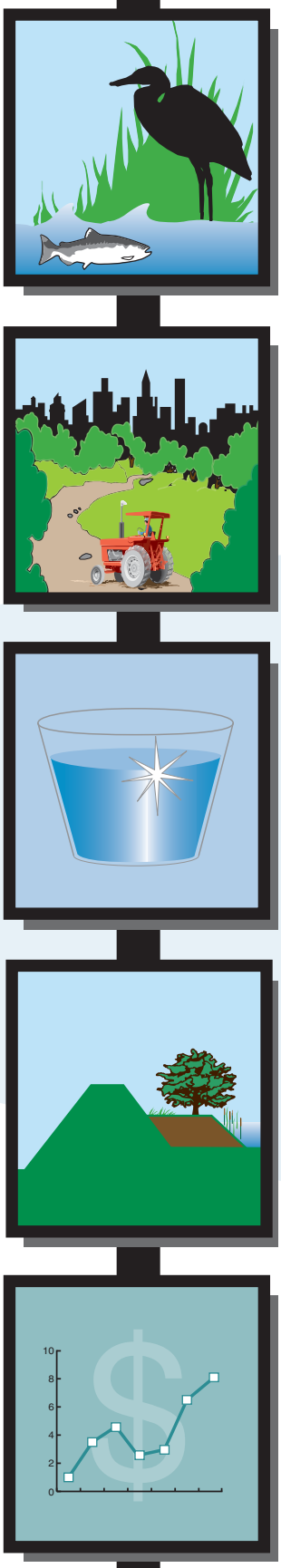

CALFED
BAY-DELTA
PROGRAM

Executive Summary of the Final Programmatic Environmental Impact Statement/Environmental Impact Report

July 2000

CALFED
BAY-DELTA
PROGRAM

Executive Summary

Final Programmatic Environmental Impact Statement/ Environmental Impact Report

July 2000

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Executive Summary

For decades, the Bay-Delta has been the focus of competing economic, ecological, urban, and agricultural interests. The CALFED Bay-Delta Program is a cooperative inter-agency effort that has developed a long-term solution to fish and wildlife, water supply reliability, flood control, and water quality problems in the Bay-Delta.

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Executive Summary

INTRODUCTION

The San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) is the largest estuary on the West Coast. It consists of a maze of tributaries, sloughs, and islands and is a haven for plants, fish, and wildlife—supporting more than 750 plant and animal species. The Bay-Delta includes over 738,000 acres in five counties and is critical to California's economy, supplying drinking water for two-thirds of all Californians and irrigation water for over 7 million acres of the most highly productive agricultural land in the world. Although all agree on its importance for both habitat and as a reliable source of water, few have agreed on how to manage and protect this valuable resource.

For decades, the region has been the focus of competing economic, ecological, urban, and agricultural interests. These conflicting demands have resulted in declining wildlife habitat, native plant and animal species becoming threatened with extinction, the degradation of the Delta as a reliable source of high quality water, and a Delta levee system faced with a high risk of failure.

Even though environmental, urban, and agricultural interests have recognized the Delta as a critical resource, they have been unable to agree on appropriate management of the Delta resources.

Seeking solutions to the resource problems in the Bay-Delta, state and federal agencies signed a Framework Agreement in June of 1994 that provided increased coordination and communication for environmental protection and water supply dependability. The impetus to forge this joint effort came at the state level in December 1992 with formation of the State Water Policy Council and the Bay-Delta Oversight Council. In September 1993, the Federal Ecosystem Directorate was created to coordinate federal resource protection and management decisions for the Bay-Delta system. The Framework Agreement laid the foundation for the Bay-Delta Accord and the CALFED Bay-Delta Program (Program). The Bay-Delta Accord detailed interim measures for both environmental protection and regulatory stability in the Bay-Delta.

The Program oversees the coordination and increased communication between federal agencies, state agencies, and stakeholders in three areas outlined in the Framework Agreement:

- Substantive and procedural aspects of water quality standard setting.
- Improved coordination of water supply operations with endangered species protection and water quality standard compliance.

- Development of a long-term solution to fish and wildlife, water supply reliability, flood control, and water quality problems in the Bay-Delta.

The Program is charged with responsibility for the third issue identified in the Framework Agreement. This Final Programmatic Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) evaluates this long term program.

THE CALFED PROGRAM

The Program is a cooperative, interagency effort involving 18 state and federal agencies with management and regulatory responsibilities in the Bay-Delta.

Bay-Delta stakeholders also contribute to the Program design and to the problem-solving/decision-making process. Public participation and input have been essential throughout the process, received through the Bay-Delta Advisory Council (BDAC), public participation in workshops, scoping meetings, com-ment letters, and other public outreach efforts.

BDAC is chartered under the Federal Advisory Committee Act and is comprised of stakeholders in organizations from throughout California. This group of public advisors helps to define problems in the Bay-Delta, helps to assure broad public participation, comments on environmental analysis and reports, and offers advice on proposed solutions.

Role of CALFED Agencies in Preparation of Programmatic EIS/EIR

Lead Agencies—State and federal agencies who have the principal responsibility for carrying out or approving the project:

- Resources Agency of California
- U.S. Fish and Wildlife Service
- U.S. Bureau of Reclamation
- U.S. National Marine Fisheries Service
- U.S. Environmental Protection Agency
- U.S. Natural Resource Conservation Service
- U.S. Army Corps of Engineers

Responsible Agencies—State agencies, other than the lead agency, with a legal responsibility for carrying out or approving the project:

- California Environmental Protection Agency
- California Department of Fish and Game*
- California Department of Water Resources
- California State Water Resources Control Board

Cooperating Agencies—Federal agencies, other than the lead agencies, with jurisdiction by law or special expertise with respect to any environmental impact:

- U.S. Forest Service
- U.S. Geological Survey
- U.S. Western Area Power Administration
- U.S. Bureau of Land Management

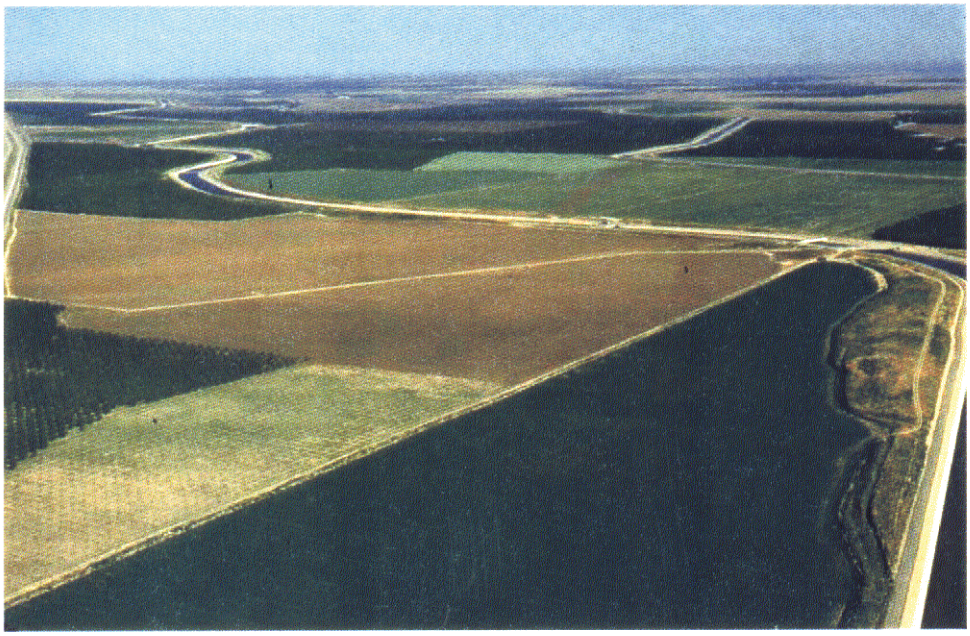
Other Agencies—Agencies that regularly participate:

- Delta Protection Commission
- California Department of Food and Agriculture
- The Reclamation Board

* The California Department of Fish and Game is also a trustee agency with jurisdiction over natural resources held in trust for the people of California.

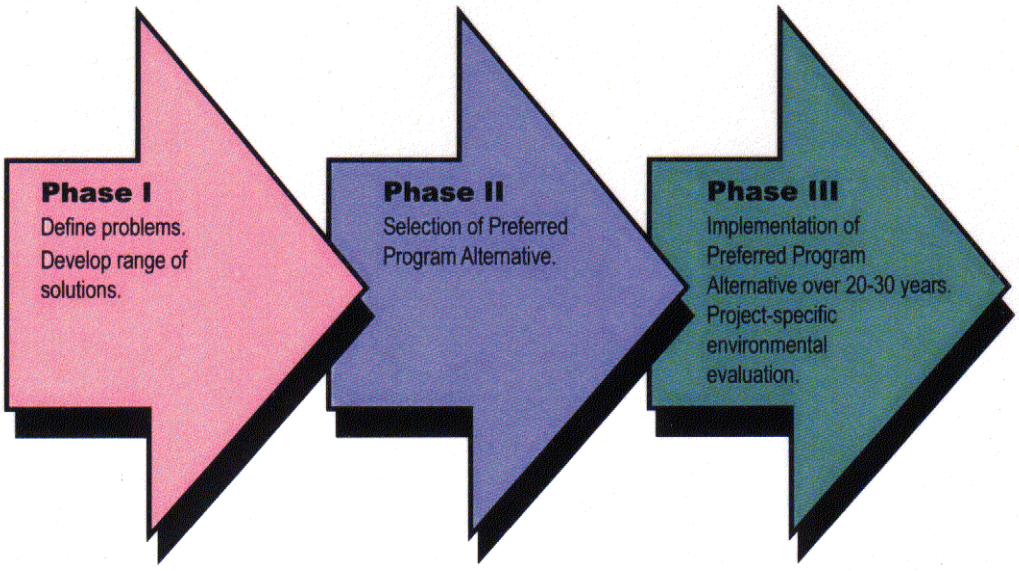
PROGRAM PURPOSE

The purpose of the Program is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. To practicably achieve this Program purpose, CALFED will concurrently and comprehensively address problems of the Bay-Delta system within four critical resource categories: ecosystem quality, water quality, water supply reliability, and levee system integrity. Important physical, ecological, and socioeconomic linkages exist between the problems and possible solutions in each of these categories. Accordingly, a solution to problems in one resource category cannot be pursued without addressing problems in the other resource categories.



THE CALFED PROGRAM WAS DIVIDED INTO THREE PHASES

In Phase I, completed in August 1996, the Program identified the problems confronting the Bay-Delta, and developed a mission statement, solution principles, and objectives (next page). Following scoping, public comment, and agency review, an initial group of actions was developed and refined into three preliminary categories of solutions to be further analyzed in Phase II.



Phase II is ongoing and will culminate with a Record of Decision and Certification (ROD/CERT) of the EIS/EIR in 2000. In Phase II, the Program conducted a comprehensive programmatic environmental review and released a Draft Programmatic EIS/EIR in March 1998.

Because a Preferred Program Alternative (Section 1.4.2 in the Final Programmatic EIS/EIR presents the Phase II alternative development process) was identified after the March 1998 Draft Programmatic EIS/EIR, the Program decided to rewrite the Draft Programmatic EIS/EIR. The primary difference between the two documents was analysis associated with the Preferred Program Alternative, although CALFED also took the opportunity to update its analysis of consequences for all alternatives and to restructure the document into a more reader-friendly format. A Multi-Species Conservation Strategy and Implementation Plan also were added. A public comment period ran from June through September 1999. Sixteen public hearings also were held during this time to solicit public testimony.

CALFED Bay-Delta Program Mission Statement

The mission statement does not stand alone as a single statement of Program purpose. Rather, the mission statement is supported by sets of primary objectives and solution principles. The mission statement is important and reflects the basic intent of the Program. However, the full expression of the Program mission is reflected in the mission statement, objectives, and solution principles, read together.

