are cost-effective at the district level. The program will be coordinated with the action (Expand Existing State and Federal Conservation Programs) described below and administered jointly by appropriate state and federal agencies. Funds will be provided by state and federal agencies from appropriations and/or bond measure proceeds pursuant to a cost-share agreement to be developed before the Record of Decision (yr 1-7).

3a. **Expand Existing State and Federal Agricultural Water Conservation Programs to Support On Farm and District Efforts -** Expand State and federal programs (DWR, USBR, USFWS, DFG, DHS, NRCS, and SWRCB) to provide technical and planning assistance to local agencies in support of local and regional conservation and recycling programs. Develop and implement an agricultural water use efficiency program in cooperation with the NRCS, USBR, DWR, Resource Conservation Districts, and other appropriate entities. The purpose of the program would be to promote cost-effective agricultural water management practices that yield multiple benefits. The AWMC will be used to assist in soliciting and selecting individual projects to best meet the objectives developed through the Ecosystem Restoration and Water Quality Programs and to improve water supply reliability. Local entities will be encouraged to collaborate on combined or regional proposed projects. Priority will be given to projects that are designed to achieve specific Delta-related benefits (e.g., improving water quality as opposed to general assistance or information dissemination). This action will be coordinated with the above action (Agricultural Financial Incentive Program) and will require increased funding above current levels (yr 1-7).

3b. **Expand Existing State and Federal Conservation Programs to Support Urban Water Purveyor Efforts -** Expand State and federal programs (DWR, USBR, USFWS, DFG, DHS, and SWRCB) to provide technical and planning assistance in support of conservation and recycling programs.

4. **Create Public Advisory Committee -** Create public advisory committee to advise State and federal agencies on structure and implementation of assistance programs, and to coordinate federal, State, regional and local efforts for maximum effectiveness of program expenditures (yr 1).

5. **Develop Urban Water Management Plan Certification Process -** Select an agency to act as certifying entity, obtain legislative authority, carry out public process to prepare regulations, implement program beginning with plans

submitted in 2005. Access to CALFED benefits will be contingent upon certification of suppliers' Urban Water Management Plan (yr 1-3).

6. **Implement Urban BMP Certification Process** - Implement a process for certification of water suppliers' compliance with terms of Urban MOU with respect to analysis and implementation of Best Management Practices for urban water conservation. Provide funding support for the California Urban Water Conservation Council to carry out this function. Access to CALFED benefits will be contingent upon certification of a supplier's compliance with the terms of the Urban MOU (yr 1-7).

7. **Statewide Urban Conservation Incentives** - Develop an incentive-based program to identify and implement urban water conservation measures that are supplemental to Best Management Practices in the Urban MOU process and are cost effective from a statewide perspective (yr 1-3).

8. **AWMC Evaluation of Agricultural Water Management Plans** - Utilize the AB 3616 Agriculture Water Management Council (AWMC) to evaluate and endorse plans to implement cost-effective water management practices by agricultural districts. Identify and secure ongoing funding sources for AWMC and its members seeking to actively participate in the development, review, and implementation of these plans. Candidate activities include: administration, including staff, of the AWMC itself; implementation of approved practices; and participation by individual signatories. Access to CALFED benefits for a given agricultural district will be contingent upon AWMC's endorsement of the adequacy of its water management plan and implementation. Prior to the ROD, the Focus Group recommends further deliberations to resolve several issues, including: 1) nature of review and form of action on such plans; 2) specific activities for which funding will be sought; 3) phasing in of certification over time (yr 1-7).

9. **Resolve Water Recycling Limitations** - Resolve legal, institutional, and funding limitations for agricultural and urban water recycling (yr 1-3). Secure loan and/or grant funding for water recycling capital improvement projects ($500 million initial Stage 1 estimate).

10. **Refuge Water Management** - Finalize and implement the methodology for refuge water management which was described in the June 1998 "Interagency Coordinated Program for Wetland Water Use Plan, Central Valley, California" (yr 1-7). Consistent with requirements of urban and agricultural water users, access to new CALFED benefits will be contingent on implementation of this methodology.

11. **Research to Improve Water Use Efficiency Actions** - Encourage and support research to expand potential water use efficiency measures (yr 1-7).

12. **Assess the Need for Additional Water Rights Protections** - After consultation with other CALFED agencies, the Legislature, and stakeholders, CALFED will evaluate the need for additional state regulations or legislation providing protection for water rights holders who have implemented water use efficiency measures and subsequently transferred water to other beneficial uses (yr 1-2).

13. **Water Measurement Program** - Develop, after consultation with CALFED agencies, the Legislature, and stakeholders, state legislation that requires appropriate measurement of water use for all water users in California (yr 1-3).

14. **Implement Recommendations Regarding Market Mechanisms** - Implement recommendations of strategic plan with regard to using market mechanisms to facilitate efficiency improvements (yr 1-7).

Water Transfer Framework

The water transfer framework is designed to facilitate, encourage, and streamline the water transfer process while protecting water rights and legal users of water and addressing and avoiding or mitigating third-party socioeconomic impacts and local groundwater or environmental impacts. This would occur through a proposed framework of actions, policies and processes. The first stage implements the recommended changes which will continue in subsequent stages. The prioritization of these and other water transfer actions will be further developed in the Water Transfers Program Plan which will be completed before adopting the Record of Decision.

Environmental, Socio-economic, and Water Resource Protection Actions

1. Establish the California Water Transfers Information Clearinghouse to collect and disseminate data and information relating to water transfers and potential transfer impacts, and perform research using historic data to understand water transfer impacts (yr 1).
2. Coordinate with CALFED agencies to formulate policy, under their existing authorities, for disclosure of additional required water transfer analysis (yr 1).
3. CALFED agencies work with the Legislature and stakeholders to determine whether additional legislation to protect water rights, including area of origin priorities, is necessary (yr 1-2).

4. CALFED agencies identify, arrange, fund, and carry out a specific number of targeted water transfers for instream environmental purposes, with a goal of using these transfers to evaluate the effectiveness of California Water Code Section 1707 procedures. CALFED agencies will work with stakeholders to develop and issue appropriate rules, regulations, or procedures to make these environmental water transfers effective (yr 1-3).
5. CALFED agencies will work with stakeholders, the Legislature, and local agencies to identify appropriate assistance to enable local agencies to develop and implement groundwater management programs to protect groundwater basins in water transfer source areas (yr 1-2).

Technical, Operational, and Administrative Actions

1. Development by CALFED agencies of a streamlined water transfer approval process including preparation of a Guidebook (yr 1-2).
2. Develop a process for expedited approval of short-term and other appropriate transfers (DWR, USBR, and SWRCB) (yr 1-3).
3. CALFED agencies work with stakeholder representatives to clarify and define what water is deemed transferrable under what conditions (yr 1-3).
4. CALFED agencies continue work with stakeholder representatives to resolve conflicts over carriage water criteria (yr 1).
5. Establish a refill criteria policy for reservoir storage based water transfers (yr 1).

Wheeling and Access to State/Federal Facilities Actions

1. Begin forecast and disclosure process of potential conveyance capacity in existing export facilities (DWR and USBR). This would be an on-going activity, occurring in conjunction with hydrologic forecasts (yr 1).
2. CALFED agencies will work with stakeholders to develop an agreed upon set of criteria and procedures governing the determination of transport system availability and costs, including the procedures to determine the fair reimbursement to the water conveyance facility operator (yr 1-3).

Watershed Program

The Watershed Program will be coordinated and integrated with existing and future local watershed programs and provide technical assistance and funding for watershed activities that support the goals and objectives of the CALFED Bay-Delta Program. The actions during Stage 1 are a mix of watershed coordination, restoration, maintenance, and conservation activities, as well as demonstration projects designed to show benefits to the Bay-Delta system while also benefitting existing watershed resources.

1. Fund and implement community based watershed restoration, maintenance, conservation, and monitoring activities that support the goals and objectives of the CALFED Bay-Delta Program (years 1-7).
2. Assist local watershed groups and government agencies to address common issues, including roles and responsibilities, funding support, technical assistance, information exchange, and to ensure effective communication and implementation among government agencies and stakeholder groups (years 1-7).
3. Develop and implement a funding process and provide watershed stewardship funds to build the capacity of locally controlled watershed groups that ensure participation of local landowner groups (years 1-7).
4. Improve the use and usefulness of existing or future watershed clearinghouse functions to assist watershed groups with obtaining information on funding opportunities, technical assistance, and data storage and retrieval (years 1-7).
5. Ensure the completion of project level environmental documentation and permitting; assist with documentation and permitting processes as appropriate (years 1-7).
6. Evaluate the benefits (including economics) that accrue from watershed plans and projects designed to achieve CALFED goals and objectives (yr 1-7).
7. Establish, fund, and maintain watershed restoration and maintenance assistance to aid local watershed groups and private landowners in project concept, design, and implementation (years 1-7).
8. Coordinate with other CALFED and non-CALFED programs on watershed related activities (years 1-7).
9. Work with stakeholders and the Legislature to develop a state-wide umbrella watershed management act (yr 1-3).

Storage

New groundwater and/or surface storage will be developed and constructed, together with aggressive implementation of water conservation, recycling and a protective water transfer market, as appropriate to meet CALFED Program goals. The CALFED Integrated Storage Investigation (ISI) will provide the comprehensive framework for evaluation of storage implementation and management opportunities through Stage 1 and beyond. The ISI will include evaluations of north of Delta off-stream storage, in-Delta and adjacent to Delta storage, on-stream storage enlargement, groundwater and conjunctive use, power facilities reoperation, and fish migration barrier removal evaluations. The ISI will provide the analyses necessary for CALFED's determination of the proper mix of groundwater and surface storage facilities, and CALFED's Water Management Strategy will rely on these analyses as it identifies an appropriate combination of water management tools for attaining CALFED's water supply reliability goals and objectives. Detailed environmental documentation, feasibility studies, permitting, and construction activities would be initiated as appropriate.

Groundwater Banking and Conjunctive Use - *This first stage includes developing cooperative partnerships with local agencies and landowners in both the north-of-Delta and south-of-Delta areas, and includes construction of several south-of-Delta projects. Additional south-of-Delta and north-of-Delta projects, if feasible, could be constructed in later stages.*

1. Develop and implement a framework for groundwater banking and conjunctive use projects (yr 1).
2. Include provision to protect overlying and other landowners' water rights (yr 1-7).
3. Provide funding assistance to local governments and special districts for groundwater plan development (yr 1-7).
4. Identify potential projects and local cooperating entities and define CALFED role (yr 1-3).
5. Conduct baseline monitoring and modeling (yr 1-7).
6. Initiate field studies (yr 2-7).
7. Project environmental documentation and permitting (yr 1-3).
8. Project design (yr 2-4).
9. In partnership with local entities, construct two to three groundwater banking facilities with a total target volume of 500,000 acre-feet (yr 1-7).
10. Study additional project sites (yr 2-7).

Surface Storage - *New offstream storage and/or expansion of existing onstream reservoirs could add up to several million acre-feet of new surface storage. Based on the outcome of the ISI and Water Management Strategy, Stage 1 will include the environmental evaluations, feasibility studies, and permit compliance procedures for the appropriate mix of promising facilities. These would lead to project design and construction if program linkages and conditions are satisfied.*

1. Identify initial local partners and other cooperating entities for projects and CALFED role (yr 1-3).
2. Develop environmental documentation (yr 1-5).
3. Perform feasibility studies and economic analyses (yr 1-5).
4. Perform field studies (yr 1-5).
5. Site selection (yr 4-5).
6. Evaluate improvements to potential conveyance to storage (yr 1-5).
7. Obtain permits, negotiate operating agreements, and seek site specific authorization and reimbursable state or federal funding for land acquisition, site preparation, and construction if conditions and linkages are satisfied (yr 5-7).
8. Identify beneficiaries and negotiate cost sharing agreements (yr 5-7).
9. Begin construction if conditions and linkages are satisfied (yr 6-7).

Power Facilities Reoperation Evaluation - *There is the potential to reoperate some hydroelectric facilities to produce water supply or ecosystem benefits. The following actions will be taken in the context of the ISI.*

1. Identify beneficiaries and negotiate cost sharing agreements (yr 1-7).
2. Work with CALFED agencies, the Public Utilities Commission, the State Water Resources Control Board, the Federal Energy Regulatory Commission, and interested stakeholders to identify reoperation opportunities (yr 1-2)
3. Develop environmental documentation (yr 3-5).
4. Perform feasibility studies and economic analyses (yr 3-5).
5. Obtain permits, negotiate operating agreements, and seek site specific authorization as required. (May require design of facilities modifications to accommodate new operational priorities) (yr 5-7).
6. Begin construction (if needed) and begin new operations if conditions and linkages are satisfied (yr 6-7).

Fish Migration Barrier Removal Evaluations - *As part of the ERP 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 following actions will be taken in the context of the ISI:*

1. Work with CALFED agencies, the State Water Resources Control Board, local water agencies, and interested stakeholders to identify opportunities for modification or removal of obstructions such as small dams (yr 1-2).
2. Develop environmental documentation (yr 3-5).
3. Perform feasibility studies and economic analyses (yr 3-5).
4. Obtain permits, negotiate agreements, and seek site specific authorization as required. (May require design of facilities modifications or removal actions (yr 5-7).
5. Identify beneficiaries and negotiate cost sharing agreements (yr 5-7).
6. Begin construction (if needed) and begin new operations if conditions and linkages are satisfied (yr 6-7).

Conveyance

CALFED's basic strategy is to develop a through-Delta conveyance alternative based on existing Delta configuration with some modifications. Some construction of improvements in the south and north Delta should occur within the first stage to improve conditions for ecosystem and water management reliability. Part of the first stage consists of studies and evaluations of the major conveyance features. This will allow conveyance projects to be ready for permitting and construction in later stages should the projects be necessary to meet Program objectives.