Mission Statement

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.

Primary Objectives of the CALFED Program

- *Ecosystem Quality* - 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.
- *Water Supply* - Reduce the mismatch between Bay-Delta water supplies and the current and projected beneficial uses dependent on the Bay-Delta system.
- *Water Quality* - Provide good water quality for all beneficial uses.
- *Vulnerability of Delta Functions* - Reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees.

Solution Principles

The solution principles were developed as a means to achieve the Program's objectives in the context of a multi-purpose mission and a history of (competing) contentious environmental, political, and institutional influences on the affected resources. The solution principles provide an overall measure of the acceptability of alternatives and guide the design of the institutional part of each alternative. The solution principles are:

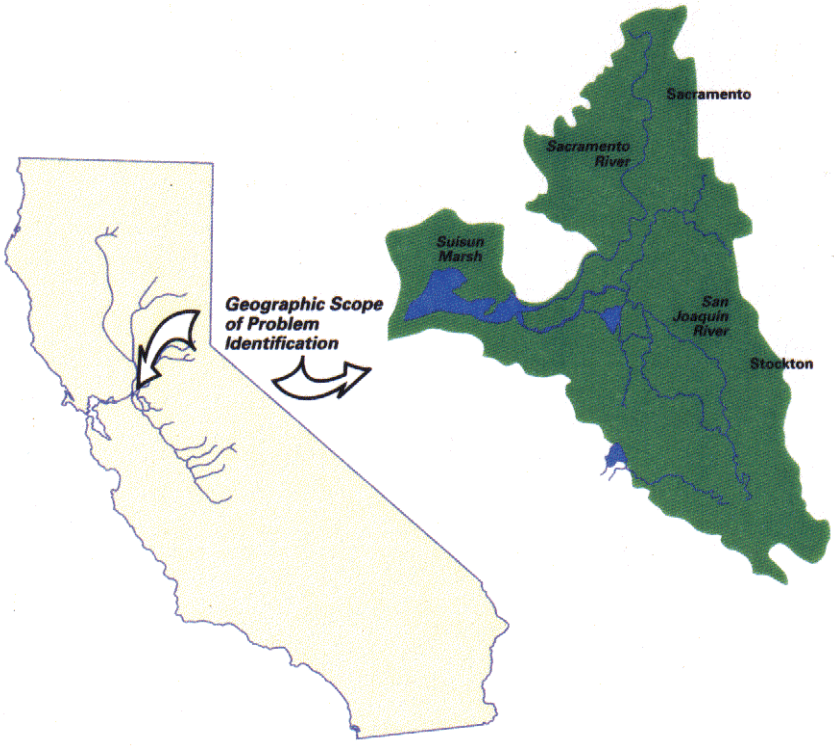
- **Reduce conflicts in the system**. Solutions will reduce major conflicts among beneficial uses of water.
- **Be equitable**. Solutions will focus on solving problems in all problem areas. Improvement for some problems will not be made without corresponding improvements for other problems.
- **Be affordable**. 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.
- **Pose 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.

During Phase III, the CALFED agencies will implement the Preferred Program Alternative. The first 7 years of Program implementation will be guided by the Implementation Plan. This phase will include any necessary studies and site-specific environmental review and permitting. Because of the size and complexity of the Program alternatives, implementation is likely to take place over a period of 30 years or more. Part of the challenge for Phase II is designing an implementation strategy that

acknowledges this long horizon and ensures that all participants remain committed to the successful completion of all phases of implementation.

GEOGRAPHIC SCOPE OF PROGRAM STUDY AREA

The geographic scope of analysis and actions for the Program evolved through both technical and public forum discussions. The geographic scope focuses on the Bay-Delta system for purposes of problem definition, while allowing solution generation from a much broader area.



The Program is addressing problems that are identified in or closely linked to the Suisun Bay/Suisun Marsh and Delta area. However, the scope of possible solutions to these problems encompass any action that can be implemented by the CALFED agencies, or can be influenced by them, to address the identified problems—regardless of whether implementation takes place in the Delta, Suisun Bay, or Suisun Marsh area.

The geographic **scope of 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 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.

PROGRAM ALTERNATIVES

Each of the alternatives include the Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, Water Transfer, Watershed, Storage, and Conveyance elements. Each alternative includes an assessment with additional storage up to 6 million acre feet [MAF] and without additional storage. The descriptions of each of the Program elements, except for Conveyance, do not vary among the alternatives.

Program Alternatives

Alternative 1 - Existing System Conveyance. Delta channels would be maintained essentially in their existing configuration. Several improvements would be made in the south Delta.

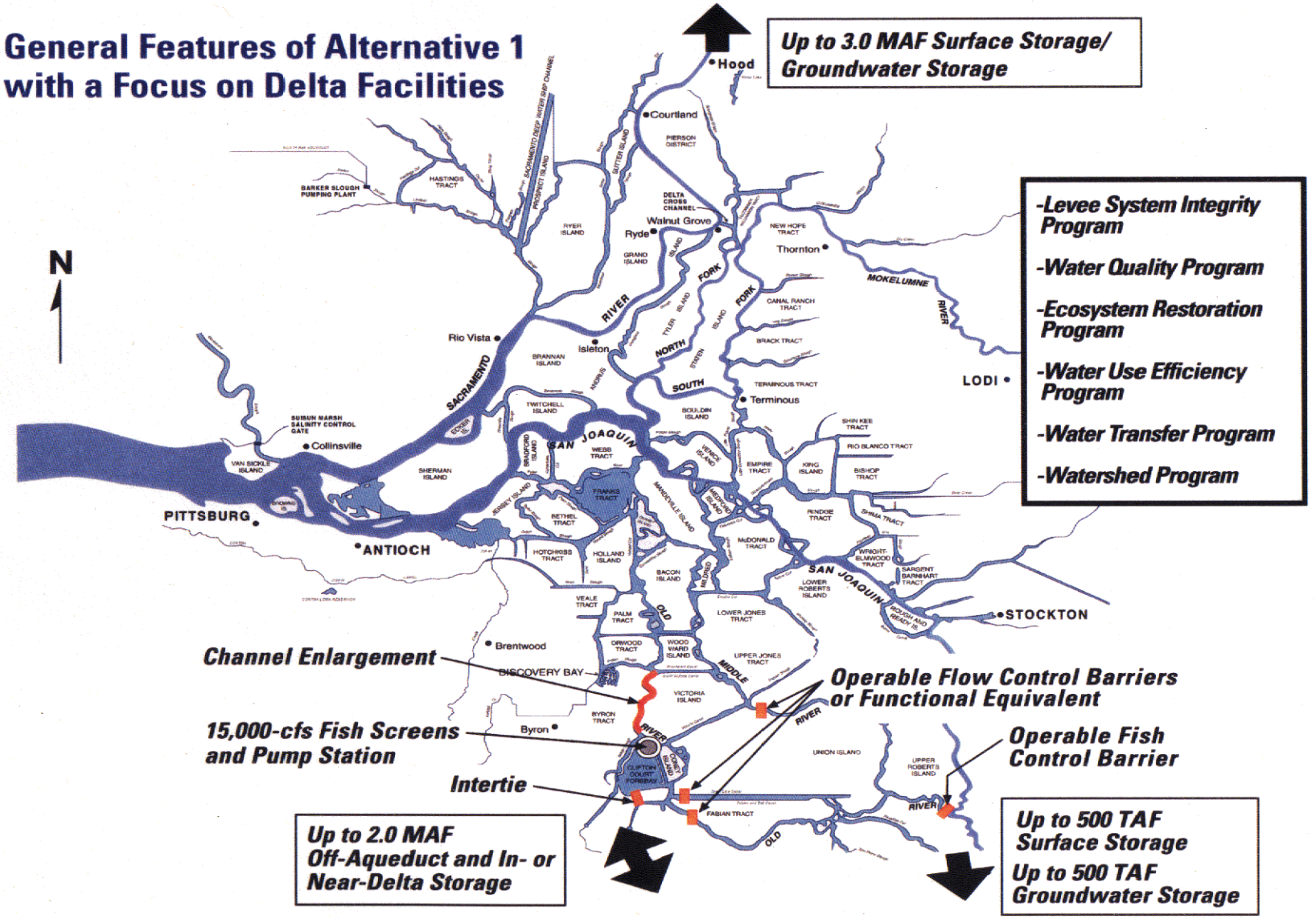
Alternative 2 - Modified Through-Delta Conveyance. Significant improvements to north Delta channels would accompany the south Delta improvements contemplated under Alternative 1.

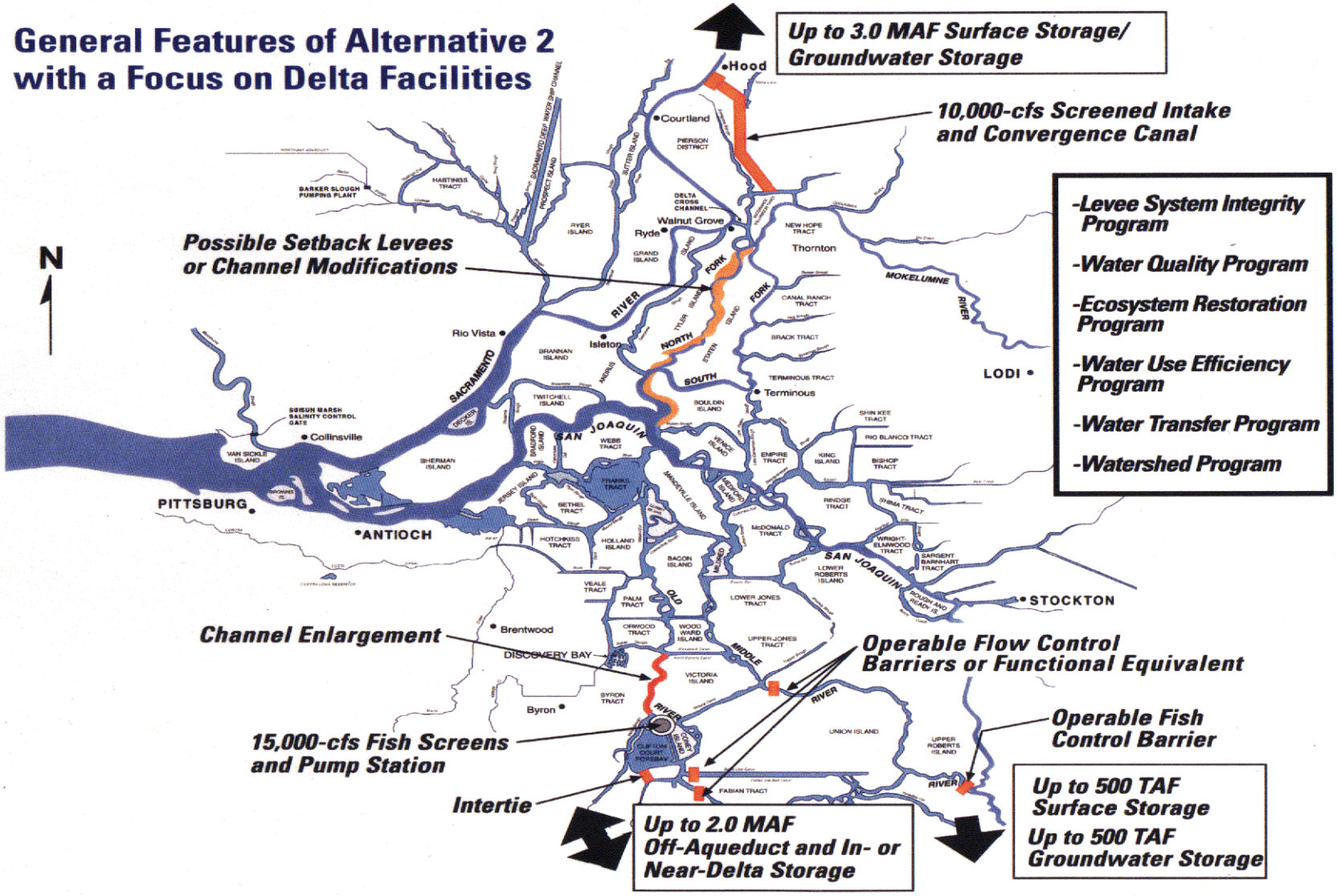
Alternative 3 - Dual-Delta Conveyance. The dual-Delta conveyance alternative is formed around a combination of modified Delta channels and a new canal or pipeline, connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta.