South Delta Improvements - *South Delta improvements consist of methods to control flow, stage and circulation, improve fish passage, fish screen and salvage facilities, and potentially provide SWP/CVP interties upstream and downstream of the export pumps. South Delta conveyance improvements included in Stage 1 would function with the basic conveyance strategy or potential modifications. The conveyance improvement actions listed below would be implemented concurrently (bundled) with other actions as detailed in Chapter 3, in a subsection titled CALFED's Delta Conveyance Strategy. The other Stage 1 actions are components of the other CALFED Program elements.*

1. Construct a 500 cfs test facility at the Tracy Pumping Plant to develop best available technology for fish screening and salvage for the intakes to the SWP and CVP export facilities (yr 1-3).
2. Construct a new screened intake for Clifton Court Forebay for the full export capacity of the SWP (yr 1-7+)
3. Implement Joint Point of Diversion for the SWP and CVP. Evaluate and decide on whether to retain a separate CVP intake facility or to consolidate with the SWP facility. Also evaluate and potentially implement an intertie between the projects downstream of the export pumps (yr 1-6).
4. Facilitate SWP export flexibility up to 8500 cfs with appropriate constraints (yr 1-7+).
5. Obtain permits to use full SWP capacity of 10,300 cfs for operational flexibility, consistent with all applicable operational constraints, for water supply and environmental benefits (yr 1-7+).
6. Expedite construction of three permanent operable barriers at the Head of Old River, Old River at Tracy, and Middle River upstream from Victoria Canal. Phase out all temporary barrier installations as soon as feasible (yr 1-6).
7. Dredge segments of south Delta channels to limit scour velocities, for water supply for local agricultural intakes, and to improve navigation (yr 1-5).
8. Extend and screen agricultural intakes as required to assure local water supply availability (yr 1-4).
9. Form a Barrier Operations Coordination Team, consisting of USFWS, NMFS, DFG, DWR, USBR, and stakeholder representatives to operate the barriers (yr 1-7).
10. Monitor barrier effects on fish, stages, circulation, and water quality (yr 1-7).
11. Retain the potential future option of constructing a Grant Line Canal Barrier after the Barrier Operations Coordination Team operates and evaluates the three barriers included in the recommended alternative. Implementation of such an option would only be undertaken if the actions described above, including detailed field studies and analyses, fail to provide an appropriate balance of fisheries, water quality, and water supply availability benefits (yr 6-7+).

12. In coordination with regional ERP actions improve flood control through levee improvements, levee setbacks, channel dredging, and flood plain restoration (yr 1-7).
13. Evaluate the feasibility of recirculating water pumped from the Delta by the CVP and SWP. If feasible, and consistent with CALFED ecosystem restoration goals and objectives, implement a pilot program (yr 1-4).

North Delta Improvements - *North Delta Improvements consist of methods to address flood control, water quality, fisheries, and water supply reliability concerns. Actions include modification of the Delta Cross Channel operational criteria, channel dredging and/or setback levees in the Mokelumne River, and creation of additional floodplain, wildlife, and fisheries habitat. A screened diversion at Hood will be evaluated and may be implemented if necessary.*

1. Develop operational criteria for the Delta Cross Channel that balances flood control, water quality, water supply reliability and fisheries concerns (yr 1-4).
2. Study and evaluate a screened diversion structure on the Sacramento River (or equivalent water quality actions) as a measure to improve drinking water quality in the event that the Water Quality Program measures do not result in adequate improvements toward CALFED's drinking water quality goals. This evaluation would consider how to operate the Delta Cross Channel in conjunction with this new diversion structure to improve drinking water quality, while maintaining fish recovery (yr 1-4).
3. If the Water Quality Program measures are consistently not achieving drinking water quality goals, and the evaluation demonstrates that a screened diversion of up to 4000 cfs would help achieve those goals without adversely affecting fish populations; a pilot screened diversion would be constructed. This pilot would likely include a fish screen, pumps and a channel between the Sacramento and Mokelumne River. The design, size and operating rules for this pilot facility would allow for analyses of impacts to upstream and downstream migrating fish as well as impacts from habitat shifts resulting from increased flows in the eastern Delta on Delta species. Following evaluation of the pilot facility operations, a final decision would be made on whether the diversion channel and structure should continue to be used, and if so, what the operational rules and optimum size of the diversion should be (yr 5-7+).
4. Evaluate opportunities to resolve local flood concerns and create tidal wetlands and riparian habitats by constructing new setback levees, improving existing levees, and dredging channels in the north Delta, especially the channels of the lower Mokelumne River system. Any proposed channel modification would be consistent with CALFED's current direction on Delta conveyance. This evaluation would carefully coordinate ecosystem restoration, regional flood

control, levee system integrity, and conveyance issues and concerns to ensure that a balanced solution to all concerns would be proposed. (yr 3-7).

5. Balance the above actions to address water quality, flood control, water supply reliability, and fisheries concerns (yr 1-7).

Isolated Facility Component - *The isolated facility component of a dual transfer Delta facility would consist of a new canal or pipeline connecting the Sacramento River in the northern Delta to the SWP and CVP export facilities in the southern Delta. A process for determining the conditions under which any additional conveyance facilities and/or other water management actions would be taken in the future would include:*

1. An evaluation of how water suppliers can best provide a level of public health protection equivalent to Delta source water quality of 50 ppb bromide and 3 ppm TOC (yr 1-7). This will include an equivalent level of investigation and studies on all of the actions which could be used to achieve CALFED's targets.
2. An evaluation based on two independent expert panels' reports–one on CALFED's progress toward these measurable water quality goals and the second on CALFED's progress toward ecosystem restoration objectives, with particular emphasis on fisheries recovery (yr 6-7).

Assurances and Institutional Arrangements

An assurances package is a set of actions and mechanisms to assure that the Program will be implemented and operated as agreed. The assurances package will include items to be adopted immediately as well as a contingency process to address situations where a part of the plan cannot be implemented as agreed. While the principles for the assurances package will be substantially complete by the ROD, many details remain to be finalized early in Phase III.

1. Implement the interim governance structure at the time of the ROD. The interim structure and functions will continue until the long-term structure is in place (yr 1-3)
2. Initiate actions to implement the long-term governance structure for CALFED (yr 1-3). By the time of the ROD a long-term governance structure will be proposed. New federal or state legislation is expected to be needed to clarify/modify existing agency authorities and/or possibly to establish new entities for program oversight and implementation.
3. Implement the contingency response process (yr 1-7).
4. Tiering from the Multi-Species Conservation Strategy, begin to develop the project specific restoration, avoidance, and mitigation measures necessary to

recover endangered species and to prevent additional listings in the Delta as well as the assurances that will be provided in exchange (yr 1-7).

5. Incorporate the final State Board water rights decision for allocation of responsibility to meet flow requirements for Water Quality Control Plan 95-6 (May 1995) in water transfer and operational rules (yr 1- ?).
6. Implement a CALFED environmental documentation, mitigation, and permit coordination process, including appropriate consideration of agricultural resource issues (yr 1-7).

Finance

The Finance Plan, to be completed by the time of the ROD, will propose a strategy for funding the Preferred Program Alternative (including total costs for implementation/improvements, mitigation, and ongoing annual operating and maintenance costs). It will include cost allocation and cost-sharing procedures and strategies for each program or individual projects. Proposed funding sources would include a combination of federal, state, private and user funds. Financing will be needed over several decades as the various parts of the Preferred Program Alternative are selected, implemented, operated, and maintained. The Finance Plan includes financial principles incorporating a benefits-based approach, a strategy for cost allocation and cost sharing for each program, and provisions for crediting of other parallel efforts. The Plan will recognize the public and private benefits derived from water quality, environmental protection, flood control, recreation, and a reliable water supply.

1. Establish reliable short-term and long-term funding for each program element and for each package of Stage 1 actions (1-7):

   - Finalize cost-share agreements (yr 1).
   - Finalize details surrounding repayment or crediting (yr 1).
   - Seek legislation and budget authority for financing, including federal and state appropriations, new authority for state bonds, private financing and new user fees (yr 1-7).
   - Develop and refine cost estimates as program actions are identified (yr 1-7).

Monitoring, Data Assessment, Research and Adaptive Management

Establish monitoring, data assessment and research activities for all program elements that provide reliable data and information which is assessed and translated into a useful format for management decisions. All the activities will be approached in a manner conducive to an

adaptive management process. Consequently, most of the activities will be undergoing continual refinement through the seven year program.

1. Periodic review and refinement of the monitoring, data assessment and research plan from a long term perspective. (yr 1-7)
2. Periodic review and refinement of the monitoring, data assessment and research plan from a short term perspective which would include all elements of the Phase II, Stage 1 Program. (yr 1-7)
3. Help management define triggers and time periods which determine the need for a change in program direction. (yr 1-7)
4. Continue to develop and refine conceptual models to be used in evaluating actions undertaken by the programs. In keeping with the adaptive management format, the models will be continually updated with information generated by program actions. (yr 1-7)
5. Through a peer review process, evaluate the effectiveness of the adaptive management in the program decision making process. (yr 1-7)
6. Review the progress toward achieving overall CALFED program goals and objectives and whether individual programs are progressing at similar paces. (yr 1-7)
7. Complete monitoring identified by diversion effects on fisheries team to provide feedback on actual diversion effects of south Delta pumps (yr 2-7) (includes long-term, system wide, baseline monitoring with focused research to increase understanding of ecological process and ways to reduce uncertainty; definition of needed studies is currently under development). The following are examples.
   - Conduct focused research on Delta hydrodynamics and linkage to food web including relation to location of diversion point.
   - Study population trends of fish using the Delta, including fish salvage at south Delta export facilities, with emphasis on San Joaquin River fall run chinook salmon, delta smelt, and Mokelumne River fall run chinook salmon and steelhead trout.
   - Expand real-time monitoring for enhanced fish protections and flexible operations for water suppliers.
8. Provide available data on need to reduce bromides, total dissolved solids, total organic carbon, pesticides and heavy metals (yr 5).
9. Provide available data on water quality in south Delta and lower San Joaquin River (yr 1-7).
10. Monitor and assess the impacts of water use efficiency measures on water demands and available supplies, and develop better information for water balances in the Bay-Delta system (yr 1-7).
11. Prepare annual reports on status and progress, including such information as: performance of habitat restoration actions compared to expected results,

summaries of any new information on the relative importance of various stressors, and any need for adjustments in actions or conceptual models (yr 1-7)

12. Analyze status and need for adjustments of actions for later stages (yr 5-7).
13. Monitor and report land use changes, such as agricultural land conversion, resulting from CALFED actions (yr 2-7)

Near Term (Stage 1a) Actions

Implementation of actions begins in Phase III. This period will include site-specific environmental review and permitting as necessary. The first stage of Program implementation is critical to its long-term success because it will serve as an indication of the CALFED agencies and stakeholder community capacity to act on a cost-effective, practical, and equitable set of actions to achieve the program objectives.

The preliminary actions have been grouped into seven bundles either to provide a balanced suite of actions for specific regions within the CALFED problem and solution areas, or to provide programmatic balance between actions which are not necessarily associated with any specific geographic area. The bundles highlight certain critical ongoing programs which will require implementation decisions in the near future, but do not include the many other ongoing monitoring and improvement programs in the Bay-Delta region.

Lower San Joaquin River and South Delta Region Bundle

This bundle is designed to address water management and fisheries concerns in the south Delta and lower San Joaquin River region, for local water uses as well as State and federal exporters. Specific issues to be addressed include fisheries, water quality, water supply reliability, recreation, flood control, and wildlife habitat. The preliminary actions are designed to advance feasibility and environmental evaluations and to implement corrective actions in the south Delta region as well as in upstream watersheds which affect the quality and quantity of flows in the San Joaquin River.

Lower Sacramento River, North Delta Bundle

This bundle is designed to develop a balanced solution to concerns surrounding fishery and water quality impacts of diversions from the Sacramento River into the central Delta, to address regional flood concerns, and to substantially enhance riparian and wetlands habitat corridors in the region.

Yolo Bypass, Suisun Marsh, and West Delta Bundle

This bundle is designed to address water quality, fisheries protection, and habitat enhancement actions for the west Delta region, including Suisun Marsh, the west Delta islands, and the Yolo Bypass. Because of the concern over toxicity effects of mercury originating in the Cache Creek basin, this bundle includes substantial research to identify those sources and potential rededication tools.

Delta-Wide ERP/Levees Bundle

This bundle is designed to achieve a reasonable balance between implementation of ecosystem improvement actions and levee system improvement actions. In addition this bundle includes actions to improve fisheries, water quality, and habitat throughout the Delta, including protection and enhancement of Delta in-channel islands.

Sacramento River, San Joaquin River and Tributaries Bundle

This bundle includes ecosystem restoration, primarily fisheries habitat, hatchery management, and floodplain and meander belt restoration along key river reaches.

Integrated Water Management Bundle

This bundle includes actions which can lead to improvements in water supply reliability and flexibility through improvements in water use efficiency, water transfers, water storage and conveyance facilities (groundwater and surface water), water quality, and water associated habitats. The proposed actions include the Program problem area and solution areas, including state and federal project service areas and upper watersheds. It includes key actions that comprise the Integrated Storage Investigation and implementation of the Environmental Water Account.

Governance Bundle

This bundle addresses certain organizational issues to assure that orderly implementation of Program actions can occur as the level of activity increases substantially. These issues include the potential formation of a CALFED management entity, an ERP implementation entity, comprehensive monitoring, and actions to assure that water quality and water use efficiency measures can be fully implemented. While creation of new entities may be proposed, no agency will transfer any existing regulatory authority to these new entities.

4.2 Governance Plan

The governance and decision-making structure for implementation of the CALFED Preferred Alternative is a key feature in assuring successful program implementation. CALFED is in the process of developing a long-term governance plan for the CALFED Bay Delta Program and a decision on the long-term governance structure will be made by the time of the Final Programmatic EIS/EIR. Once the decision is made it is expected that it will take some time before the long term governance structure is in place because of the time required to enact legislation required to make changes to existing laws and authorities. While the long-term structure is being established, an interim governance structure will need to be in place. For the interim, CALFED proposes the continuation of essentially the current structure being used for the planning phase of the program but adapted to support the implementation phase. The interim structure will be in place only as long as it takes to establish a long-term structure. A basic principle of the interim governance proposal is that there would not be any new legislation or changes in existing legal authorities.

The CALFED program is complex, multi-objective, involves many agencies and programs, and covers a large geographic scope. In developing a long term-governance structure for the CALFED Program, the implementation principles, functions, and structure/form have been evaluated at two levels-- the policy oversight level and the program element level. Each of the program elements are also part of an implementation strategy that is based on the four CALFED resource areas--ecosystem restoration, water quality, water supply reliability, and levee system integrity.

The *Implementation Plan* Appendix to the *Revised Draft EIS/EIR*, contains the draft Governance Plan. The Governance Plan includes a description of the governance functions necessary for implementation, a recommended interim governance structure, and a discussion of the options for long-term governance. A summary of the Draft Governance Plan is provided below.

Program Principles and Functions for Implementation Phase

In developing a governance structure, it is important to first identify the guiding principles and basic functions that need to be performed. The principles and functions serve as the criteria by which to evaluate the different governance structure options.

Principles for an Oversight Entity. Due to the complexity and evolving nature of the Program over a long period of time, oversight and policy/program direction will be critical to the Program's success. Several principles should be considered as conditions for any governance structure for the CALFED program:

- State and federal partnership
- Stakeholder involvement in decision-making
- Involvement by elected officials
- No impairment of existing agency regulatory authority
- Efficient decision making
- Durability of agreements/decisions
- Accountability for agreements/ decisions

CALFED has organized the implementation functions for the program into three categories to accommodate the complexity of the program.

Oversight Functions. An oversight entity for the CALFED Program will be the primary point of accountability for program implementation and for achieving program objectives. Because the program has four equal objectives , it will be important for the oversight entity to ensure balance and coordination between the program elements and objectives and to provide program direction. The key functions for a CALFED oversight entity include:

- Overall program direction
- Oversight of CALFED program implementation
- Assessing CALFED progress
- Assuring balanced implementation
- Reviewing priorities and funding of programs managed by the CALFED Program and programs managed by CALFED agencies. Recommending changes and approval to the appropriate agency with program and funding authority.
- Coordination and dispute resolution between program elements
- Coordination with related programs
- Stakeholder communication
- Legislative communication

Program coordination and management functions. Program management and coordination for each program element will be critical for effective implementation. Program management and coordination functions include:

- Manage/oversee program element implementation
- Identify priorities, propose actions, develop budgets
- Assess and report on program element performance
- Coordinate with implementing agencies & stakeholders, and between program elements

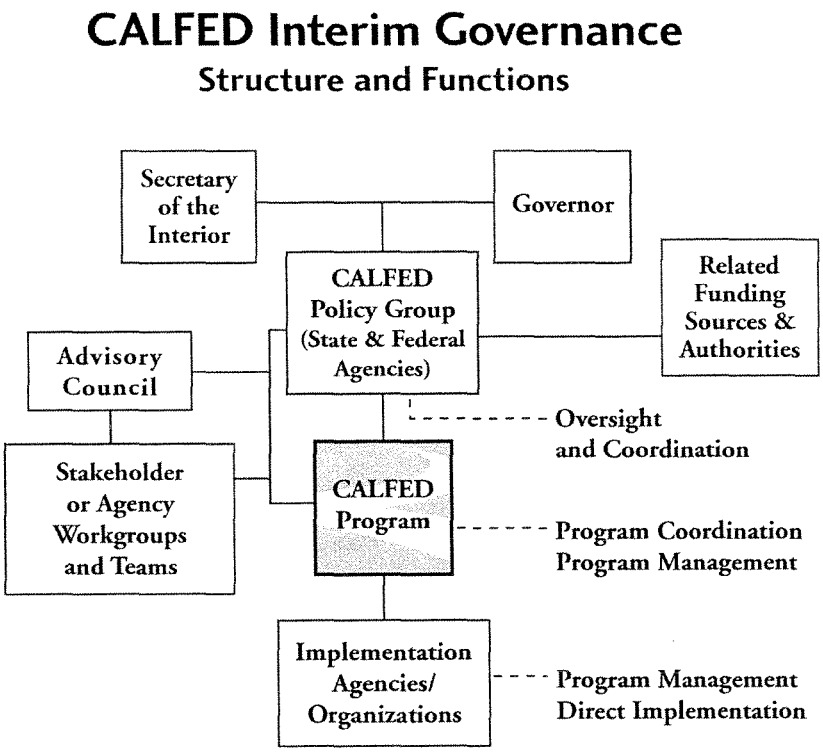
Direct implementation functions have been identified separately because some agencies which may be involved in CALFED program element implementation may not have program management responsibility. For example, one entity (CALFED in the interim) may direct the

Integrated Storage Investigation, while another entity (DWR or USBR) may be the lead on assessment for individual storage sites. Direct implementation functions include:

- Responsibility for direct implementation of individual programs and actions.
- Report on assessment and monitoring of individual programs or actions
- Prepare environmental documentation and obtain permits
- Stakeholder and local coordination

Interim Governance Structure

To provide for the transition while a long term governance structure is established, an interim governance structure is proposed. The interim structure will be in place from the time of the ROD and possibly for several years depending on the time required to adopt recommended legislative changes and reorganize existing authorities and structures.



CALFED proposes that the interim structure essentially continue the current CALFED structure being used during the planning stage, but with modifications to ensure it is suitable for performing the implementation functions. The modifications would be made in revised or new agreements or contracts that will be in place by the time of the ROD to begin the implementation phase of the program. Continuing the existing structure with modifications will enable the primary focus for governance to be placed on the long-term governance structure. The current structure will provide for an efficient transition to the implementation phase with minimal program delays or disruption.

Schedule for Governance Decisions and Implementation

- **Interim Governance**

--Proposal in the Revised draft EIS/R, June 1999
--Revised Agreements in place by the time of the ROD, June 2000
--Operates until a long-term governance structure adopted

- **Long term governance**

--Decision by the time of the ROD, June 2000
--Legislation expected to be needed
--Long term governance in place in 2-3 years (2002- 2003)

Policy Group. In the interim, the oversight functions will continue to be performed by the CALFED Policy Group. A new Framework Agreement is needed and will be in place by the time of the ROD. The Framework Agreement will describe the agency membership and designated representatives, describe the meeting schedule which will be at least quarterly, identify the frequency of Policy Group public meetings, specify that require at least one meeting will be with the advisory council each year to perform a CALFED program assessment, specify decision-making procedures, and describe the oversight functions (listed above) of the Policy Group during the implementation phase.

Stakeholder Involvement. In the interim, stakeholder involvement in the decision making structure will be through an advisory council. A new or amended Federal Advisory Council Act (FACA) Charter will be prepared by the time of the ROD which will be focused on the new tasks associated with program implementation. The Charter will identify the membership and alternates, describe the new functions and tasks, identify the necessary advisory Workgroups, describe the frequency of meetings, which should be at least quarterly and specify that an annual meeting with Policy Group will be conducted for the purpose of an annual CALFED program assessment.

CALFED Program and CALFED Agencies. In the interim the CALFED Program will perform the program coordination functions and in some cases the program management functions associated with the different program elements and resource areas. A new administrative Memorandum of Understanding between the state and federal CALFED agencies will be prepared by the time of the ROD. The MOU will specify the CALFED Program's functions and responsibilities, and establish the interim operating budget and necessary positions. The Draft Governance Plan included in the *Implementation Plan Appendix* provides a more

detailed description of the interim governance structure, and in some cases the options for long term governance, for each of the program elements, the Environmental Water Account, and the Comprehensive Monitoring Assessment and Research Program.

The proposed interim governance structure for the program elements places the program coordination functions within the CALFED Program. This is because the CALFED program staff have knowledge of the CALFED program objectives and the experience in coordination with the agencies and stakeholders, thereby making the transition to implementation the easiest. This also avoids fragmentation of the coordination function.

In the interim, program management functions will be distributed among the State and federal agencies which currently have the program authority and funding. As new programs and funding are directed to CALFED, the CALFED program will assume additional program management functions. For example, CALFED will continue serving program management functions for the CALFED ecosystem restoration program, specifically for the funding available through the federal Bay-Delta Ecosystem Enhancement and Water Security Act and Proposition 204. CALFED will also serve the program coordination functions in the interim with the other existing ecosystem restoration programs and funding such as the CVPIA Restoration Fund. With program management distributed among many agencies in the interim, it is important that agencies closely coordinate to achieve the CALFED objectives. In the interim, direct implementation would continue to be done by existing agencies.

Pre-ROD Governance Actions

- Finalize the agreements and contracts necessary to implement the interim governance structure
- Recommend a long-term governance structure for CALFED
- Initiate steps to begin adoption of the long-term governance structure

4.3 Finance Plan

With the signing of the Record of Decision, scheduled for June 2000, CALFED will need to have a financing plan in place to begin implementation. In fact, early implementation of portions of the program will begin in 1999 with existing funding sources. To be prepared for program implementation, a finance plan is needed to guide State and federal administration and legislative discussions regarding new bonds, new fees, and proposed budget appropriations.

The Draft Finance Plan contained in the Implementation Plan Appendix lays the initial framework for developing a CALFED Finance Plan. The Plan provides background, definitions,

description of program benefits, description of possible funding sources, financing options, and issues to resolve to finalize a Finance Plan. CALFED will work to complete the Finance Plan in 1999, but no later than the time of the ROD.

The Finance Plan for implementing the CALFED Bay Delta Program is a critical component of the program because of the assurance needed by CALFED agencies and stakeholders that a serious and concerted effort will be made to secure funding for all components over the life of the program. In developing financial strategies and cost sharing for the many aspects of the CALFED program, CALFED is following several basic steps:

- Identifying the priority actions for implementation
- Developing cost estimates for priority actions
- Identifying the funding and cost sharing formulas in existing laws and agreements
- Identifying program/project benefits and beneficiaries
- Identifying finance and cost allocation issues that affect the successful implementation of the program (promoting new technologies, changing attitudes/behaviors, ability to pay problems, characteristics of funding sources limiting program implementation)
- Lastly, but not included in this draft, recommending the cost allocation and cost-sharing procedures and strategies for each program element and in some cases for individual projects

A fundamental philosophy of the CALFED program is that costs should, to the extent possible, be paid by the beneficiaries of the program actions. There are reasons, other than equity and fairness, that the beneficiaries-pay principle be applied to CALFED and other water resources programs. Having beneficiaries pay for public programs encourages them to more carefully review their water and power needs and the costs of proposed programs (including mitigation costs) in relation to the benefits they receive. Such a policy also encourages examination of a fuller range of alternatives, including locally funded measures, in order to assure that public funds are spent in the most cost-effective way to meet program goals.

Historical Financing. CALFED's finance strategy must be considered within the current and historical context of state and federal water resources financing. Historically, federal water projects have been financed with appropriations and, in some cases, repayment was provided by beneficiaries at below market rates of interest (or no interest). This resulted in historically low levels of effective cost-sharing. Since the 1980's, federal water resources agencies have been requiring higher levels of nonfederal cost-sharing, through higher levels of up-front cost sharing

and other means. The Central Valley Project Improvement Act of 1992 enacted tiered water rates, Mitigation and Restoration payments, and other fees to be deposited into a Restoration Fund to be used for environmental purposes. Financing for the State Water Project relies principally on general obligation bonds and revenue bonds, with revenue bonds being backed by payments from water and power users which provides large repayment levels.

Program Benefits/Beneficiaries. At this time, because many of the actions have not yet been specified, (e.g. water use efficiency actions, storage sites), the specific benefits cannot be identified or measured, and program costs cannot be allocated to those benefits. In other cases, such as ecosystem restoration, benefits can be identified but not easily measured or assigned to specific beneficiaries. However, to initiate the finance discussions, and lay the framework for a CALFED finance strategy, the Draft Finance Plan identifies expected benefits and beneficiaries at the program level. For actions where benefits can be measured, the program or project costs will be allocated among the measured benefits. In the final Finance Plan a specific cost allocation procedure will be identified. For those programs where benefits cannot be reasonably measured (ecosystem, water quality, watershed programs), CALFED will need to identify a procedure or strategy for estimating and allocating costs. After the benefits analysis and cost allocation, CALFED may propose cost shares among beneficiaries that differ from existing state and federal cost-sharing formulas or may use the cost-sharing formulas in existing programs.

The benefits from each program area (both near-term and expected future benefits), are described in the Draft Finance Plan. In addition, the Draft Finance Plan identifies cost allocation and cost-sharing issues, and potential cost-sharing options. In general, the options differ financially (the extent to which they require higher levels of repayment from beneficiaries), or institutionally (in terms of what mechanism they rely on to secure repayment, ranging from existing programs, up-front cost-sharing, recovery through water rates, or recovery through other user charges). Some of these options address user fees targeted at the beneficiaries of a particular program.

Financing Mechanisms. The Draft Finance Plan compares several different financing mechanisms, all of which have been used to date and are expected to be used in the future, including state and federal appropriations, state general obligation bonds, state water and power revenue bonds (tied to SWP water and power rates), private financing, user fees and a broad-based Bay-Delta system diversion fee. The advantages and disadvantages of these various funding sources and financing mechanisms are also described in the table below.

Potential Funding Sources -- Advantages and Disadvantages		
Option	**Advantages**	**Disadvantages**
General obligation bonds	--Can achieve substantial up-front funding, but distribute the financial burden over time. --Focuses stakeholders and the public on next program phase.	--Requires legislative and voter approval. --Would require repeated approval over 30-year period. --Cannot be used for ongoing costs such as land management costs, monitoring and assessment
Water and power revenue bonds	--Can provide immediate sources of funding if linked to revenue-generating facilities. --Less burden on state budgets than general obligation bonds. Does not require voter or legislative approval. Linking beneficiaries to programs in SWP rates is consistent with beneficiary pay.	--Works well for private benefits (water deliveries and powers), but hasn't been used to cover programs with broad public benefits.
State appropriations	--Provides immediate sources of funding. --Focuses stakeholders and the public on next program phase. --Allows annual Legislative review	--A more direct financial burden than bonds. --Competition with other state programs. --Annual approval reduces assurance for long-term funding --Would require repeated approval over 30-year period.
Federal appropriations	--Provides immediate sources of funding. --Focuses high-level state and federal attention on the program. --Allows annual Congressional review	--Competition with other federal priorities. --Annual approval reduces assurance for long-term funding. --Would require repeated approval over 30-year period.
Private financing	--Can be more immediate than funding from public sources. --Some contributions have been made to solve regional problems, as well as local problems.	--Is generally focused on local needs.
Broad-based diversion fee	--Dependable and ongoing source of revenues (may fit with programs for ongoing funding needs). --Tied to diversion impacts on the Delta. --A broader-based fee would provide consistency and fairness with CVP users, who currently pay such fees. --Supported by stakeholder groups - Business Roundtable, etc.	--Since revenues come in annually, the funding available initially is less than with bonding or appropriations.