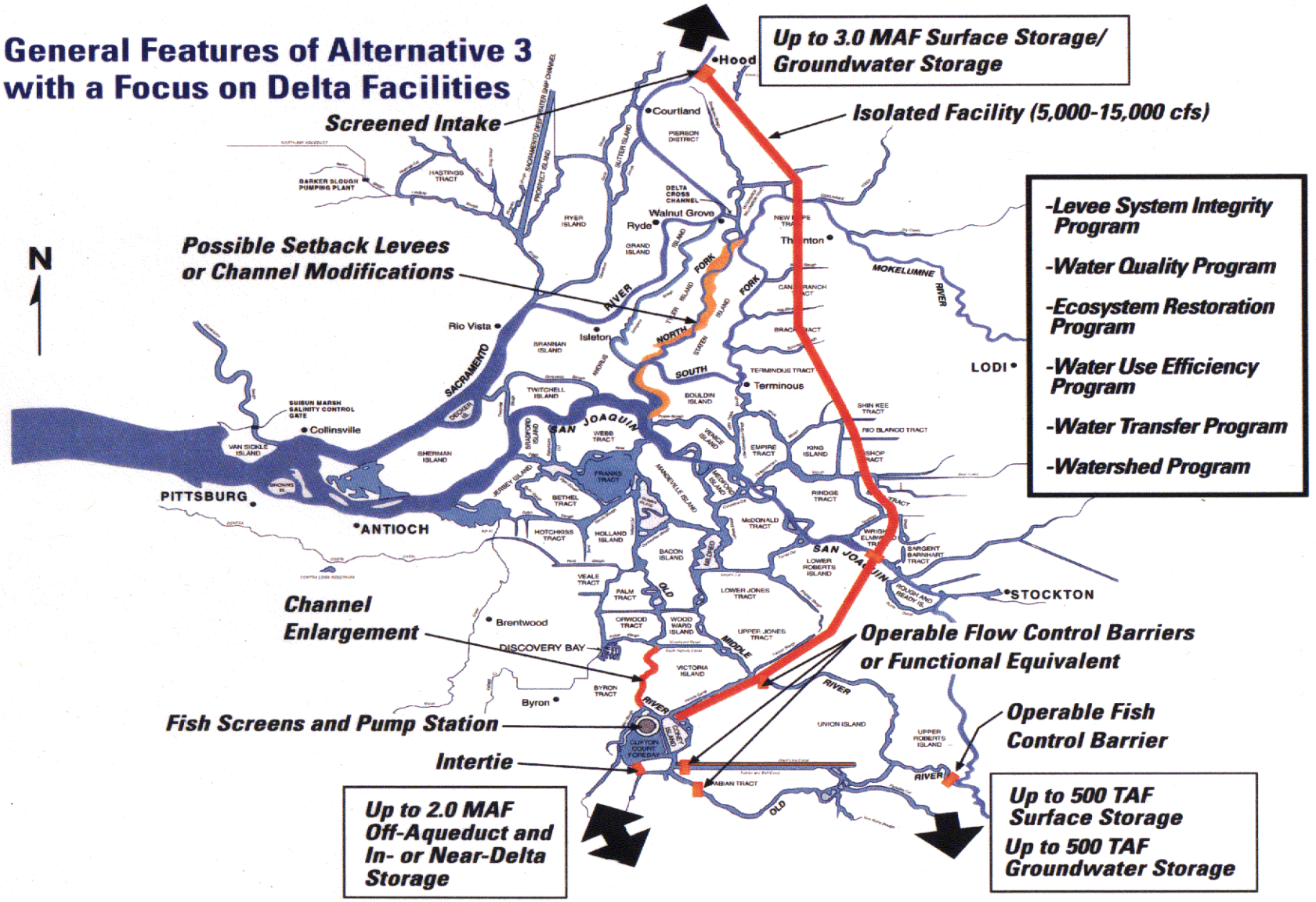
Preferred Program Alternative - Through-Delta Conveyance. The Preferred Program Alternative incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than Alternative 2. If, after additional analysis, the diversion facility is not constructed, the Preferred Program Alternative would be most similar to Alternative 1.

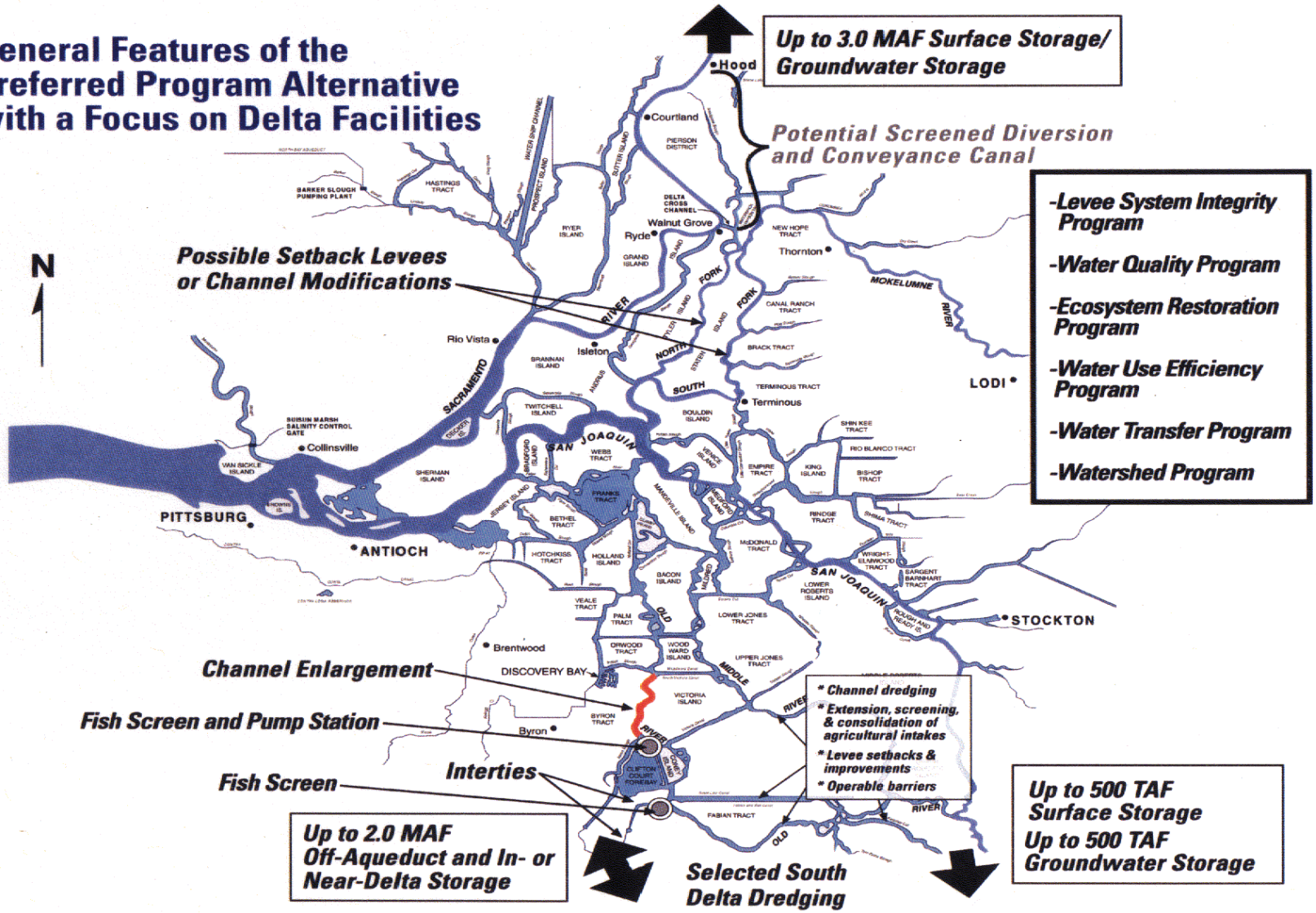
No Action Alternative. The No Action Alternative is a description of the anticipated physical, project operation, and regulatory features that would be in place in 2020 if the Program is not approved. The No Action Alternative was used as a basis for comparison of the Program alternatives. The purpose of this comparison is to highlight the changes to the environment that would take place as a result of implementing the various alternatives. The Program also compared the alternatives to existing conditions, referred to as the "affected environment" in the Final Programmatic EIS/EIR.

The descriptions of the alternatives are programmatic in nature, defining broad approaches to meet Program purposes. The alternatives are not intended to define the site-specific actions that ultimately will be implemented. The figures on the following pages show the general features of the Program alternatives with a focus on Delta facilities.


General Features of Alternative 1 with a Focus on Delta Facilities
Up to 3.0 MAF Surface Storage/ Groundwater Storage
-Levee System Integrity Program
-Water Quality Program
-Ecosystem Restoration Program
-Water Use Efficiency Program
-Water Transfer Program
-Watershed Program
Channel Enlargement
15,000-cfs Fish Screens and Pump Station
Intertie
Operable Flow Control Barriers or Functional Equivalent
Operable Fish Control Barrier
Up to 2.0 MAF Off-Aqueduct and In- or Near-Delta Storage
Up to 500 TAF Surface Storage
Up to 500 TAF Groundwater Storage
N
Hood
Courtland
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
Terminous
LODI
Collinsville
PITTSBURG
ANTIOCH
Brentwood
Byron
STOCKTON
SACRAMENTO RIVER
SAN JOAQUIN RIVER
MOKELUMNE RIVER
NORTH FORK
SOUTH FORK
OLD RIVER
MIDDLE RIVER
DELTA CROSS CHANNEL
SUISUN MARSH SALINITY CONTROL GATE
BARKER SLOUGH PUMPING PLANT
CLIFTON COURT FOREBAY
DISCOVERY BAY

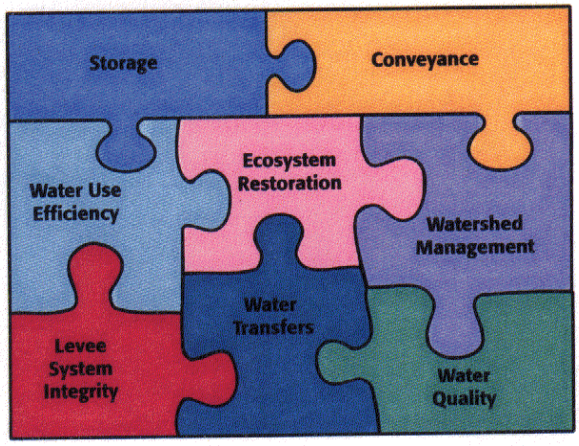

General Features of Alternative 2 with a Focus on Delta Facilities
Up to 3.0 MAF Surface Storage/ Groundwater Storage
10,000-cfs Screened Intake and Convergence Canal
-Levee System Integrity Program
-Water Quality Program
-Ecosystem Restoration Program
-Water Use Efficiency Program
-Water Transfer Program
-Watershed Program
Possible Setback Levees or Channel Modifications
N
Hood
Courtland
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
Terminous
LODI
STOCKTON
ANTIOCH
PITTSBURG
Collinsville
Brentwood
DISCOVERY BAY
Byron
Channel Enlargement
15,000-cfs Fish Screens and Pump Station
Intertie
Operable Flow Control Barriers or Functional Equivalent
Operable Fish Control Barrier
Up to 500 TAF Surface Storage
Up to 500 TAF Groundwater Storage
Up to 2.0 MAF Off-Aqueduct and In- or Near-Delta Storage
SACRAMENTO RIVER
SAN JOAQUIN RIVER
OLD RIVER
MIDDLE RIVER
MOKELUMNE RIVER
NORTH FORK
SOUTH FORK
DELTA CROSS CHANNEL
SUISUN MARSH SALINITY CONTROL GATE
BARKER SLOUGH PUMPING PLANT
CLIFTON COURT FOREBAY
FABIAN TRACT