CALFED and CALFED stakeholders have discussed the use of a broad-based Bay-Delta system diversion fee, particularly to finance some of the programs or actions with public benefits, such as the Ecosystem Restoration Program (such a fee is discussed, for example, in the 1996 report on *Financing Options* produced by the California Business Roundtable, the California Chamber of Commerce, the California Farm Bureau Federation, and the California Manufacturers Association). This diversion fee would most likely apply to all major diverters of water from tributaries that flow into the Delta, as well as exporters of Delta water. The Draft Finance Plan explores how such a broad-based diversion fee could be structured and what revenues could be expected for fees similar to those established in the CVPIA. The crediting of CVPIA revenues and other contributions to date would be an integral part of implementing any broad-based diversion fee.

Stage 1 Cost Estimates

CALFED has developed preliminary cost estimates for the Program for Stage 1. These costs are shown in the table. Stage 1 costs are in current year dollars, and exclude interest, inflation, operation and maintenance, and program management costs. These estimates range in precision from specific project costs for conveyance improvements in the South Delta to broad programmatic level estimates of costs for water use efficiency. Additionally, CALFED's adaptive management approach makes long term cost estimating inherently difficult. However, the Stage 1 cost estimates do represent the right order of magnitude of investment which will be necessary to carry the program forward successfully.

During the coming year CALFED will be working with all parties to refine these cost estimates, particularly those for Stage 1a, as a necessary component of the CALFED ROD.

Pre-ROD Finance Actions

- Select cost allocation and cost-sharing procedures and strategies for each program or individual projects
- Propose financing strategy for Years 1-7 -- including what user fees, bonds, and other funding sources will be pursued.
- Finalize a crediting policy
- As appropriate, finalize cost-sharing agreements for Stage 1 actions

Estimated CALFED Stage 1 Costs[1] ($ in millions)	
Program Area	**Total Cost**
Ecosystem Restoration[2]	$910
Water Use Efficiency/Recycling	$2,000
Water Transfers[3]	$6
Watershed Management	$210
Water Quality	$250
Levees	$264
Storage[4]	$370
Conveyance[5]	$913
Monitoring[6]	$246
TOTAL	**$5,169**

Notes:

[1] Preliminary; current year dollars based on staff estimates. Total costs assume contributions from State, Federal, and User/Private funding.

[2] Total cost could be paid for by Prop. 204 (State), Federal Bay-Delta appropriation and CVPIA water and energy funds (Federal), and CVPIA Restoration Fund (User).

[3] No major capital investments are necessary for this program.

[4] Includes South of Delta groundwater and North-of-Delta groundwater ($300 million), Integrated Storage Investigation and related planning and feasibility work ($70 million).

[5] Includes South Delta Improvements ($671 million), North Delta Improvements ($220 million), conveyance studies ($22 million).

[6] Assumes monitoring and assessment costs are 5% of total program costs (in addition to costs of existing science programs).

4.4 Restoration Coordination

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 administration function for Category III funds was shifted to the CALFED Bay-Delta Program's Restoration Coordination Program, which 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.

Actions funded under the Restoration Coordination Program are selected for their benefits to the long-term program regardless of the final configuration of the Preferred Program Alternative. These actions must be consistent with any alternative configuration and provide early implementation benefits. This implementation also provides valuable information which can be used to adaptively manage the system. Actions funded through the Restoration Coordination Program must have appropriate environmental documentation, have no significant cumulative impacts, and must not limit the choice of a reasonable range of alternatives. As the CALFED long-term program becomes more developed, the priorities and project selection process have been revised to ensure consistency with the Strategic Plan for Ecosystem Restoration, the Ecosystem Restoration Program objectives and the draft Stage 1 action list.

Ecosystem Restoration projects have been identified as directed programs and through a public solicitation process. CALFED has the discretion of directing funds towards specific actions (directed programs) which it believes helps 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 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 Secretary for Resources and the Secretary of Interior.

To date, CALFED's Restoration Coordination Program has received more than 800 proposals and has funded 195 projects for a total of approximately $228 million. Types of projects funded have included fish screens, fish ladders, land acquisition, habitat restoration and focused research and monitoring which are designed to provide information which will improve future restoration efforts. Funding sources include contributions from the California Urban Water Agencies, Proposition 204 State bond funds and funding from the Federal Bay-Delta Act, and Federal EPA watershed funding. For 1999, the majority of funds available are from the Federal Bay-Delta Act, with additional contributions from State Proposition 204. The Restoration Coordination Program also has the responsibility of improving coordination among fish and wildlife restoration programs in the Central Valley to ensure that Category III programs and projects are well integrated with other restoration programs and are consistent with the long-term ERP and the Strategic Plan for Ecosystem Restoration.

4.5 Comprehensive Monitoring, Assessment and Research Program (CMARP)

Introduction

The CALFED Bay-Delta Program is organized around the concept of adaptive management because there is incomplete knowledge of how the ecosystem functions and the effects of individual project actions on populations and processes. Monitoring key system functions (or indicators), completing focused research to obtain better understanding, and staging implementation based on information gained are all central to the adaptive management process. The process necessarily includes numerous assessment and feedback loops so that management decisions are based on the best and most current information. This process entails an institutional framework to ensure that the correct questions are identified for monitoring and research actions, that monitoring and research are conducted appropriately, that the data collected and obtained are stored properly and available to those with an interest, and that relevant information is developed from the data obtained to further the incremental process of adaptive management. The Comprehensive Monitoring, Assessment and Research Program (CMARP) is being developed to meet these needs.

A substantial monitoring effort in the Bay and Delta has been carried out for several years under the auspices of the Interagency Ecological Program (IEP). The purpose of the CMARP is to build on the work of IEP and other efforts to assure that information gathering and evaluation necessary to the success of the CALFED Program is developed and carried out. CMARP will

help provide those new facts and scientific interpretations necessary for implementing the CALFED Program and for the public to judge the Program's success. Major efforts will include documenting and explaining the status and trends of the resources, providing timely information for real-time management, and participating in design, execution, and analysis of adaptive experiments. CMARP must routinely make available information on major indicators of program progress. CMARP efforts must be subjected periodically to independent scientific review to evaluate the Program's relevance and approach and to maintain public confidence in the Program.

Scope

CMARP is designed to provide information on all of the CALFED program elements, including the Ecosystem Restoration Program, the Conservation Strategy, Water Quality Program, Levee Stability, Water Use Efficiency Program, Water Transfer Program, Storage, Conveyance, and the Watershed Program. CMARP also has responsibility for organizing and evaluating data generated by projects of the Restoration Coordination Program. In addition, CMARP will contribute to the design of monitoring for any mitigation efforts of CALFED. Finally, CMARP will be coordinated with existing monitoring and research programs so that they can provide a foundation of information for the Program. The CMARP will include options to ensure that monitoring, assessment, and research needs are:

- Identified
- Coordinated to provide comprehensive system-wide coverage
- Performed by the most appropriate party
- Completed in a comparable manner by all parties
- Accomplished with minimum redundancy and optimum efficiency and effectiveness

The CMARP must also ensure that results from the monitoring are:

- Interpreted
- Made readily available to all interested parties in a timely manner
- Incorporated as feedback to facilitate adaptive management

CMARP must also assure that study and monitoring designs are sufficient to detect statistically significant and ecologically relevant impacts or changes.

The scope of CMARP includes both institutional and environmental considerations. It seeks to balance specific knowledge needs of water managers and the public versus an understanding of ecosystem processes and what can actually be obtained and measured from the field. For example, CALFED agencies presently monitor the abundance of several key species and environmental attributes such as streamflow at the State and federal diversion facilities in the

Delta to understand better what is entrained, when, how many, during what life stage and under what kind of environmental conditions. Although much of this monitoring is designed to address institutional needs, limits on knowledge obtained are based on limitations of monitoring design which in turn are limited by the physical system to be monitored. Thus, the programmatic scope of CMARP must consider both institutional needs and environmental considerations and should maintain sufficient flexibility to respond to both as they change over time.

CALFED has determined that monitoring, assessment, and research efforts are a critical component of the adaptive management process, and should be integral to all program elements. The application of CMARP will be very different for individual CALFED programs. However, each program element has similar needs that include gathering and assessing data. In addition, the CMARP must also address the monitoring and assessment needs of the CALFED Conservation Strategy, as well as any mitigation required as a result of CALFED program actions.

Restoration projects require special consideration. A requirement for funding is that project proposals contain monitoring elements to determine if stated objectives have been met and to provide guidance for assessing future rehabilitation needs. CMARP will include recommendations to ensure that monitoring data from all these projects are technically sound, broadly usable, and provide meaningful information to guide future actions.

The CMARP Plan will take into consideration the broad variety of factors that can affect the environment, its physical structure, chemical makeup and biotic communities. The recommended program will necessarily be limited to monitoring only a small fraction of the possible physical chemical, and biological, attributes of the environment. Conceptual modeling will play a key role in helping decide which attributes to monitor.

Objectives

Objectives have been established for CMARP's monitoring and assessment and research functions that are consistent with the adaptive management strategy adopted by CALFED.

Monitoring and Assessment Program Objectives

- Provide information necessary to management necessary to evaluate the effectiveness of program actions and to support ongoing adaptive management actions
- Describe conditions in the Bay-Delta and its watershed on appropriate temporal and spatial scales
- Evaluate trends in the measures of environmental conditions
- Identify the major factors that may explain the observed trends

- Analyze data and report results to stakeholders and agencies on a timely basis

Research Program Objectives

- Build an understanding of physical, chemical and biological processes in the Bay-Delta and its watershed that are relevant to CALFED program actions
- Provide information useful in evaluating the effectiveness of existing monitoring protocols and the appropriateness of environmental attributes
- Test causal relationships among environmental variables identified in conceptual models
- Reduce areas of scientific uncertainty regarding management actions
- Incorporate relevant new information from all sources
- Revise conceptual models as understanding of the system increases

Program Activities

The CMARP development process has included the following steps:

1. **Identify the goals, objectives and needs** of CALFED Program elements, related programs, and agency major program goals and objectives.

2. **Develop a conceptual framework** that focuses on development of explicit conceptual models for use in designing monitoring and research programs. (This task is being accomplished in coordination with monitoring and research programs from Puget Sound, Chesapeake Bay and South Florida).

3. **Monitoring program design**
   - Inventory existing monitoring programs
   - Develop monitoring elements
   - Develop a process for data management
   - Develop a process for data analysis and monitoring
   - Restoration coordination monitoring institutional process

4. **Design a CALFED focused research program** to investigate causes and trends, reduce areas of scientific uncertainty, and corroborate relationships in conceptual models.

5. **Develop an institutional structure for monitoring, assessment and research** to focus on identifying institutional functions, and recommending how a monitoring and research program should operate. The *CMARP Program Report*, a separate

appendix to this *Draft Programmatic EIS/EIR,* recommends that there be a chief scientist, a science coordination team, and a science review board.

CALFED recognizes the need for reducing uncertainties about the factors affecting the resources of the Bay-Delta system. Although a traditional monitoring, assessment and research program will meet this need over a period of decades, CALFED needs to reduce key uncertainties at a more rapid rate to meet program goals. Therefore, CALFED will undertake an active program of adaptive resource management. Such a program will require a partnership between resources managers and scientists in which effects of key factors are better defined by informed management experiments. Resource managers will thereby increase chances of avoiding catastrophes and responding successfully to unexpected events. Informed adaptive experiments require policy-level recognition and acceptance of some risks to the resources.

Implementation of CMARP

CMARP will be implemented in concert with the evolving CALFED Program. CMARP is being refined in 1999 by making a more detailed comparison between the information being generated by existing programs and the proposed actions of Stage 1. In addition, given available funding prior to the Record of Decision, CMARP expects to implement some of the following initial efforts in support of CALFED program elements:

- Diversion effects on fish - Assessment of fish entrained at the SWP and CVP facilities in concert with real-time monitoring results to better define flexibility of project operations and use of an environmental water account.
- Fish screen evaluation - Establish a team or teams to develop information needed to evaluate the major proposed Stage 1 fish screens and provide information to help decide whether to expand or modify these screens.
- Municipal source water quality - Establish a team of agency and stakeholder personnel to reach consensus on questions and priorities identified by the Bromide Panel to reduce source water concentrations during Stage 1 implementation.
- Marking hatchery salmon - Develop a constant fractional marking program at Central Valley Chinook salmon hatcheries to help evaluate hatchery contribution to spawning escapement and ocean and inland recreational fisheries. The goal is to have the program implemented by fall of 2000.
- Factors affecting salmon - Through the IEP's Central Valley Salmonid Project Work Team and its satellite teams, develop proposals to refine understanding of factors affecting survival of juvenile chinook salmon living in and traveling through the Delta.
- Factors affecting delta smelt - Assemble an interdisciplinary agency/stakeholder team to prioritize and if possible start additional research on delta smelt in support

of CALFED goals and adaptive management. The prioritized list and subsequent proposals will be peer-reviewed.

- Fish/X2 relationships - In concert with external peer review panel recommendations, select and begin studies to document physical and biological mechanisms involved in the fish/X2 relationships.
- Documenting and assessing effects of aquatic species introductions - By review and synthesis of existing data and by initiation of new projects, document non-indigenous species introductions and determine effects of these introductions. These efforts will be closely coordinated with other efforts in the IEP, CALFED, SFEI and the Coastal Committee of the Western Regional Panel of the National Aquatic Nuisance Species Task Force.
- Delta topography and bathymetry - Assemble an agency/stakeholder team to direct a short-term (3-month) study on the feasibility of using Light Detection and Ranging for topography and shallow-water bathymetry and multi-beam sonar for deeper bathymetry.
- Review existing streamflow network - Review the existing streamflow gage network in the Bay-Delta watershed used to evaluate water transfers, water availability, water use efficiency, water quality and other aspects of the CALFED program. Develop a proposal for augmentation of gages where determined necessary.
- Category III Program effectiveness - Continue the review and oversight of monitoring activities for projects being implemented through the Category III program, to determine effectiveness of projects and to provide an assessment of information being developed.
- Relational Database Management System - Continue development and implementation of a Relational Database Management System that allows individual data providers to manage their own data locally while contributing to a larger comprehensive database.

4.6 Adaptive Management

No long term plan for management of a system as complex as the Bay-Delta can predict exactly how the system will respond to Program efforts or foresee events such as earthquakes, climate change, or the introduction of new species to the system. Adaptive management, as an essential Program concept, acknowledges that there is a need to constantly monitor the system and adapt the actions that are taken to restore ecological health and improve water management. These adaptations will be necessary as conditions change and as more is learned about the system and how it responds. The Program's objectives will remain fixed over time, but the actions may be adjusted to assure that the solution is durable.

The concept of adaptive management is an essential part of every CALFED Program element, as well. The concept of adaptive management can be illustrated as applied to the Ecosystem Restoration Program element as shown in the following section.

Because the Bay-Delta ecosystem is large, complex, diverse and variable, it is impossible to know with certainty how it will respond to implementation of the ERP and other Program components. And although much is known about how the Bay-Delta functions, there are still significant information gaps that hamper the ability to sufficiently define problems and design restoration actions to address them. To account for this uncertainty, the ERP strategic plan outlines an adaptive management approach to restoring and managing the Bay-Delta ecosystem. An adaptive management approach acknowledges the uncertainty inherent in restoring and managing a natural system as large and complex as the Bay-Delta by designing and monitoring restoration actions so that they improve the understanding of the system while simultaneously restoring it. This approach allows revised restoration activities or better designed future restoration actions based upon the information learned from projects implemented earlier. It also provides the flexibility required to respond to changing Bay-Delta conditions and to identify and address resource conflicts and trade-offs. The Strategic Plan outlines the following steps as part of the adaptive management approach:

1. **Define the problem or set of problems to be addressed.** In order to design effective restoration actions, the geographic, temporal, and ecological parameters of the problem must clearly be defined. Decades of scientific study have already identified many of the problems affecting the health of the Bay-Delta ecosystem. However, for certain components of the Bay-Delta ecosystem, existing knowledge is insufficient to adequately define problems, so targeted research will be necessary to provide the information that allows the problems to be defined with greater detail.

2. **Define goals and objectives for resolving identified problems.** It is important to establish the expectations of the overall restoration program and for individual restoration actions by articulating clear restoration goals. It is also important to establish the criteria that can be used to measure success in achieving goals by defining measurable objectives. Clear goals and measurable objectives help focus and direct ecosystem restoration, they help facilitate the design of restoration actions, and they help resource managers track incremental progress toward restoration objectives.

3. **Develop conceptual models.** It is impossible to account for all of the variables that compose and animate an ecosystem as large and complex as the Bay-Delta; therefore, it is necessary to distill the most important ecosystem attributes and relationships into simplified models that can guide resource restoration and management. Conceptual models articulate hypotheses about what attributes and

relationships are most important in an ecosystem. By articulating hypotheses about causal relationships in the ecosystem, conceptual models can suggest potential restoration actions or identify critical information gaps that help target additional research.

4. **Develop and design alternative restoration or management actions.** Conceptual models will provide an assessment of the confidence we can place in potential restoration actions. For those actions about which there is confidence in how the ecosystem will respond, full-scale implementation can begin. If conceptual models suggest multiple viable restoration alternatives, pilot or demonstration projects to test the alternative hypotheses could be implemented. The resulting information will improve understanding of the ecosystem and help suggest which restoration actions are most effective in achieving restoration goals. Conceptual models can also help identify information gaps and needed targeted research.

5. **Implement restoration actions.** Restoration actions selected for implementation must address the more serious environmental problems, must be linked to conceptual models, and must provide an opportunity to enrich our knowledge of how the ecosystem operates.

6. **Monitor the ecosystem.** It is important to monitor the ecosystem to gauge how it responds to the restoration or management action. Monitoring provides the information necessary for assessing the effectiveness of a given restoration action. It also provides the data that will help improve understanding of the Bay-Delta ecosystem.

7. **Update restoration and management actions.** The information derived from monitoring data allows resource managers to evaluate restoration actions and revise or update them to be more effective in achieving restoration goals and objectives. Monitoring data can also indicate when there is a need to refine the definition of a problem or the goals and objectives.

Similar models of these seven steps can be used to develop adaptive management approaches for the other program elements.

5. REGULATORY COMPLIANCE

The CALFED Program proposes specific actions to comply with the programmatic requirements of the National Historic Preservation Act; the Memorandum on Farmland Preservation and the Farmland Protection Policy Act; the Federal Agricultural Improvement and Reform Act of 1996 and the 1985 Food Security Act; Executive Orders 11988 (Floodplain Management), 11990 (Protection of Wetlands), and 12898 (Environmental Justice); the Federal Clean Air Act; and the Federal Climate Change consideration under NEPA. The Impact Analysis Document of the Draft Programmatic EIS/EIR contains information regarding compliance with applicable laws and regulations.

The Impact Analysis Document outlines programmatic compliance actions that still need to be finalized before the Final Programmatic EIS/EIR is completed. This section indicates how the CALFED Bay-Delta Program plans to comply with the federal/state Endangered Species Acts; Fish and Wildlife Coordination Act; 404(b)(1) Guidelines (Clean Water Act); and the Coastal Zone Management Act. Further compliance steps will be taken by agencies carrying out specific projects in Phase III.

5.1 Multi-species Conservation Strategy

Introduction

The CALFED Multi-species Conservation Strategy (MSCS) is a comprehensive species and habitats conservation program that is an integral part of the CALFED Program. The MSCS addresses multiple species and habitat needs and the maintenance of ecological functions within the CALFED Program study area, which includes the Delta Region, the Bay Region (including the outer Bay or near-shore area), the Sacramento River Region, the San Joaquin Region (including the Tulare Lake Basin), and other State Water Project and Central Valley Project service areas (Other Service Areas). The MSCS addresses the needs of species and habitats at the landscape level and identifies measures to compensate for CALFED Program impacts and to benefit species and habitats.

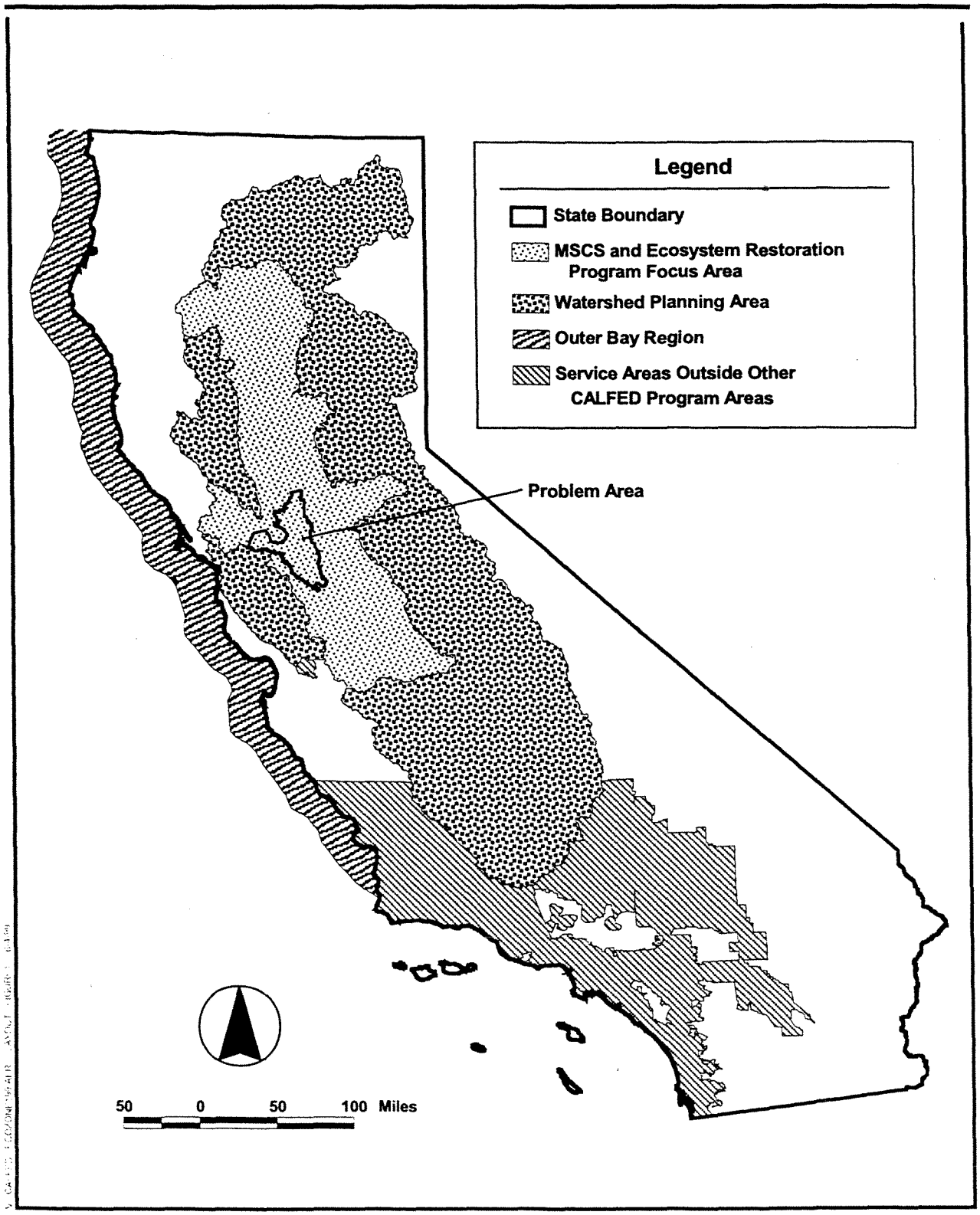
The purpose of the MSCS is two-fold, both biological and regulatory. First, the MSCS builds on the CALFED Ecosystem Restoration Program (ERP) and creates mechanisms designed to ensure that the CALFED Program achieves specific goals for species and habitats. Second, the MSCS provides a framework for compliance with the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), and the Natural Community Conservation Planning Act (NCCPA) at both the programmatic and project-specific levels.

Geographic Scope of the MSCS

The MSCS considers the potential impacts of CALFED Program actions within the following two areas:

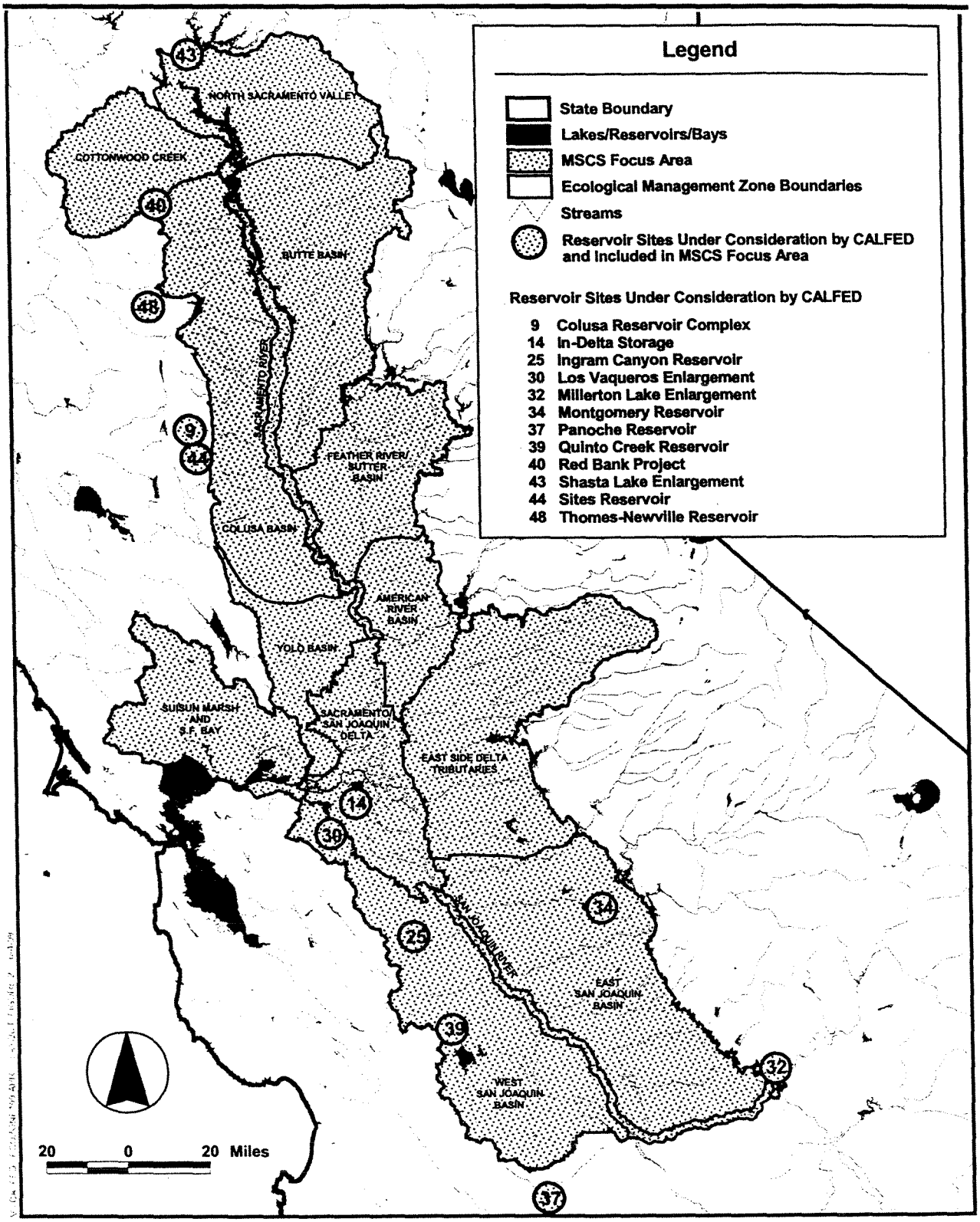
1. **Focus Area:** This area, shown on the map titled "MSCS Focus Area", includes the legally defined Delta, Suisun Bay, the Sacramento and San Joaquin rivers and their tributaries downstream of major dams, and the potential location of future reservoirs. The MSCS focus area is equivalent to the ERP focus study area, with the addition of the potential future reservoir sites. The legally defined Delta and Suisun Bay are also referred to collectively as the CALFED Problem Area, as shown in the map titled "CALFED Program Areas".

2. **Other Service Areas:** The "Other Service Areas" of the State Water Project (SWP) or the Central Valley Project (CVP) include: small portions of Santa Cruz, San Benito, and Santa Clara Counties outside the Bay watershed that are served by the CVP; and most of the urbanized areas of southern California, as well as Santa Barbara and San Luis Obispo Counties served by the SWP. CVP and SWP service areas are located in the Central Valley, but these areas are covered by the Central Valley Watersheds. In addition, the Imperial Irrigation District is included in this region. The Other Service Areas are shown in the map entitled "CALFED Program Areas".