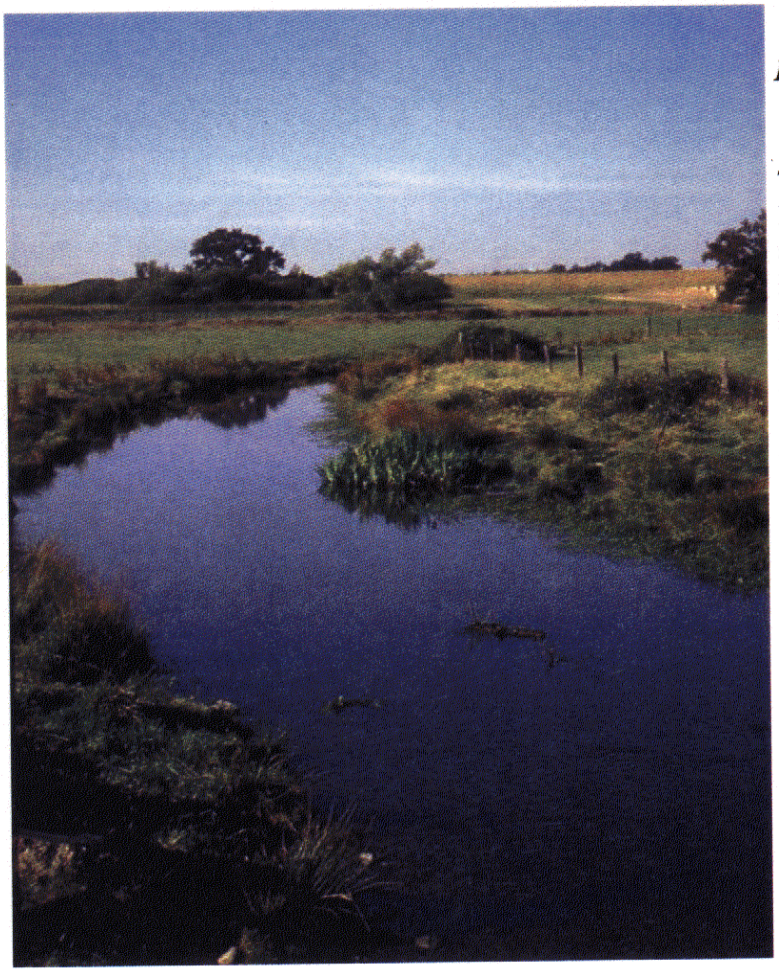

General Features of Alternative 3 with a Focus on Delta Facilities
Screened Intake
Possible Setback Levees or Channel Modifications
Channel Enlargement
Fish Screens and Pump Station
Intertie
Up to 2.0 MAF Off-Aqueduct and In- or Near-Delta Storage
Up to 3.0 MAF Surface Storage/ Groundwater Storage
Isolated Facility (5,000-15,000 cfs)
-Levee System Integrity Program
-Water Quality Program
-Ecosystem Restoration Program
-Water Use Efficiency Program
-Water Transfer Program
-Watershed Program
Operable Flow Control Barriers or Functional Equivalent
Operable Fish Control Barrier
Up to 500 TAF Surface Storage
Up to 500 TAF Groundwater Storage
N
Hood
Courtland
Walnut Grove
Ryde
Rio Vista
Isleton
Terminous
LODI
STOCKTON
ANTIOCH
PITTSBURG
Collinsville
Brentwood
DISCOVERY BAY
Byron
SACRAMENTO RIVER
SAN JOAQUIN RIVER
NORTH FORK MOKELUMNE RIVER
OLD RIVER
MIDDLE RIVER


General Features of the Preferred Program Alternative with a Focus on Delta Facilities
Up to 3.0 MAF Surface Storage/ Groundwater Storage
Potential Screened Diversion and Conveyance Canal
-Levee System Integrity Program
-Water Quality Program
-Ecosystem Restoration Program
-Water Use Efficiency Program
-Water Transfer Program
-Watershed Program
Possible Setback Levees or Channel Modifications
N
Hood
Courtland
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
Terminous
LODI
Collinsville
PITTSBURG
ANTIOCH
STOCKTON
Brentwood
DISCOVERY BAY
Byron
Channel Enlargement
Fish Screen and Pump Station
Fish Screen
Interties
* Channel dredging
* Extension, screening, & consolidation of agricultural intakes
* Levee setbacks & improvements
* Operable barriers
Up to 2.0 MAF Off-Aqueduct and In- or Near-Delta Storage
Selected South Delta Dredging
Up to 500 TAF Surface Storage
Up to 500 TAF Groundwater Storage

Overview of the Eight Program Elements

The eight Program elements provide the foundation for overall improvement in the Bay-Delta system. Implementation of these Program elements will result in a significant investment in and improvement of the resource conflicts in the system. For more detailed information on each of these elements, please see the Phase II Report as well as specific program plans.





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.

Water Quality Program

The Program is committed to achieving continuous improvement in the quality of the waters of the Bay-Delta system—with the goals of minimizing ecological, drinking water, and other water quality problems and of 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.

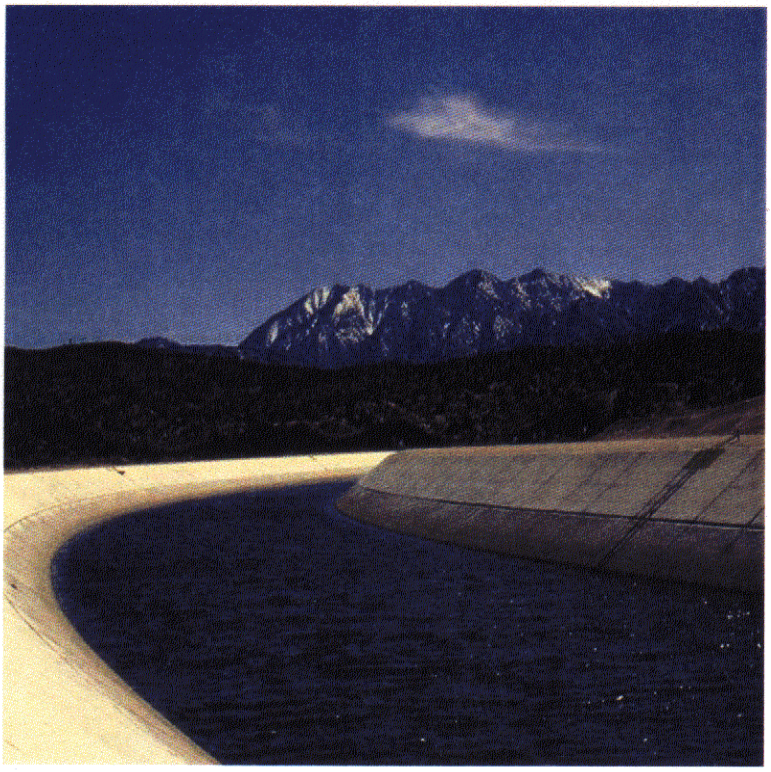
Levee System Integrity Program

The Levee System Integrity Program focuses on improving 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 would indirectly improve water supply reliability. Levee actions also would protect water quality, particularly during low-flow conditions when a catastrophic levee breach would draw salty water into the Delta.

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 also can 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.



Water Transfer Program

The Water Transfer Program proposes a frame-work 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 also can help to match water demand with water sources of the appropriate quality, thus increasing the utility of water supplies.

Watershed Program

The Watershed Program provides financial and technical assistance 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. These actions also help to maintain levee integrity during high-flow periods. Other watershed actions will improve water quality by reducing the discharge of parameters of concern.

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 or surface water storage will be predicated on compliance with all environmental review and permitting requirements and maintaining balanced implementation of all Program elements.

Conveyance

Modifications in conveyance would result in improved water supply reliability, protection of and improvement in Delta water quality, improvements in ecosystem health, and reduced risk of supply disruption due to catastrophic breaching of Delta levees.

The four alternate conveyance approaches are:

-Alternative 1 - existing system conveyance

-Alternative 2 - modified through-Delta conveyance

-Alternative 3 - dual-Delta conveyance

-Preferred Program Alternative - through-Delta conveyance

PREFERRED PROGRAM ALTERNATIVE

The Preferred Program Alternative consists of a set of broadly described programmatic actions that set the long-term, overall direction of the Program. Implementation of these actions would fulfill the Program mission to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. Implementation of the Preferred Program Alternative also would achieve the Program's objectives for ecosystem quality, water quality, levee and channel system integrity, and water supply reliability.

OVERVIEW OF THE PREFERRED PROGRAM ALTERNATIVE

The problems and potential solutions facing the Bay-Delta involve a complex set of interrelated biological, chemical, and physical systems. This complexity, coupled with the broad scope and number of actions needed to implement the Program, the 30-year or more implementation period, the need to test hypotheses, and resource limitations make it necessary to implement the Program in stages. Consequently, the Preferred Program Alternative provides for implementation of the Program in a staged manner and establishes mechanisms to obtain the necessary additional information to guide the next stage of decision making.

The Preferred Program Alternative consists of a through-Delta conveyance approach, coupled with ecosystem restoration, water quality improvements, levee system improvements, increased water use efficiency, improved water transfer opportunities, watershed restoration, and a Water Management Strategy that includes an integrated storage program. The Preferred Program Alternative meets the Program's multiple purposes, reduces adverse environmental effects, and provides a system of research and monitoring to determine whether modifications or additional actions are needed. It provides multiple benefits, including:

- Modifying the timing and magnitude of flow to restore ecological processes and to improve conditions for fish, wildlife, and plants in the Bay-Delta system.
- Improving and increasing aquatic and terrestrial habitats.
- Modifying and eliminating fish passage barriers.
- Constructing fish screens that use the best available technology.
- Reducing the loads and impacts of bromide, total organic carbon, pathogens, nutrients, salinity, and turbidity.
- Reducing the impacts of pesticides.
- Reducing the impacts of trace metals, mercury, and selenium.
- Improving and maintaining the stability of the Delta and Suisun Marsh levee system.
- Enhancing flood protection for key Delta islands.
- Expanding and implementing agricultural and urban conservation incentive programs.
- Implementing better water management for managed wetlands.
- Facilitating water transfers while protecting from third parties from potentially significant adverse impacts.
- Supporting local watershed restoration, maintenance, and conservation activities.
- Developing appropriate groundwater and surface storage in conjunction with specified water conservation, recycling, and water transfer programs to provide water for the environment at times when it is needed most, and to improve water supply reliability.
- Modifying existing Delta conveyance systems for improved water supply reliability and water quality, improved ecosystem health, and reduced risk of supply disruption due to catastrophic breaching of Delta levees.