CALFED BAY-DELTA PROGRAM

CALFED Program Areas



CALFED BAY-DELTA PROGRAM

MSCS Focus Area

Assessment of CALFED Program Impacts on Species And Habitats

To meet its biological and regulatory purposes, the MSCS presents information and recommendations based on a multi-year research and development process. The biological elements of the MSCS can be summarized as follows:

Evaluated Species List and Habitats List Over 400 fish, wildlife, and plant species that were known to occur or had the potential to occur within the MSCS focus area were identified. This broad group of species was reduced to 243 species to be evaluated in the MSCS. Species were included as "evaluated species" if they met one of the following criteria: (1) the species is federally listed as threatened or endangered or California-listed as rare, threatened, endangered, or fully protected; (2) the species could become federally or California-listed as threatened or endangered during the term of CALFED implementation (at least 30 years) and the species could be adversely affected by CALFED actions; or (3) CALFED actions could affect a substantial portion of the species' range or important habitat. Species in the Other Service Areas are not included in this analysis and will be treated in a subsequent process.

A habitat classification was developed for the MSCS that encompasses 18 habitat types and two fish communities. The 18 habitat types evaluated in the MSCS include: tidal perennial aquatic; valley riverine aquatic; montane riverine aquatic; lacustrine; saline emergent; tidal freshwater emergent; nontidal freshwater permanent emergent; natural seasonal wetland; managed seasonal wetland; valley/foothill riparian; montane riparian; grassland; inland dune scrub; upland scrub; valley/foothill woodland and forest; montane woodland and forest; upland cropland; and seasonally flooded agricultural land. The two fish groups evaluated in the MSCS include: anadromous fish species; and estuarine fish species. Collectively, the habitats and fish groups are referred to in the MSCS as "NCCP communities."

Species and Habitat Goals and Prescriptions The MSCS establishes conservation goals for species and goals for the NCCP communities. For species, the MSCS delineates goals of "recovery" or (R), "contribute to recovery" or (r), and "maintain" or (m).

> **Recovery (R)**: For these species designated "R," the CALFED Program has established a goal to recover the species within the CALFED ERP Ecological Management Zones. A goal of "recovery" was assigned to those species whose range is entirely or nearly entirely within the Delta and Suisun Bay and marsh areas and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. The term recover means the decline of the species is arrested or reversed, threats to the species are neutralized, and thus, the species' long-term survival in nature is assured. In the case of most species listed under the federal ESA, recovery is equivalent, at a minimum, to the requirements of delisting. Certain "R" species, such as anadromous fish, have threats that are outside the geographic scope or purview of the CALFED Program (i.e., ocean harvest of anadromous fish that is regulated by national and

international laws). Thus in some instances CALFED may not be capable of completing all actions potentially necessary to recover the species, however, CALFED will implement all recovery actions within the ERP Ecological Management Zones. For other species, CALFED may choose a goal that aims to achieve more than would be required for delisting (e.g., restoration of a species and/or its habitat to a level beyond delisting requirements). The effort required to achieve the goal of "recovery" may be highly variable between species.

Species assigned the "R" goal include: Central Valley steelhead evolutionarily significant unit, Central Valley winter-, spring-, and fall-run chinook salmon, delta smelt, longfin smelt, Sacramento splittail, green sturgeon, valley elderberry longhorn beetle, Lange's metalmark, Suisun ornate shrew, Suisun song sparrow, San Pablo song sparrow, Antioch dunes evening primrose, Contra Costa wallflower, soft bird's-beak, Suisun thistle, Mason's lilaeopsis, and Suisun marsh aster.

Contribute to Recovery (r): For those species designated "r," the CALFED Program will make specific contributions toward the recovery of the species. The goal "contribute to recovery" was assigned to those species for which CALFED Program actions affect only a limited portion of the species' range and/or CALFED program actions have limited effects on the species. In the case of a species with a recovery plan, this may mean implementing the measures identified in the plan that are within the CALFED Problem Area, and some of the measures outside the Problem Area. For species without a recovery plan, this would mean implementing specific measures that would benefit the species.

Species assigned the "r" goal include: Sacramento perch, delta green ground beetle, giant garter snake, salt marsh harvest mouse, riparian brush rabbit, San Pablo California vole, San Joaquin Valley woodrat, least Bell's vireo, California clapper rail, California black rail, little willow flycatcher, bank swallow, western yellow-billed cuckoo, greater sandhill crane, Swainson's hawk, California yellow warbler, salt marsh common yellowthroat, Crampton's tructoria, Northern California black walnut, delta tule pea, delta mugwort, bristly sedge, delta coyote-thistle, alkali milkvetch, and Pt. Reyes bird's-beak.

Maintain (m): For those species designated "m," the CALFED Program will undertake actions to maintain the species. The goal "maintain" was assigned to species expected to be minimally affected by CALFED actions. For this category, CALFED will ensure that any adverse effects to the species from implementing CALFED actions are addressed commensurate with the level of impact; actions to maintain a species may not actually contribute to its recovery, but would be expected, at a minimum, to not contribute to the need to list an unlisted species or degrade the status of a listed species. CALFED will also maximize beneficial effects on these species from implementing Program actions to the extent practicable.

The MSCS establishes specific prescriptions for achieving the species goals. The prescriptions for "R" and "r" species provide habitat or population targets that, if met, would achieve the goal for the species. The prescription for all "m" species requires either an increase in, or no discernable adverse effect on, the size or distribution of species' populations.

For the NCCP communities, the MSCS establishes goals consistent with those described in the ERP for restoration and maintenance of aquatic, wetland, and riparian habitats in the Delta, Suisun Bay, and mainstems of the Sacramento and San Joaquin rivers. For upland habitats that were not the focus of the ERP, the MSCS establishes goals that focus on replacing habitat values and functions that are impacted by implementation of CALFED Program actions.

Assessment of CALFED Program Impacts on Species and Habitats The MSCS analyzes the beneficial and adverse impacts of implementing the CALFED Program on the evaluated species and habitats. The approach to analyzing the Program impacts involved combining specific proposed CALFED Program actions with similar purposes into programmatic-level "summary outcomes." Potential impacts on NCCP communities and evaluated species of implementing CALFED Program actions were determined by analyzing activities that could be associated with implementing summary outcomes (e.g., flooding of Delta islands to restore tidal freshwater emergent wetland) and that could cause a direct or indirect adverse effect on an NCCP habitat or result in the harm or mortality to an evaluated species.

Conservation Measures The MSCS identifies conservation measures for evaluated species and for the 18 MSCS habitat types. There are two types of conservation measures in the MSCS: (1) conservation measures required to avoid, minimize, or compensate for potential Program impacts on the evaluated species and habitats; and (2) conservation measures required in addition to those measures to avoid, minimize, or compensate for Program impacts that will ensure the CALFED Program achieves the species goals. The conservation measures required for implementation of a particular Program action will depend on the scope, location, and timing of the action as well as the current status, distribution, and needs of the affected species and the condition of its habitat. Generally, the conservation measures recommended in the MSCS to achieve the species goals involve implementation of existing ERP measures, or refinement of existing ERP measures (i.e., recommendation on the preferred location for an ERP measure or the priority of certain ERP measures over others) and implementation of other beneficial Program actions.

Summary of Effects of Implementing CALFED Program and Conservation Measures Implementation of CALFED Program actions would result in conversion of existing natural (non-agricultural) habitat types to other natural habitat types. For example, nontidal freshwater permanent emergent wetlands present on Delta islands could be converted to tidal freshwater emergent wetlands as a result of setting back or breaching Delta levees. There could also be a

loss of natural habitat, for example, during construction of conveyance facilities, roads, or other infrastructure. Implementation of CALFED Program actions and conservation measures that compensate for habitat loss, however, would result in increases in the extent or quality of most natural NCCP habitats. Some overall loss of grassland and upland scrub habitats could result from conversion of these habitat types to other natural habitats or to other uses.

Implementation of proposed Program actions would also result in conversion of a substantial amount of agricultural lands (primarily in the Delta region) to natural habitat or to other uses (e.g., conveyance and storage facilities). The habitat values for evaluated species provided by affected agricultural lands, however, would be replaced or increased as a result of: (1) restoration and enhancement of natural NCCP habitats; (2) enhancement of habitat values provided by existing agricultural lands (i.e., converting cropping patterns to crops that yield higher forage values for wildlife, implementing wildlife-friendly agricultural practices); (3) and implementation of conservation measures to compensate for loss of habitat values.

Because implementation of the CALFED Program actions and conservation measures are expected to result in an increase in the extent or quality of most natural NCCP habitats, the Program is expected to be beneficial for numerous species in the MSCS that use these habitats. No species are expected to be adversely affected by implementation of CALFED Program actions with the addition of the conservation measures.

Relationship to CALFED's Ecosystem Restoration Program

Implementation of the CALFED Program, including the ERP, will result in actions that impact species and their habitats. These actions must comply with the federal ESA and CESA where the impacts on species and habitats include impacts to species listed under the two acts or other sensitive species. The MSCS has been developed to ensure that the CALFED Program as a whole, and individual CALFED Program actions, comply with the endangered species laws.

Certain conservation measures in the MSCS are designed to avoid, minimize, or compensate for potential Program impacts on the evaluated species and habitats. The MSCS develops conservation measures that go beyond what is required to avoid, minimize, or compensate for Program impacts so that the Program can achieve the species goals. These conservation measures contribute to the ERP by identifying temporal or locational refinements to existing ERP actions. Further, the MSCS develops conservation measures for wildlife species that were not the primary focus of the ERP and for certain plant species, the measures for which may be incorporated into the ERP in the future. Finally, the MSCS also develops conservation measures that refine other CALFED program elements and add specificity to CALFED's Comprehensive Monitoring, Assessment, and Research Program.

Framework for Regulatory Compliance

The MSCS also serves to ensure that the CALFED Program as a whole and individual CALFED Program actions will be implemented in compliance with the State and federal endangered species laws.

Programmatic Compliance with Endangered Species Laws The CALFED agencies will comply with ESA for approval of the CALFED Program through a programmatic ESA section 7 consultation with the USFWS and NMFS. The MSCS will serve as the biological assessment of the CALFED Program in support of the programmatic section 7 consultation. The USFWS and NMFS will use the MSCS biological information and analysis to prepare programmatic biological opinions. The MSCS will also be submitted to DFG for approval as a programmatic NCCPA Plan. The programmatic biological opinions and DFG's NCCP determination will be completed at the time the CALFED agencies issue a Record of Decision (ROD) and make findings of fact on the CALFED Program as a whole.

Neither the programmatic biological opinions nor the programmatic NCCP determination will authorize take of the species covered in the MSCS. Instead, as discussed below, take authorization for entities implementing CALFED Program actions will follow through a streamlined compliance process that tiers from both the MSCS and the programmatic species actions. The subsequent compliance process for some Program actions or groups of actions may be completed shortly after the CALFED agencies issue the ROD and make findings of fact for the CALFED Program, depending on the level of detail available about each action and its environmental effects.

Project-Level Compliance with Endangered Species Laws Due to the varying level in which CALFED Program actions are currently defined, and the need for additional biological data for some species, the MSCS in itself cannot provide the analysis needed to achieve compliance with ESA, CESA, and the NCCPA for all or even a subset of Program actions. In most cases, additional information will be required for the wildlife agencies to ascertain a CALFED Program action's specific impacts on species to the extent required by ESA, CESA, and the NCCPA. The MSCS, the programmatic biological opinions, and DFG's NCCP determination will therefore serve as the springboard for a streamlined regulatory compliance process to allow those entities implementing CALFED actions to comply with ESA, CESA, and the NCCPA and to efficiently obtain any required take authorizations.

Entities implementing CALFED Program actions will be required to prepare an action-specific implementation plan (ASIP) for the proposed Program action or group of actions being implemented collectively. The ASIP will be based on and tier from the data, information, analysis, and conservation measures in the MSCS. The implementing entity will submit the ASIP to the USFWS, NMFS, and DFG. The wildlife agencies will utilize both the MSCS and the ASIPs to meet their respective agency's regulatory requirements for analyzing the effects of

Program actions on species and their habitats. The USFWS, NMFS, and DFG will authorize take of listed covered species, where appropriate, based on the analysis and conservation measures in the MSCS and the ASIP. The agencies will coordinate their reviews of the ASIPs to jointly determine the conservation measures necessary for compliance with ESA, CESA, and the NCCPA.

The USFWS and NMFS will determine compliance with ESA by entities implementing CALFED Program actions primarily under section 7 of the ESA. The Services will consider issuing an ESA section 10(a)(1)(B) permit if a non-federal entity proposes to implement one or more CALFED actions that are not authorized, funded, or carried out by a federal agency. The ASIP will contain all information required for compliance under either ESA section 7 or ESA section 10(a)(1)(B).

The DFG will determine compliance with the NCCPA primarily through section 2835 of the California Fish and Game Code, which is part of the NCCPA. The ASIP will contain all information required for compliance with the NCCPA.

Content of Action-Specific Implementation Plans To fulfill the requirements of ESA section 7, ESA section 10, and Fish and Game Code section 2835, each ASIP will include the following:

- A detailed project description of the CALFED Program action or group of actions to be implemented, including site specific and operational information.

- A list of the listed, proposed, and other sensitive species that occur in the action area.

- An analysis identifying the direct, indirect, and cumulative impacts on listed and proposed State and federal species, as well as other sensitive species occurring in the action area (along with an analysis of impacts that may occur to any designated critical habitat) likely to result from the proposed CALFED Program action or group of actions, as well as actions interrelated and interdependent to the proposed action.

- The measures the implementing entity will undertake to minimize and mitigate such impacts; a plan to monitor the impacts and the implementation and effectiveness of the minimization and mitigation measures; the funding that will be made available to undertake the minimization and mitigation measures; and the procedures to address unforeseen circumstances.

- A discussion of alternative actions the applicant considered that would not result in take, and the reasons why such alternatives are not being utilized.

- Additional measures the wildlife agencies may require as necessary or appropriate for compliance with ESA, CESA, and the NCCPA.