There is concern whether a through-Delta conveyance approach can meet future water quality objectives and not adversely affect the recovery of threatened and endangered fish species. Although some scientific and engineering evidence suggests that a dual-Delta conveyance configuration may improve export water quality and achieve fish recovery more effectively, other evidence indicates that such a conveyance configuration can cause in-Delta water quality problems. In addition, during scoping and public meetings, some stakeholders and agencies voiced concern that moving water around the Delta instead of through it may:

- Cause difficulty in ensuring the appropriate operation of such a facility.
- Create impacts from construction.

- Increase the amount of land needed for the facility.
- Provide an engineered solution when non-structural modifications and reoperation of existing facilities may provide similar benefits.

Although the CALFED agencies did not rule out the possibility of constructing an isolated conveyance facility in the future, they were mindful that, even if approved immediately following the ROD/CERT, such a facility could not be studied, approved, funded, and constructed within the first stage (7 years) of implementation.

In light of the technical and feasibility issues discussed above, the CALFED agencies propose to begin with through-Delta modifications. As part of the Preferred Program Alternative, the Program also would:

- Continue to investigate storage opportunities in the context of the broader Water Management Strategy.
- Implement the first stage of the Ecosystem Restoration, Water Quality, and Levee System Integrity Program Plans, Water Use Efficiency, Water Transfers and Watershed.
- Monitor the results of these actions to determine whether an isolated conveyance facility as part of a dual-Delta conveyance configuration is necessary to meet the Program objectives.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

As described above, the Preferred Program Alternative adopts a set of programmatic actions designed to achieve the objectives for each of the resource areas while evaluating the effectiveness of those actions, and assessing whether modifications may be needed to meet Program goals and objectives. The Preferred Program Alternative accordingly constitutes the "Environmentally Preferable Alternative" as that term is used in NEPA, and the "Environmentally Superior Alternative" as that term is used in CEQA.

ALTERNATIVES CONSIDERED BUT ELIMINATED

The three basic alternative approaches developed in Phase I were carried into Phase II. Seventeen alternative configurations of the three basic alternative approaches were developed to further explore potential refinements for storage and conveyance in Phase II. Of the 17 configurations, 5 were eliminated based on the results of a narrowing process. The narrowing process primarily focused on technical deficiencies and the conveyance options used in each alternative. In addition, if alternatives provided the same conveyance function with similar impacts, the less expensive alternatives were retained. Alternatives with lower cosets but higher adverse impacts were eliminated. Twelve alternatives were evaluated in the March 1998 Draft Programmatic EIS/EIR. Based on public and agency comments on the March 1998 Draft Programmatic EIS/EIR and on additional technical analysis, the Program was able to further refine and narrow the number of alternative solutions to the four evaluated in the June 1999 Draft Programmatic EIS/EIR. The four alternatives evaluated in the June 1999 Draft Programmatic EIS/EIR were carried forward to the Final Programmatic EIS/EIR and were further refined based on comments received.

SUMMARY OF CONSEQUENCES OF PREFERRED PROGRAM ALTERNATIVE

The Program alternatives were analyzed to determine the potential for adverse and beneficial consequences. The most significant potential consequences of the Preferred Program Alternative are related to the resource areas listed below. For detailed information about impacts on all environmental resource areas, please refer to Chapters 5, 6, and 7 in the impact analysis document. Chapter 3 in the impact analysis document provides a summary comparison of the consequences for all resources and Program alternatives.

RESOURCE	BENEFICIAL CONSEQUENCES	POTENTIALLY ADVERSE CONSEQUENCES
WATER SUPPLY AND WATER MANAGEMENT	Improvements in water supply through coordinated implementation of Water Use Efficiency, Water Transfer, Water Quality, and Watershed Programs; facilities reoperation and integration; and, if appropriate, additional groundwater and/or surface water storage.	Temporary local water supply interruptions due to turbidity of water during construction of facilities and habitat restoration activities.
WATER QUALITY	Improved water quality for environmental and urban or agricultural uses from reduced concentrations of many contaminates, including heavy metals, pesticide residues, salts, selenium, pathogens, suspended sediments, total organic carbon, and bromides.	Increases in concentrations of bromide, salinity, total dissolved solids, and total organic carbon in the Delta; increased diversions of water from the Delta, reducing outflow to the Bay and changing Bay salinity; releases of inorganic or organic suspended solids, or toxic substances into the water column in the Delta; increased water temperatures and decreased dissolved oxygen concentrations in the Delta; potential decreased in-stream water quality from reduced in-stream flows associated with new storage facilities. Possible increases in salinity (expressed as EC) in localized areas in the central Delta. Without operation of a diversion facility on the Sacramento River, increases in salinity would be more widespread in the central Delta.
GROUNDWATER	In areas undertaking managed groundwater use programs, long-term increased groundwater levels, reduced pumping-induced subsidence, improved groundwater recharge, locally reduced potential for salt-water intrusion or pumping-induced migration of existing contaminants, and reduced groundwater extraction and reduced long-term lift costs.	Increased groundwater extractions in the Sacramento Valley and, to a lesser extent, in the San Joaquin Valley, resulting in land subsidence, lower groundwater levels, and higher pumping costs; degradation of groundwater quality; or losses of existing wells. In areas where groundwater basins are recharged mainly from percolation of applied water, agricultural and landscape water use efficiency could reduce recharge and result in declines of shallow water tables.
FISHERIES AND AQUATIC ECOSYSTEMS	Reactivated and maintained ecological processes and structures that sustain healthy fish, wildlife, and plant populations; increased abundance and distribution of desired aquatic species; improved streamflow, sediment supply, floodplain connectivity, stream temperature, and biological productivity; and reduced entrainment losses.	Increased non-native species abundance and distribution; blocked access to habitat and potentially altered water quality and flow conditions from placement of barriers in the south Delta; altered natural ecosystem structure, removal of benthic communities, and creation of conditions that may damage habitat for desired species from dredging activities; short-term disturbance of existing biological communities and species habitat, mobilized sediments, and input contaminants from construction activities; reduced streamflow and Delta outflow, changed seasonal flow, water temperature variability, and changes in salinity potentially resulting in reduced habitat abundance, impaired species movement, and in-creased loss of fish to diversions; increased entrain-ment loss of chinook salmon and other species from diversions to

RESOURCE	BENEFICIAL CONSEQUENCES	POTENTIALLY ADVERSE CONSEQUENCES
FISHERIES AND AQUATIC ECOSYSTEMS (Continued)		new off-stream storage; reduced fre-quency and magnitude of net natural flow conditions in the south and central Delta from Delta Cross Channel operations and south Delta barriers; with a Sacramento River diversion facility, impacts on individual organisms of special status-species from reduced net flow conditions in the Sacramento River down-stream of the diversion, increased mortality through abrasion, increased predation, and other factors from a new fish screen facility for the through-Delta ele-ment on the Sacramento River, and delayed migration and reduced spawning success for adult fish.
VEGETATION AND WILDLIFE	Net increases in target habitat types, increased protection for natural habitats, reduced toxic organic and inorganic constituents in the food web; increased quality and quantity of wetland and riparian habitats; increased habitat diversity; improved vigor of target populations (including special-status species); and long-term flood protection for existing and restored wetland, riparian, upland, and agricultural habitats.	Fragmentation of existing habitat corridors on small or ephemeral tributaries as a result of inundation by storage reservoirs, potentially blocking the movement and interchange of populations of some wildlife species from upper to lower watershed locations; loss of habitat and direct impacts on special-status species; loss of incidental wetlands and riparian habitats that depend on agricultural water use inefficiencies; temporary or permanent loss or disturbance of wetland or riparian communities, wintering waterfowl habitat, portions of rare natural communities and significant natural areas, and quantity or quality of forage for species of concern.
AGRICULTURAL LAND AND WATER USE	Increased certainty in availability of irrigation water, potential for higher value crops and higher grazing productivity because of better water quality, increased property protection through levee improvement and reduction of salt-water intrusion, updated aging and inefficient irrigation systems, and opportunities for water transfers that could make irrigation water available where it may not have been otherwise.	Conversion of prime, state-wide important, and unique farmland; conflicts with adjacent land uses; and conflicts with local government plans and policies.
AGRICULTURAL ECONOMICS	Increased property protection through levee improvements, long-term savings, increased revenues, and increased certainty to the agricultural economy.	Reduction in agricultural incomes in local areas.
AGRICULTURAL SOCIAL ISSUES	Some localized increases in agricultural-related employment, protection of agricultural jobs and income from catastrophic loss due to levee failure, and reduced future social dislocations due to water reliability.	Localized social effects related to reduced agricultural incomes.
URBAN LAND USE	Greater flood protection for urban centers.	Displacement of existing urban residences, physical disruption or division of established communities, and potential conflicts with local general plans.
URBAN WATER SUPPLY ECONOMICS	Lower treatment and regulatory costs, improved water quality, relocated water supply intakes, reduced risk of export interruptions caused by levee failure, and increased water supply availability.	Additional costs through payment for Program elements. Many economic effects cannot be determined until more specific information is available.
UTILITIES AND PUBLIC SERVICES	Reduced risk to electrical or natural gas transmission lines, utility facilities, communication infrastructure, and emergency service centers due to protection against levee failure.	Relocation or modification of major infrastructure components; increased risk of gas line rupture during construction.

RESOURCE	BENEFICIAL CONSEQUENCES	POTENTIALLY ADVERSE CONSEQUENCES
RECREATION RESOURCES	Increased open space; enhanced or restored wetland or wildlife habitat; improved water quality; increased fishing, hunting, and wildlife viewing opportunities; more recreation-related jobs; increased quality of recreational experience; increased flood protection for camping facilities and boat launches; and increased or improved access to public recreation areas.	Temporary or permanent closure of some recreation areas or facilities; reduced access to recreation facilities; decreased recreation opportunities from changes in reservoir levels; loss of terrestrial and on-stream recreation by innundation from reservoirs; temporary and permanent changes to motorized boating in the Delta from speed limits, channel closures, and installation of flow and fish control barriers; decrease in flooded lands suitable for wildlife viewing, hunting, and fishing; reduced water-contact recreation quality from releases of reservoir cold water.
FLOOD CONTROL	Easier inspection, maintenance, and repair of the flood control system; improved flood flow conveyance capacities; and reduced incidences of instability and overtopping failures; levees improved to the Public Law 84-99 standards and restored floodplains would provide additional system-wide flood control benefits.	Reduced levee stability and reductions in a channel's flow conveyance from barriers in the channel; increases in seepage, wind fetch, and wave erosion on landside levee slopes; level of flooding downstream of diversions after removal of Sacramento River tributary diversion structures and other flow obstructions; flood stages along streams; localized subsidence, resulting in levee slumping or cracking near levees; and adverse effects on water quality from use of dredged materials.
POWER PRODUCTION AND ENERGY	Some increase in hydropower generation if new storage is constructed.	Decrease in amount of energy available for non-project uses; possible air quality and land use impacts from new power plants to replace lost power.
REGIONAL ECONOMICS	Increases in recreation-related or construction-based economies; increased land values due to flood protection; reduced cost to some water supplies due to increased storage; and some increases in regional revenues and jobs associated with the Storage element.	Adverse effects to agricultural sector in the Delta. Amount and allocation of costs are currently uncertain.

COMMENTS

As the CALFED Program and the Programmatic EIS/EIR were being developed, several items were often mentioned by agencies, stakeholders, and the public. These topics have been addressed in the Final Programmatic EIS/EIR and in a set of Common Responses that are included in the Response to Comments Appendix to the Final Programmatic EIS/EIR. The following list is intended to provide the reader a cursory impression of the types of items mentioned:

- How should measures to increase water supply and measures to decrease water demand be combined? Is demand management alone adequate to meet California's needs, what kind of water storage should be considered, and how should supplies be managed for different uses and different geographic areas?
- How should water be moved through the Delta and how much water should be moved through the Delta?
- How will different areas of the Program, including ecosystem restoration, water transfers, and water supply actions affect agriculture?
- How will actions be funded? How will decisions be made?
- What should be the magnitude of the ecosystem restoration effort?

- How will the Environmental Water Account be operated?
- How will the Program affect growth and local planning?
- How will water quality be improved and what are the best methods for improvement?
- How will the Program handle area of origin, water rights, and the Public Trust Doctrine?
- As the Program is implemented, how do we ensure that all the components of the Program move forward together?
- Does the Program meet the "solution principles"? Are there any significant redirected impacts? Are conflicts in the system reduced? Is the Program equitable?

ENVIRONMENTAL JUSTICE

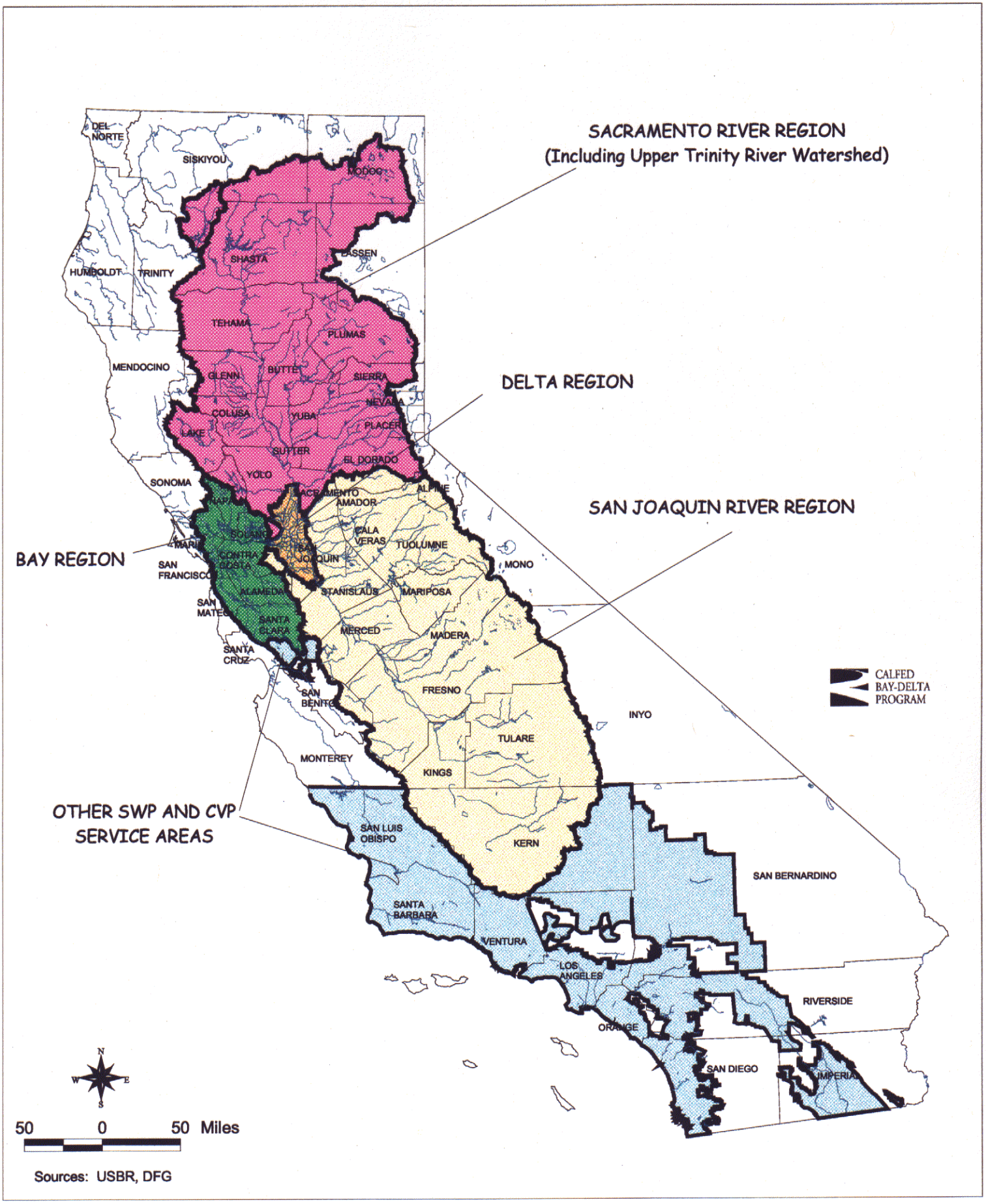
Executive Order 12898 requires federal agencies to analyze the impacts of alternatives in order to identify and evaluate disproportionate impacts on minorities and low-income populations. The geographic scope of the CALFED solution area encompasses a large portion of the state of California; therefore, it is difficult to conclude, at a programmatic level of analysis, that one social group would be adversely affected to a greater extent than any other group by any alternative. Site-specific NEPA and CEQA documentation will occur for specific projects that tier from this Programmatic EIS/EIR. Environmental justice issues will be addressed as part of the NEPA process for future site-specific projects.

INDIAN TRUST ASSETS

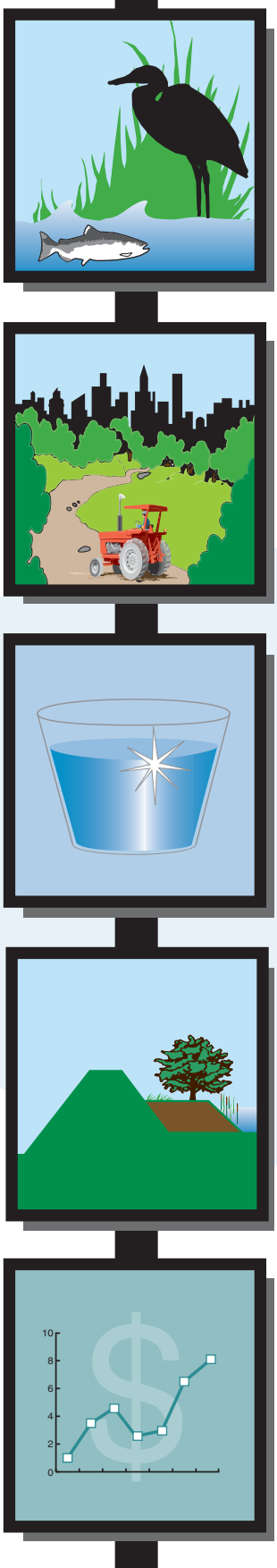
Federal policy is to protect American Indian trust assets and to determine whether alternatives would affect the use and enjoyment of trust assets. At the programmatic level of analysis, no alternative would adversely affect reserved water rights, water quality of the water rights, hunting and fishing rights, or noise near a land asset. Increases stream flows and improved water quality associated with the alternatives could positively affect Indian trust assets located adjacent to rivers and streams and the associated hunting and fishing rights. Site-specific NEPA and CEQA documentation will occur for specific projects that tier from this Programmatic EIS/EIR. Indian trust assets will be addressed as part of the NEPA process for future site-specific projects.

NEXT STEPS

Following the ROD/CERT of the Final Programmatic EIS/EIR, the CALFED agencies will implement the Program. For more information on implementation, please see the Phase II Report and the Implementation Plan.



CALFED Bay-Delta Program Programmatic EIS/EIR Study Area



CALFED
BAY-DELTA
PROGRAM

Final Programmatic Environmental Impact Statement/Environmental Impact Report

July 2000

Final Environmental Impact Statement/Environmental Impact Report
CALFED Bay-Delta Program

Prepared by the CALFED Bay-Delta Program for the
U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service,
National Marine Fisheries Service, U.S. Environmental Protection Agency,
Natural Resources Conservation Service, U.S. Army Corps of Engineers, and
California Resources Agency

This Final Programmatic Environmental Impact Statement/Environmental Impact Report (Final Programmatic EIS/EIR) is prepared in compliance with the National Environmental Policy Act (NEPA), the U.S. Bureau of Reclamation (Reclamation) policy and procedures for implementing NEPA, and the California Environmental Quality Act (CEQA).

The CALFED Bay-Delta Program (Program) is a cooperative effort of 18 state and federal agencies with regulatory and management responsibilities in the San Francisco Bay/San Joaquin River Bay-Delta to develop a long-term plan to restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system. The objective of this collaborative planning process is to identify comprehensive solutions to the problems of ecosystem quality, water supply reliability, water quality, and Delta levee and channel integrity.

Additional Information

For further information, please contact:

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Sacramento, CA 95814

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State Clearinghouse Number: 96032083

Each of the four alternatives, including the Preferred Program Alternative, includes Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, Water Transfer, Watershed, Storage, and Conveyance elements. Because the problems addressed by the Program and the solution are closely interrelated, the descriptions of each of the Program elements, except for the Conveyance element, do not vary among alternatives. This is a programmatic-level document to select a long-term plan. The document focuses on the interrelated long-term and cumulative consequences of each of the alternatives. Implementation of the long-term plan will follow the approval of this Final Programmatic EIS/EIR, and subsequent environmental review for project-specific aspects of the Program will be required.

The Program issued a Draft Programmatic EIS/EIR in June 1999. Public comments were received from June 25, 1999, to September 23, 1999. Responses to public comments can be found in the Response to Comments Document - Volumes I, II, and III.

Preface

The CALFED Bay-Delta Program (Program) includes a series of proposed actions that will take place in stages over time and a decision-making process for moving forward through the next phase of the Program. This preface describes the relationships between:

- The Preferred Program Alternative evaluated in this document, potential near-term actions, and a long-term implementation strategy.
- This document and the program plans, which together constitute the Final Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR).
- The programmatic impact analysis in this document and project-specific impact analyses associated with future proposed actions.

Preferred Program Alternative and Proposed Actions

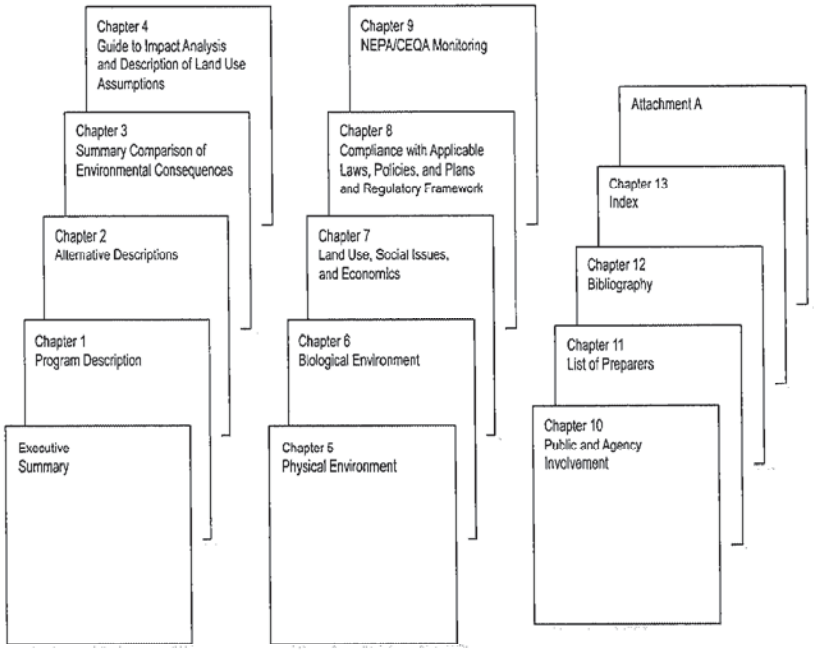
The Preferred Program Alternative consists of programmatic actions that set the long-term, overall direction of the Program. However, detail at a greater level of specificity than is available in the programmatic description of the Preferred Program Alternative is important to understanding how this large, complex program may be implemented, funded, and governed in the future. Accordingly, the CALFED agencies have described proposed actions for the first years following a Record of Decision/ Certification of the Final Programmatic EIS/EIR, as well as set out a long-term implementation strategy.