The ASIPs will be based, in large part, on the biological data, CALFED Program information, impacts analysis, and conservation measures in the MSCS. Additional information, analysis, and conservation measures may be required for Program actions that are not yet well-defined. The MSCS has reduced the potential for an implementing entity to be required to provide additional information, analysis, and conservation measures by offering as much detail as feasible on the expected impacts of Program actions on species and habitats. The ASIPs must be consistent with the species goals, prescriptions, and conservation measures in the MSCS for species affected by the proposed CALFED Program action. To obtain take authorization for a CALFED Program action, the ASIP must incorporate all applicable conservation measures in the MSCS and any additional measures required by the wildlife agencies where the MSCS references the need for additional information.

The MSCS and the ASIPs are the mechanism for implementing entities to comply with ESA, CESA, and the NCCPA for CALFED Program actions. The ASIPs will not address all regulatory and permitting needs for Program actions. Rather, all CALFED Program actions will require environmental review and permitting under other State and federal laws before the actions can be implemented. The CALFED Program is developing a coordinated environmental review and permitting process for Program actions. The coordinated permitting process includes the MSCS' streamlined process for complying with ESA, CESA, and the NCCPA.

Covered Species Covered species will be identified in the final MSCS after review of public comments received regarding the draft MSCS. Only species currently identified as evaluated species will be included in the list of covered species. Evaluated species that the wildlife agencies determine are not adequately conserved and protected from jeopardy by the MSCS and ERP will not be included as covered species. Evaluated species whose habitat will not be significantly increased or enhanced under the MSCS and ERP are most likely to be excluded.

Assurances

As key CALFED Program elements such as the ERP and the EWA are finalized, funded and implemented, the wildlife agencies will rely increasingly on CALFED's conservation of covered species when evaluating the long-term effects of CALFED Program actions. The potential need for conservation measures that are new or different than the measures in the MSCS will decrease as conditions for covered species are shown to improve. The MSCS reflects this fact by providing assurances to CALFED agencies that the conservation measures identified in ASIPs in the MSCS' streamlined permitting process will not be substantially increased or altered over time. Before implementation of the ERP, the EWA and other key CALFED Program elements is initiated, the wildlife agencies' assurances will be limited or qualified. However, the assurances will increase over time as implementation progresses.

The wildlife agencies will provide assurances regarding each CALFED Program action directly to the CALFED agency or other entity carrying out the action. The assurances will be based on the ASIP developed for the action in the MSCS' streamlined permitting process and will limit new or different conservation measures that would require a commitment of land, money or water, or would restrict the use of land or water, beyond what is required in the ASIP.

In addition, the MSCS provides the framework for assuring cooperating landowners that they will not be prevented from continuing their existing land uses because of the implementation of CALFED Program actions or MSCS conservation measures. Many landowners may be concerned that if the numbers of threatened and endangered species within the focus area increases, the use of land or water in or near the species' habitat will be restricted by ESA and CESA. Cooperating landowner programs are intended to address this concern and to preserve compatible land uses within the focus area. Cooperating landowner programs may include, where appropriate:

- Protections for farmers and ranchers who neighbor land preserved by CALFED agencies for wildlife conservation purposes under the CALFED Program.
- Protections for landowners or local public entities who maintain levees on which wildlife habitat will be created or enhanced under the CALFED Program.
- Protections for landowners or local public entities who use or divert water from streams or rivers newly opened to anadromous fishes under the CALFED Program.
- Protections for landowners or local public entities who operate and maintain water diversions in which fish screens will be installed under the CALFED Program.

Funding

In order to comply with the NCCP guidelines, the MSCS must address how the strategy will be funded. As noted in the Introduction to this section, the MSCS is an integral part of the CALFED Program and therefore, will be funded through the finance strategy developed for the Program. As implementation of the Program proceeds, funding of the conservation measures necessary to mitigate for any detrimental impact to the covered species and the additional measures to achieve species conservation goals, will be addressed in the Action Specific Implementation Plan. It is anticipated that the agency or entity initiating the ASIP, will provide the funding for the necessary conservation measures, though the actual implementation of the measures may be accomplished through the Ecosystem Restoration Program.

5.2 Fish and Wildlife Coordination Act

Under subsection 2(a) of the Fish and Wildlife Coordination Act (FWCA), federal agencies are responsible for consulting with the USFWS and the DFG for the purpose of conservation of wildlife resources by preventing loss and damage as well as providing for their development and improvement in connection with water-resource projects. Also within subsection 2(b) of the FWCA, the USFWS is required to report its recommendations for wildlife conservation and development and the results expected, and to describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages.

For the programmatic FWCA report, the USFWS will provide the public with their overall assessment of the effects of the CALFED Program and alternatives on fish and wildlife resources, providing recommendations for mitigation of adverse effects (where appropriate), and providing recommendations for implementing future (Phase III and beyond) CALFED Program actions.

The USFWS, as a member agency of the CALFED program, has provided technical assistance to the Program throughout the development of the Preferred Program Alternative. The USFWS will complete this programmatic FWCA analysis and report its findings and recommendations prior to completion of a Final Programmatic EIS/EIR for the CALFED Program. That report will become a part of the Final Programmatic EIS/EIR.

The USFWS will continue to provide technical assistance during Program implementation. Analyses of effects on fish and wildlife will also be provided for applicable Program actions as they are being planned.

5.3 Clean Water Act Section 404

The Program was established to develop a comprehensive solution to the problems facing the Bay-Delta system. The Program has crafted programmatic alternatives that will address multiple concerns over an implementation period of 30 years or more. The Preferred Program Alternative likely will include hundreds of individual actions combined with a carefully crafted monitoring program to guide implementation based on adaptive management. Many of these actions would involve potential impacts on wetlands and waters of the United States. Therefore, the actions will require Corps permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act (Section 404 permits). The actions potentially range from major, highly controversial projects (such as new surface water storage facility construction) to less controversial projects (such as creating new wetlands habitat by contouring land and changing local hydrology). It is critical to the success of the Program that an effective strategy for addressing the Section 404

permits process for this diverse range of potential actions be developed and agreed to prior to the Record of Decision (ROD) for the Program.

Many stakeholders are urging that the EPA and Corps issue a "programmatic" Section 404 permit to ensure that the CALFED solution actions would be permittable under a clearly defined process with appropriate decision criteria. The Corps and EPA determined that the level of detail in the Programmatic EIS/EIR for the Preferred Program Alternative will not establish a sufficient basis for a final determination of Section 404 compliance at the time of the ROD before Stage 1 begins. Although no site-specific Section 404 permits will be available at the time of the ROD, the Corps, EPA, and CALFED are developing a plan to facilitate Section 404 permitting during Program implementation. The preliminary proposal includes:

- An early permitting process for those projects included in the initial CALFED actions during Stage 1 of Program implementation.

- Developing programmatic assurances regarding a process by which the proposed water storage facilities in the Program will be evaluated under Section 404. Establishing and defining this process will allow for a more expedited Section 404 permit evaluation when Program projects need site-specific permits.

Establishing these assurances would take place no later than completion of the ROD and would include a Memorandum of Agreement (MOA) among the Corps, EPA, and appropriate CALFED agencies to establish the Section 404 compliance strategy. This MOA will:

- Establish performance criteria for alternatives to water storage projects, which would represent the limit of practicability for the purpose of Section 404 (b)(1) alternatives analyses. Input for this element of the Section 404 compliance strategy currently is being developed as the result of several concurrent processes involving agency staffs and stakeholders for water use efficiency and water transfer actions.

- Determine the level of alternatives that must be assured of implementation before water storage projects may be constructed.

- Establish a framework by which Program implementation projects would be evaluated for permits during the Program's implementation phase. Set forth a method for determining whether storage is needed after the necessary alternatives have been assured of implementation.

- Establish other procedures needed to comply with the Section 404 permitting process on a wide range of potential implementation actions.

In addition to the MOA, the Corps and EPA are working with CALFED to complete the initial screening process for potential surface water storage sites, resulting in a short list of sites that would undergo detailed evaluation during the Program's implementation.

Under Section 401 of the CWA, the SWRCB certifies that federally licensed or funded projects are consistent with maintenance or attainment of water quality standards. Before the ROD, the SWRCB and other appropriate CALFED agencies will develop an MOA to establish a process for determining Section 401 certification for CALFED projects requiring such certification.

5.4 Coastal Zone Management Act

Under the Coastal Zone Management Act (CZMA) of 1972, coastal states are required to develop coastal zone management programs, and federal agencies are required to certify that any proposed activities within or affecting the coastal zone are consistent with the state's program. In California, the San Francisco Bay Conservation and Development Commission (BCDC) oversees the San Francisco Bay segment of California's coastal zone management program. Among other areas, BCDC also has permit jurisdiction over projects within certain waterways up to, but not including, the legally-defined Sacramento-San Joaquin Delta (east of Chipps Island) that empty into the Bay and within specific saltponds and managed wetlands.

For Phase II, the Program will prepare a Programmatic Coastal Zone Management Act Consistency Determination which will document the possible effects of the Preferred Program Alternative on coastal resources. The Consistency Determination will also document the actions that the Program will take to ensure that implementation of the Preferred Program Alternative is carried out in a manner consistent, to the maximum extent practicable, with CZMA and the California Coastal Act. Since the March 1998 Draft Programmatic EIS/EIR did not contain a Preferred Program Alternative, the Programmatic Coastal Zone Management Act Consistency Determination for the CALFED Bay-Delta Program was not submitted to BCDC. This Consistency Determination document will be presented to BCDC and be part of the Final Programmatic EIS/EIR.

5.5 Clean Water Act Section 303

Section 303 of the Clean Water Act requires all states to conduct triennial reviews to evaluate and, where necessary to protect the designated uses for the state's waters, revise water quality standards. In California, the SWRCB is the recognized entity responsible for implementing the triennial review process.

The triennial review process of Section 303 is particularly well-suited to the adaptive management approach to ecosystem protection being proposed in the CALFED Program. CALFED intends to work with the SWRCB and Regional Boards and the EPA to assure that the implementation of the Water Quality Program, Ecosystem Restoration Program and other CALFED Program elements is consistent with and, where appropriate, incorporated into the ongoing regulatory programs based on Section 303.

5.6 Phase III Site-Specific Environmental Documentation

During Phase III of the CALFED Program, second-tier site-specific environmental documents will be prepared for the individual actions or site-specific projects chosen for implementation during the current Phase II process. Second-tier documents will be completed after certification of the Programmatic EIS/EIR to concentrate on issues specific to the individual parts of the program elements being implemented or the site chosen for the action. The second-tier documents will summarize and incorporate by reference the issues discussed in the broader program-oriented EIS/EIR and focus on the issues specific to the part of the overall program being implemented. Information presented in the second-tier EIS/EIRs will be specific to a smaller area within the CALFED Bay-Delta study area and will focus on impacts within the smaller area and individual action-level mitigation performance criteria.

Many entities have expressed concerns about the effects of the CALFED Program (especially the ERP and Levee Program) on agricultural resources. Agricultural resources are an important feature of the existing environment of the state and are recognized and protected under CEQA and State and federal policy. One of the major principles of the State's agricultural policy is to sustain the long-term productivity of the State's agriculture by conserving and protecting the soil, water, and air which are agriculture's basic resources. It is CALFED policy that adverse environmental effects to agricultural resources resulting from CALFED programs, projects, and actions will be fully assessed and disclosed under CEQA and NEPA, and avoided or mitigated to the extent required by law. Assessment, disclosure, and avoidance and other mitigation strategies will be developed at the programmatic and project-specific levels in consultation with other State, federal, and local agencies with special expertise or authority over agricultural resources which may be affected by the Program, such as the California Department of Food and Agriculture.

5.7 Coordination

Central Valley Project Improvement Act

The USFWS and the USBR are jointly responsible for implementing the Central Valley Project Improvement Act (CVPIA). The Act includes provisions intended to restore anadromous fish populations, improve and facilitate water transfers, implement water conservation actions, provide water for wildlife refuges in the Central Valley, and improve flows on the Trinity River for anadromous fish. It is the foundation for the Bay-Delta Accord and the CALFED Program.

Many of the provisions of the CVPIA parallel elements of the CALFED Program. CALFED's Ecosystem Restoration Program, Water Transfer Program, Water Use Efficiency Program, and Water Management Strategy are complementary to programs with similar goals being implemented under the CVPIA. Coordination of similar elements of the CALFED and CVPIA programs is a necessary priority to ensure that the common elements of both the CVPIA and CALFED are implemented in the most efficient way.

The USFWS and the USBR, as member agencies of CALFED, have played essential roles in developing the Program's Preferred Program Alternative. The USFWS and the USBR will continue to ensure that CALFED and CVPIA programs, as well as all other programs and statutory obligations, are coordinated.

6. GLOSSARY AND ACRONYMS

Glossary

AF Abbreviation for acre feet; the volume of water that would cover one acre to a depth of one foot, or 325,851 gallons of water. On average, could supply 1-2 households with water for a year. A flow of 1 cubic foot per second for a day is approximately 2 AF.

Alternative A collection of actions or action categories assembled to provide a comprehensive solution to problems in the Bay-Delta system.

AFRP Anadromous Fish Restoration Program, part of the Central Valley Project Improvement Act. The AFRP identified instream and Delta flows needed for recovery of anadromous fish.

Action A structure, operating criteria, program, regulation, policy, or restoration activity that is intended to address a problem or resolve a conflict in the Bay-Delta system.

Anadromous Fish Fish that spend a part of their life cycle in the sea and return to freshwater streams to spawn.

B(2) Water Statutory mandate to manage the water dedicated to fish and wildlife purposes pursuant to Section 3406(b)(2) of the Central Valley Project Improvement Act.

Banks Pumping Plant The State Water Project (SWP) export pumping plant in the south Delta. The plant is located downstream of Clifton Court Forebay.

BDAC The Bay-Delta Advisory Council, a 34-member federally chartered citizens' advisory committee. BDAC provides formal comment and advice to the CALFED agencies during regularly scheduled meetings.

Best Management Practices (BMP) An urban water conservation measure that the California Urban Water Conservation Council agrees to implement among member agencies. The term is also used in reference to water quality standards, watershed management activities, and others.

Carriage Water Additional flows released during export periods to ensure maintenance of water quality standards and assist with maintaining natural outflow patterns in Delta channels. For instance, a portion of transfer water released from upstream of the Delta intended for export from south Delta would be used for Delta outflow.

Central Valley Project (CVP) Federally operated water management and conveyance system that provides water to agricultural, urban, and industrial users in California. The CVP was originally authorized by legislation in 1937.