The potential near-term actions and long-term implementation strategy are presented in the Implementation Plan and the Phase II Report. The proposed near-term actions and long-term implementation strategy share two characteristics: they are designed to achieve multiple benefits by emphasizing actions that serve several purposes, and they will be implemented in ways that increase knowledge so that the CALFED agencies can adapt subsequent actions to increase their effectiveness. As appropriate, the near- and long-term actions will be subject to subsequent alternative analysis, environmental review, and permitting decisions before they are implemented.

Contents of the Final Programmatic EIS/EIR

The Final Programmatic EIS/EIR includes the impact analysis document and the program plans.

Impact Analysis Document. The impact analysis document contains the required programmatic environmental document elements, including an Executive Summary. The illustration below depicts those elements.



Program Plans. The Phase II Report contains a general summary of the program plans. More fundamentally, the report also describes the Program process, the fundamental Program concepts that have guided their development, and analyses that have contributed to Program development. Further, this report describes how this large, complex program may be implemented, funded, and governed in the future.

The following plans outline Program actions:

- Ecosystem Restoration Program Plan (Volumes 1, 2, and 3)
- Water Quality Program Plan
- Water Use Efficiency Program Plan
- Water Transfer Program Plan
- Levee System Integrity Program Plan
- Watershed Program Plan

These plans include a description of programmatic plans and actions that are evaluated in this impact analysis document as well as more specific actions that will be subject, as appropriate, to subsequent environmental review.

The remaining program plans include the:

- Implementation Plan
- Multi-Species Conservation Strategy (MSCS)
- Comprehensive Monitoring, Assessment, and Research Program (CMARP)

The Implementation Plan describes the proposed schedule and process for implementing near-term actions in the context of the overall implementation approach, including financial and assurance strategies. The MSCS describes a comprehensive species and habitat conservation program that builds on the Ecosystem Restoration Program to provide a framework for compliance with endangered species laws. The CMARP describes the information generated from monitoring, assessment, and research that will be used to (1) assess the effectiveness of existing actions, (2) guide additional research, and (3) modify the actions of each of the Program elements in order to improve the Program's ability to meet its goals and objectives.

Programmatic Impact Analysis

The Program currently consists of multiple actions that are diverse, geographically dispersed, and to be carried out over many years. Consequently, the Program will be implemented in stages, using the information gained by adaptive management to modify and refine Program actions over time, within the framework of the Preferred Program Alternative. Given the uncertainties, the large scope of the Program area, and the conceptual nature of the proposed actions, the CALFED agencies elected to prepare a Programmatic EIS/EIR.

This document provides a broad overview of the Program and the CALFED agencies' vision of their highest priority actions to pursue. It describes, in a broad sense, the environmental consequences of proposed actions and enables decisions to be made regarding Program direction and content. Information from this document will be incorporated by reference into subsequent tiered environmental documents for specific projects. This level of analysis is consistent with the guidance for programmatic documents provided by the Council on Environmental Quality's Regulations for implementing the National Environmental Policy Act (NEPA) and by the State California Environmental Quality Act (CEQA) Guidelines.

The Preferred Program Alternative will not, in itself, enact any changes in law, regulation, or policy nor allow project construction. Instead, the Preferred Program Alternative describes programmatic actions that set the long-term, overall direction of the Program. Any subsequent actions or facility construction stemming from the programmatic actions in the Preferred Program Alternative must be developed in compliance with NEPA, CEQA, and other applicable laws and regulatory processes.

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Attachments

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Program Plans

Phase II Report
Implementation Plan
Ecosystem Restoration Program Plan:
Volume 1: Ecological Attributes of the San Francisco Bay-Delta Watershed
Volume 2: Ecological Management Zone Visions
Volume 3: Strategic Plan for Ecosystem Restoration
Levee System Integrity Program Plan
Water Quality Program Plan
Water Use Efficiency Program Plan
Water Transfer Program Plan
Watershed Program Plan
Multi-Species Conservation Strategy
Comprehensive Monitoring, Assessment, and Research Program

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List of Acronyms

A

AB	Assembly Bill
AFB	Air Force Base
AFRP	Anadromous Fish Restoration Program
ALs	action levels
ARWRI	American River Water Resource Investigation
ASIP	action-specific implementation plan
ATSF	Atchison, Topeka and Santa Fe
AWMC	Agricultural Water Management Council

B

BATs	best available technologies
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

C

CAA	Clean Air Act
CalEPA	California Environmental Protection Agency
CALFED Ops Group	California-Federal Operations Group
CART	CALFED Agency Review Team
CCC	Contra Costa Canal
CCCTs	combined cycle combustion turbines
CCFB	Clifton Court Forebay
CCWD	Contra Costa Water District
CDF	California Department of Forestry and Fire Protection
CDFA	California Department of Food and Agriculture
CERT	Certification of the EIS/EIR
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CMARP	Comprehensive Monitoring, Assessment, and Research Program
CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
CTs	combustion turbines
CUWA	California Urban Water Agency
CUWCC	California Urban Water Conservation Council
CVGSM	Central Valley Groundwater and Surface Water Model
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CZARA	Coastal Zone Act Reauthorization Amendments
CZMA	Coastal Zone Management Act

D

D-	Water Rights Decision
D/DBP Rule	Disinfectant/Disinfection By-Products Rule
DBCP	dibromochloropropane
DBPs	disinfection by-products
DCC	Delta Cross Channel
DEFT	Diversion Effects on Fisheries Team
DFG	California Department of Fish and Game

DHS	California Department of Health Services
DMC	Delta-Mendota Canal
DO	dissolved oxygen
DOC	Department of Conservation
DOC	dissolved organic carbon
DPC	Delta Protection Commission
Dupont	El Dupont De Nemours & Co.
DWR	California Department of Water Resources
DWRSIM	DWR system operational model

E

EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District
EC	electrical conductivity
ECCID	East Contra Costa Irrigation District
EDB	ethylene dibromide
EDD	California Economic Development Department
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
EPA	U.S. Environmental Protection Agency
ERAF	Education Reinvestment Augmentation Fund of 1992
ESA	Endangered Species Act
ESWTR	Enhanced Surface Water Treatment Rule
EWA	Environmental Water Account
EWMP	efficient water management practices

F

FACA	Federal Advisory Committee
FCAA	Federal Clean Air Act
FEMA	Federal Emergency Management Act
FIP	Federal Implementation Plan
FPPA	Farmland Protection Policy Act of 1981
fps	feet per second
FWCA	Fish and Wildlife Coordination Act

G

GBT	getting better together
GIS	geographic information system
gpcd	gallons per capita per day
GWh	gigawatt hours

I

I-5	Interstate-5
I-80	Interstate-80
IID	Imperial Irrigation District
Interior	U.S. Department of the Interior
IOCs	inorganic chemicals
ISDP	Interim South Delta Program
ISO	Independent System Operator

J

JPD	joint point of diversion

K

KCWA	Kern County Water Agency

L

LCPSIM	Least-Cost Planning Simulation Model
Ldn	day-night sound level
LTMS	Long-Term Management Strategy

M

M&I	municipal and industrial
MAD	mosquito abatement district
MAF	million acre-feet
MCLGs	maximum contaminant level goals
MCLs	maximum contaminant levels
mg/L	milligrams per liter
MH	Maas-Hoffman
MOA	memorandum of agreement
MOU	memorandum of understanding
MSCS	Multi-Species Conservation Strategy
msl	mean sea level
MTBE	methyl tert-butyl ether
MW	megawatts
MWD	The Metropolitan Water District of Southern California
MWh	megawatt hour
MWQI	Municipal Water Quality Investigation
μg/L	micrograms per liter
μmhos/cm	micromhos per centimeter

N

NBA	North Bay Aqueduct
NAWQA	National Water Quality Assessment
NCCAB	North Central Coast Air Basin
NCFCWCD	Napa County Flood Control and Water Conservation District
NCCP	Natural Community Conservation Plan
NCCPA	Natural Community Conservation Planning Act
NCP	navigation control point
NDDB	National Diversity Database
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMOG	non-methane organic gas
NOD	Notice of Determination
NOI/NOP	Notice of Intent/Notice of Preparation
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPS Program	Nonpoint Source Program
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSDWR	National Secondary Drinking Water Regulations
NWR	National Wildlife Refuge

O

O_3	ozone
Ops	Operations Coordination

P

PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEIS	Programmatic Environmental Impact Statement
PG&E	Pacific Gas and Electric Company
PL	Public Law
PM_{10}	particulate matter smaller than 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than 2.5 microns in diameter
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
Program	CALFED Bay-Delta Program
Programmatic EIS/EIR	Programmatic Environmental Impact Statement/Environmental Impact Report

Q

QWEST	Measure of net flow in the lower San Joaquin River and other smaller Delta channels

R

RBDD	Red Bluff Diversion Dam
Reclamation	U.S. Bureau of Reclamation
RMP	Regional Monitoring Plan
RO	reverse osmosis
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board

S

SB	Senate Bill
SBA	South Bay Aqueduct
SCFCWCD	Solano County Flood Control and Water Conservation District
SCVWD	Santa Clara Valley Water District
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMPA	Suisun Marsh Preservation Agreement
SO_2	sulfur dioxide
SOC	synthetic organic chemical
SR 99	State Route 99
SRA	State Recreation Area
SRFCP	Sacramento River Flood Control Project
Strategic Plan	Strategic Plan for the Ecosystem Restoration Program
SDCWA	San Diego County Water Authority
SWP	State Water Project
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule

T

TAF	thousand acre-feet
TCE	trichloroethylene
TDS	total dissolved solids
THM	trihalomethane
TIE	toxicity identification evaluation
TMDL	total maximum daily load
TOC	total organic carbon
TSS	total suspended solids
TTHMs	total trihalomethanes

U

USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
USTs	underground storage tanks

V

UV	ultra violet
VAMP	Vernalis Adaptive Management Plan
VMS	Visual Management System
VOCs	volatile organic chemicals

W

Western	Western Area Power Administration
WMA	Wildlife Management Area
WQCP	water quality control plan
WSCC	Western Systems Coordinating Council

Chapter 1. Program Description

The Bay-Delta estuary is the largest estuary on the West Coast and is the hub of California's water supply system. For decades, conflicting demands on the system have resulted in threats to Bay-Delta resources, including a declining ecosystem with some species threatened with extinction, degradation of water quality, and reduced levee system stability. The initial steps of how the CALFED Bay-Delta Program intends to alleviate the problems in the Bay-Delta are outlined in this chapter.

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1. Program Description

1.1 PROGRAM DESCRIPTION

1.1.1 BACKGROUND

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 of the United States. It is a haven for plants, fish, and wildlife, supporting over 750 plant and animal species. In addition to native species, a number of species have been introduced either purposefully (striped bass) or accidentally (Chinese mitten crab). 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 location of the Sacramento-San Joaquin Delta is shown in Figure 1-1.