Central Valley Project Improvement Act **(CVPIA)** This federal legislation, signed into law on October 30, 1992, mandates major changes in the management of the federal Central Valley Project. The CVPIA puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower users.

Channel Islands Natural, unleveed land masses within Delta channels. Typically good sources of habitat.

Clifton Court Forebay The in-Delta storage used to regulate flows to the Banks Pumping Plant.

Common Delta Pool Delta provides a common resource, including fresh water supply for all Delta water users, and all those whose actions have an impact on the Delta environment share in the obligation to restore, maintain and protect Delta resources, including water supplies, water quality, and natural habitat.

Conjunctive Use The operation of a groundwater basin in combination with a surface water storage and conveyance system. Water is stored in the ground water basin for later use in place of or to supplement surface supplies. Water is stored by intentionally recharging the basin during years of above-average water supply.

Conveyance A pipeline, canal, natural channel or other similar facility that transports water from one location to another.

Delta Cross Channel Existing gated structure and channel connecting the Sacramento River at Walnut Grove to the North Fork Mokelumne River. The facility was constructed as part of the CVP to enhance movement of Sacramento River water into the central Delta and to the south Delta export pumps. Operating criteria currently require the gates to be closed for specific periods to keep downstream migrating fish in the Sacramento River and to prevent flooding of the central Delta.

Delta Inflow The combined water flow entering the Delta at a given time from the Sacramento River, San Joaquin River, and other tributaries.

Delta Islands Islands in the Sacramento-San Joaquin Delta protected by levees. Delta Islands provide space for numerous functions including agriculture, communities, and important infrastructure such as transmission lines, pipelines, and roadways.

Delta Outflow The net amount of water (not including tidal flows) at a given time flowing out of the Delta towards the San Francisco Bay. The Delta outflow equals Delta inflow minus the water used within the Delta and the exports from the Delta.

Demand Management Programs that seek to reduce demand for water through conservation, rate incentives, drought rationing, and other activities.

Direct Mortality The direct loss of fish associated with facilities (forebay, fish screens, and salvage facilities) for the south Delta export pumps. This direct mortality is a portion of the total fish mortality resulting from operation of the export pumps (see indirect morality).

Diversions The action of taking water out of a river system or changing the flow of water in a system for use in another location.

Drought Conditions A time when rainfall and runoff are much less than average. One method to categorize annual rainfall is as follows, with the last two categories being drought conditions: wet, above normal, below normal, dry critical.

Dual Conveyance A means of improving conveyance across the Delta by both improving through-Delta conveyance and isolating a portion of conveyance from Delta channels.

Ecosystem A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them.

Ecosystem Manager (Trustee) An entity responsible for environmental improvements in the Bay-Delta system with the financial means, legal rights, authorities, and discretion needed to carry out the Ecosystem Restoration Program (ERP).

Entrainment The process of drawing fish into diversions along with water, resulting in the loss of such fish.

Environmental Water Account A method of accounting for the water and financial assets that can be managed to provide additional protections for fishery resources beyond prescriptive standards.

ESA (Endangered Species Act) Federal (FESA) and State (CESA) legislation that provides protection for species that are in danger of extinction.

Export Water diversion from the Delta used for purposes outside the Delta.

Export-Inflow Ratio (E-I Ratio) This requirement presently limits Delta exports by the State and federal water projects to a percentage of Delta inflow. In July through January, 65% of

inflow can be exported. During February through June, months most critical to fisheries, the allowable E-I ratio is reduced to 35% to help diminish reverse flows and the resulting entrainment of fish caused by south Delta export operations.

Fish Entrainment The incidental capture and loss of fish during water diversion.

Fish Salvage The process of screening fish at the south Delta export facilities and physically transporting them by truck to release in other parts of the Delta. This generally results in higher fish mortality than a more conventional fish screen where screened fish simply return to the river and continue downstream. Fish salvage is required at the existing export facilities since there is no flow continuing downstream to carry the fish away.

Fish Screens Physical structures placed at water diversion facilities to keep fish from getting pulled into the facility and dying there.

Flexible Operations Operation of the south Delta export pumps that would allow reducing export pumping at times critical to fish and increasing export pumping at other times. Flexible operations would allow higher or lower export rates and export-inflow ratios than prescribed by the *1995 Water Quality Control Plan*. Pumping could deviate from currently permitted rates seasonally and on a real-time basis in response to Delta flows and fish distributions.

Grasslands Bypass Project The Grasslands Bypass Project is a means of diverting selenium-contaminated agricultural drainage water away from fresh water channels serving Grassland wetlands. The project includes interim use of a 28-mile section of the San Luis Drain with strict monthly and annual selenium-load targets for discharges from the 97,000 acre project area.

Groundwater Banking Storing water in the ground for use to meet demand during dry years. In-lieu Groundwater Banking replaces groundwater used by users with surface water to build up and save underground water supply for use during drought conditions.

Hood A location on the Sacramento River in the northern Delta above the major tidal influence. It has been identified as one potential location for a new diversion, if it is determined to be needed, from the Sacramento River. A new intake at this point could move more water into the central Delta or be the beginning for an isolated facility. Sacramento River water is much fresher at this location than at the export facilities and a diversion at this point may have substantially fewer impacts on most species of fish than the current diversions at the export pumps.

Hydrograph A chart or graph showing the change in flow over time for a particular stream or river.

In-Delta Storage Water storage within the Delta by converting an existing island to a reservoir.

The storage can help facilitate flexible operations of the export pumps by allowing export of stored water when critical fish species are present in the south Delta.

Indirect Mortality The indirect fish losses from operating the Delta Cross Channel and south Delta export pumps. For example, fish diverted from the Sacramento River into the central and south Delta experience higher mortality through increased stress, small agricultural water diversions, poor water quality, predation, reduced shallow water habitat for fry, higher water temperatures, and higher residence times. This indirect mortality is a portion of the total fish mortality resulting from operation of the export pumps (see direct morality).

Interagency Coordinated Program A cooperative effort among the California Department of Fish and Game, the U.S Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the Grasslands Water District to develop optimum water use planning for managed wetlands of the Central Valley.

Isolated Conveyance Facility A canal or pipeline that transports water between two different locations while keeping it separate from Delta water.

Land Fallowing/Retirement Allowing previously irrigated agricultural land to temporarily lie idle (fallowing) or purchasing such land and allowing it to remain out of production for a variety of purposes for a long period of time.

MAF An abbreviation for million acre feet, as in 2 MAF or 2,000,000 AF.; 10,000 cfs flowing for a year is about 7 MAF.

Mine Drainage Remediation Controlling or treating polluted drainage from abandoned mines.

Meander Belt Protecting and preserving land in the vicinity of a river channel in order to allow the river to meander. Meander belts are a way to allow the development of natural habitat around a river.

Non-native Species Also called introduced species or exotic species; refers to plants and animals that originate elsewhere and are brought into a new area, where they may dominate the local species or in some way negatively impact the environment for native species.

Program Element The program elements for the Phase II Alternatives include an element for Delta conveyance, a element for storage, and the six common program elements (Water Use Efficiency, Water Quality, Levee System Integrity, Ecosystem Restoration, Water Transfers, and Watershed Management).

Old River A natural channel in the southern Delta. The channel merges with many other channels in the south Delta, passes by the south Delta export facilities and connects with the San

Joaquin River at its upstream end. Much of the water approaching the export facilities flows up Old River from the central Delta. Potential improvements to the channel include a fish barrier at its upstream end to keep migrating fish in the San Joaquin River and dredging north of Clifton Court Forebay to allow more efficient flow to the export facilities.

Overdraft The condition, over the long-term, when more water is withdrawn from a groundwater basin than is recharged.

QWEST A broad indication of the net direction and quantity of flow in the San Joaquin River at Jersey Point. This is only an indicator since net flow is not measurable at this location. Considerable tidal exchange at this point is not included, because QWEST is an estimate of net flow conditions. A positive QWEST indicates the net flow is generally in the downstream direction towards the San Francisco Bay. A negative number indicates that the net flow is generally in the upstream direction to the east. Generally, a positive QWEST is desirable for Delta flow circulation, water quality, and fisheries.

Real-Time Monitoring and Operations Continuous observation in multiple locations of biological conditions on site in order to improve management to protect fish species and allow optimal operation of the water supply system. This is an essential feature to allow flexible operations of the export pumps.

Riparian The land adjacent to a natural water course such as a river or stream. Often supports vegetation that provides important wildlife habitat, and important fish habitat values when growing large enough to overhang the bank.

Riverine Habitat within or alongside a river or channel.

San Joaquin Valley Drainage Program The Federal-State San Joaquin Valley Drainage Program (SJVDP) studied ways of remedying subsurface agricultural drainage and related problems operated during the period 1985-1990. The SJVDP prepared the report titled "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside of the San Joaquin Valley, September 1990." The report identified the need for 75,000 acres of land retirement by year 2040 but pointed out that without adequate drainage management, soil salinization will occur and potentially cause almost 500,000 acres of land to be abandoned by year 2040.

Setback Levee A constructed embankment to prevent flooding that is positioned some distance from the edge of the river or channel. Setback levees allow wildlife habitat to develop between the levee and the river or stream.

Shallow Water Water with just enough depth to allow for sunlight penetration, plant growth, and the development of small organisms that function as fish food. Serve as spawning areas for delta smelt.

Smolt A young salmon that has assumed the silvery color of the adult and is ready to migrate to the sea.

Solution Principles Fundamental principles that guide the development and evaluation of Program alternatives. They provide an overall measure of acceptability of the alternatives.

South of Delta Storage Water storage supplied with water exported south from the Delta.

State Water Project (SWP) A California state water storage and conveyance system that pumps water from the Delta for agricultural, urban domestic, and industrial purposes. The SWP was authorized by legislation in 1951.

TAF Thousand acre feet, as in 125 TAF equals 125,000 AF.

Tracy Pumping Plant The CVP export pumping plant in the south Delta.

Terrestrial Species Types of species of animals and plants that live on or grow from the land.

Through-Delta Conveyance A means of improving conveyance across the Delta by a variety of modifications to Delta channels.

Upstream Storage Any water storage upstream of the Delta supplied by the Sacramento or San Joaquin Rivers or their tributaries.

Water Conservation Those practices that encourage consumers to reduce the use of water. The extent to which these practices actually create a savings in water depends on the total or basin-wide use of water.

Water Reclamation Practices that treat and reuse water. The waste water is treated to meet health and safety standards depending on its intended use. Also called water recycling.

Water Transfers Voluntary water transactions conducted under state law and in keeping with federal regulations.

Watershed An area that drains to a particular channel or river, usually bounded peripherally by a natural divide of some kind such as a hill, ridge, or mountain.

X2 The location (measured in kilometers upstream from the Golden Gate Bridge) of 2 parts per thousand total dissolved solids. The length of time X2 must be positioned at set locations in the estuary in each month is determined by a formula that considers the previous month's inflow to the Delta and a "Level of Development" factor, denoted by a particular year. X2 is currently used as the primary indicator in managing Delta outflows. The X2 indicator is also used to reflect a variety of biological consequences related to the magnitude of fresh water flowing downstream through the estuary and the upstream flow of salt water in the lower portion of the estuary. The outflow that determines the location of X2 also affects both the downstream transport of some organisms and the upstream movement of others and affects the overall water operations of the CVP and SWP.

Acronyms

A

AB	Assembly Bill
AFRP	Anadromous Fish Restoration Program
ASIP	Action-specific implementation plan
AWMC	Agricultural Water Management Council
AWWARF	American Water Works Association Research Foundation

B

Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta estuary
BCDC	San Francisco Bay Conservation and Development Commission
BDAC	Bay-Delta Advisory Council
BMPs	best management practices
BOD	biochemical oxygen demand

C

CCFB	Clifton Court Forebay
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cfs	cubic feet per second
CMARP	Comprehensive Monitoring Assessment and Research Program
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWA	Clean Water Act
CZMA	Coastal Zone Management Act

D

DDT	dichlorodiphenyltrichloroethane
DEFT	Diversion Effects on Fisheries Team
DFG	California Department of Fish and Game
DHS	California Department of Health Services
DO	dissolved oxygen
DWR	California Department of Water Resources
DWRSIM	DWR system operational model

E

EEWMA	Economic Evaluation of Water Management Alternatives
E/I Ratio	Export/Inflow Ratio
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
EPA	U.S. Environmental Protection Agency
ERP	Ecosystem Restoration Program
ESA	Endangered Species Act
EWA	Environmental Water Account
EWMP	efficient water management practices

F

FERC	Federal Energy Regulatory Commission
FWCA	Fish and Wildlife Coordination Act

G

GLC	Grant Line Canal

I

ICP	Interagency Coordinated Program
IEP	Interagency Ecological Program
ISDP	Interim South Delta Program
ISI	Integrated Storage Investigation

J

JPOD	joint point of diversion

M

"m" species	"maintains"
M&I	municipal and industrial
MAF	million acre-feet
mg/L	milligrams per liter
MOA	Memorandum of Agreement

MOU	Memorandum of Understanding
MSCS	Multi-species Conservation Strategy
MTBE	methyl tert-butyl ether
μg/L	micrograms per liter

N

NCCP	Natural Community Conservation Plan
NCCPA	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service

O

Ops Group	California-Federal Operations Group

P

PCB	polychlorinated biphenyl
PL	Public Law
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
Program	CALFED Bay-Delta Program

R

"R" species	"recovery"
"r" species	"contributes to recovery"
Reclamation	U.S. Bureau of Reclamation
ROD	Record of Decision

S

SB	Senate Bill
SFEI	San Francisco Estuary Institute
SWP	State Water Project
SWRCB	State Water Resources Control Board

T

TAF	thousand acre-feet
TDS	total dissolved solids
TMDL	total maximum daily load

	TOC	total organic carbon
U		
	USBR	U.S. Bureau of Reclamation
	USDA	U.S. Department of Agriculture
	USEPA	U.S. Environmental Protection Agency
	USFS	U.S. Forest Service
	USGS	U.S. Geological Survey
	USFWS	U.S. Fish and Wildlife Service
V		
	VAMP	Vernalis Adaptive Management Plan
W		
	WMS	Water Management Strategy
	WUE	Water Use Efficiency Program
X		
	X2	Location (measured in kilometers upstream from the Golden Gate Bridge) of 2 parts per thousand total dissolved solids
Y		
	yr	year