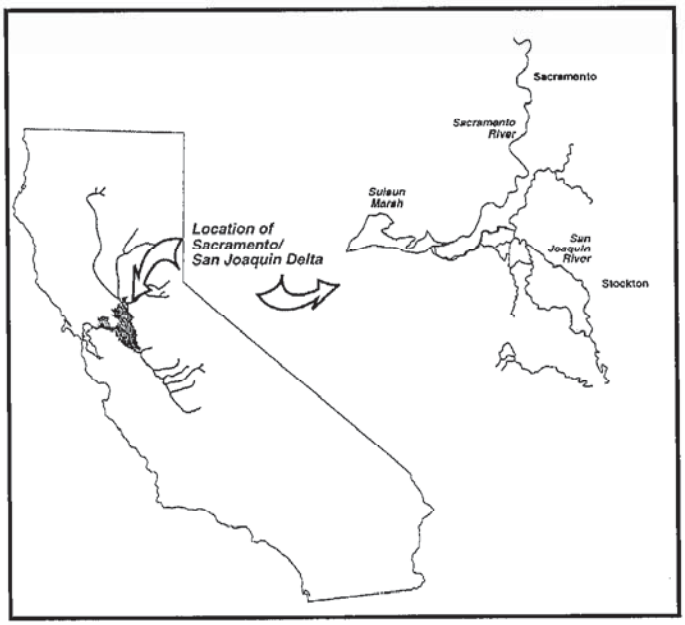


Figure 1-1. Location of the Sacramento/ San Joaquin Delta

For decades, the region has been the focus of competing interests—economic and ecologic, and urban and agricultural. These conflicting demands have resulted in a number of threats to Bay-Delta resources:

- Declining fish and wildlife habitat.
- Native plant and animal species becoming threatened with extinction.

Some Delta Statistics

- 738,000 acres including 538,000 acres of irrigated agriculture
- 750 plant and animal species
- Source of drinking water for 22 million Californians
- Supplies irrigation water for the 45% of the nation's produce grown in California

- Degradation of the Delta as a reliable source of high quality water.

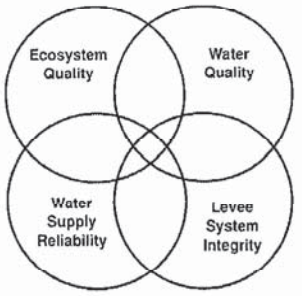
- A Delta levee system faced with an unacceptably high risk of failure.

Even though environmental, urban, and agricultural interests have recognized the Delta as a critical resource, for decades they have been unable to agree on appropriate management of the Delta resources. Consequently, the numerous "traditional" efforts to address the Bay-Delta problems, including government decrees, private remediation efforts, and seemingly endless rounds of litigation, have failed to reverse the steady decline of the Delta as fish and wildlife habitat and as a reliable source of water.

Interrelationships of Bay-Delta Problems and Solutions

What are the problems that face the Bay-Delta and why have they occurred? At the simplest level, problems occur when demands conflict over the use of resources from the Bay-Delta system. As California's population increases, we ask more of the system and there is more conflict. Single-purpose efforts to solve problems often fail to address these conflicts. 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. In the past, most efforts to improve water supply reliability or water quality, improve ecosystem health, or maintain or improve the Delta levees were single-purpose projects. Single-purpose projects have the potential to solve one problem but create other problems, and thereby engender opposition to future actions.

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



1.1.2 Development of the CALFED Bay-Delta Program

The CALFED Bay-Delta Program (Program) was established in May 1995. CALFED is a consortium of eight state and ten federal agencies with management and regulatory responsibilities in the Bay-Delta estuary.

State and federal agencies participating in CALFED are noted in the box on the next page. They are listed according to their respective roles in preparation of the Programmatic Environmental Impact Statement/ Environmental Impact Report (EIS/EIR).

Seeking solutions to the resource problems in the Bay-Delta, state and federal agencies signed a "Framework Agreement" in June 1994. As part of the Framework Agreement, the state and federal governments pledged to (1) coordinate their implementation of water quality standards to protect the Bay-Delta estuary; (2) coordinate the operation of the State Water Project (SWP) and the Central Valley Project (CVP), which both involve transporting fresh-water through the Delta to points south; and (3) develop a process to establish a long-term Bay-Delta solution that will address four categories of problems: ecosystem quality, water quality, water supply reliability, and levee system vulnerability.

The impetus to forge this joint effort came at the state level in December 1992 with the formation of the State Water Policy Council and the Bay-Delta Oversight Council, an advisory group to the State Water Policy Council. In September 1993, the Federal Ecosystem Directorate was created to coordinate federal

resource protection and management decisions for the Bay-Delta.

The Framework Agreement laid the foundation for the Bay-Delta Accord and CALFED. The Accord, also called the Principles for Agreement on Bay-Delta Standards between the State of California and the Federal Government, detailed interim measures for both environmental protection and regulatory stability in the Bay-Delta. On December 15, 1994, the Accord was signed by state and federal resource agencies, with the cooperation of local water agencies and environmental organizations. The Accord was set to expire on December 15, 1997. In late 1997, the state and federal signatories to the Accord extended its effect through December 31, 1998. In December 1998, a second 1-year extension was signed, extending the Accord until December 1999. The Accord was again extended until September 15, 2000.

Role of CALFED Agencies in Preparation of Programmatic EIS/EIR

Lead Agencies—State and federal agencies who have the principal responsibility for carrying out or approving the project:

- Resources Agency of California
- U.S. Fish and Wildlife Service
- U.S. Bureau of Reclamation
- U.S. National Marine Fisheries Service
- U.S. Environmental Protection Agency
- U.S. Natural Resource Conservation Service
- U.S. Army Corps of Engineers

Responsible Agencies—State agencies, other than the lead agency, with a legal responsibility for carrying out or approving the project:

- California Environmental Protection Agency
- California Department of Fish and Game*
- California Department of Water Resources
- California State Water Resources Control Board

Cooperating Agencies—Federal agencies, other than the lead agencies, with jurisdiction by law or special expertise with respect to any environmental impact:

- U.S. Forest Service
- U.S. Geological Survey
- U.S. Western Area Power Administration
- U.S. Bureau of Land Management

Other Agencies—Agencies that regularly participate:

- Delta Protection Commission
- California Department of Food and Agriculture
- The Reclamation Board

* The California Department of Fish and Game is also a trustee agency with jurisdiction over natural resources held in trust for the people of California.

CALFED oversees the coordination and increased communication between federal agencies, state agencies, and stakeholders in three areas outlined in the Framework Agreement:

- Substantive and procedural aspects of water quality standard setting.
- Improved coordination of water supply operations with endangered species protection and water quality standard compliance.
- Development of a long-term solution to fish and wildlife, water supply reliability, flood control, and water quality problems in the Bay-Delta.

The Program is charged with responsibility for the third issue identified in the Framework Agreement. This Programmatic EIS/EIR evaluates this long-term program.

1.1.3 STRUCTURE OF THE PROGRAM

In addition to the CALFED agencies, Bay-Delta stakeholders contribute to the Program design and the problem-solving and decision-making process. The public participation and input that have been essential throughout the process have included the Bay-Delta Advisory Council (BDAC) and public participation in workshops, scoping meetings, comment letters, and other public outreach efforts. The BDAC charter is described in the adjacent text box.

Bay-Delta Advisory Council

The Bay-Delta Advisory Council (BDAC) is chartered under the Federal Advisory Committee Act and includes representatives of stakeholders, including water districts and utilities, environmental organizations, the California Farm Bureau, and sport fishing organizations from throughout California. The BDAC meets regularly with CALFED agencies and staff to review the status of work on developing the recommended program. Additionally, BDAC has formed several subcommittees, called "work groups," on various issues to provide more focused attention on particularly complex issues. This group of public advisors helps define problems in the Bay-Delta, helps to assure broad public participation, and offers advice on proposed solutions.

The CALFED agencies appointed an Executive Director to oversee the process of developing a long-term comprehensive plan for the 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 Program through a variety of multi-level technical and policy teams.

The Program was divided into a three-phase cooperative planning process (Figure 1-2) intended to identify an appropriate strategy to reduce conflicts in the Bay-Delta system. Phase I began in May 1995 with a series of public workshops to define the problems of the Bay-Delta and begin work on developing a range of alternatives to solve the Bay-Delta system problems. The Program participants worked to clearly define the fundamental problems in the Bay-Delta system: ecosystem quality, water supply reliability, water quality, and levee system integrity. This effort resulted in the development of a mission statement, solution principles, and objectives (on the following page) for the Program. In addition, an initial group of actions was developed and refined into three preliminary categories of solutions (Section 1.4.1). Phase I was completed in August 1996.

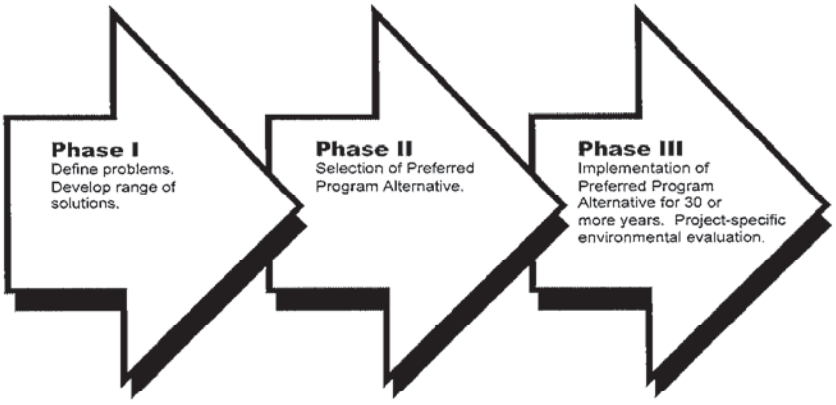


Figure 1-2. Three Phases of the CALFED Process

CALFED Bay-Delta Program Mission Statement

The mission statement does not stand alone as a single statement of Program purpose. Rather, the mission statement is supported by sets of primary objectives and solution principles. The mission statement is important and reflects the basic intent of the Program. However, the full expression of the Program mission is reflected in the mission statement, objectives, and solution principles, read together.

Mission Statement

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.

Primary Objectives of the CALFED Program

- *Ecosystem Quality* - 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.
- *Water Supply* - Reduce the mismatch between Bay-Delta water supplies and the current and projected beneficial uses dependent on the Bay-Delta system.
- *Water Quality* - Provide good water quality for all beneficial uses.
- *Vulnerability of Delta Functions* - Reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees.

Solution Principles

The solution principles were developed as a means to achieve the Program's objectives in the context of a multi-purpose mission and a history of (competing) contentious environmental, political, and institutional influences on the affected resources. The solution principles provide an overall measure of the acceptability of alternatives and guide the design of the institutional part of each alternative. The solution principles are:

- **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. Improvement 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.
- **Pose 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.

Phase II is ongoing and will culminate with a federal Record of Decision (ROD) and state Certification (CERT) of the Programmatic EIS/EIR in 2000. Phase II includes development of the Preferred Program Alternative and development of an Implementation Plan focusing on the first 7 years following the ROD/CERT. Section 1.4.2 presents the Phase II alternative development process.

During Phase III, the CALFED agencies will implement the Preferred Program Alternative. This phase will include any necessary studies and site-specific environmental review and permitting. Because of the size and complexity of the Program alternatives, implementation is likely to take place over a period of 30 years or more. Part of the challenge for Phase II is designing an implementation strategy that acknowledges this long planning horizon and ensures that all participants remain committed to the successful completion of all phases of implementation.

1.2 PROJECT DESCRIPTION AND PROGRAM PURPOSE AND NEED

Approval of the ROD/CERT of this Programmatic EIS/EIR provides the general direction for long-term implementation of the CALFED Program. The Program includes a range of balanced actions that can be taken to move forward on a comprehensive, multi-agency approach to managing Bay-Delta resources. The Programmatic EIS/EIR allows the decision makers and the public to evaluate the consequences of the alternative approaches to accomplishing the goals and objectives of the Program at a programmatic planning stage. Thus, the "project" as an element of the California Environmental Quality Act (CEQA) is a decision to approve the long-term, multi-stage plan as described in this Programmatic EIS/EIR.

Purpose Statement

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

Additional specific information will be necessary for subsequent decisions during implementation of the Program over the next 30 or more years. Thus, the project is the approved planning road map for achieving the CALFED Program purpose: to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. Although the decision affects a broader geographical area, the decision in the ROD/CERT of this Programmatic EIS/EIR is similar to the approval of a general plan on a local level for a city or county. The general plan sets the broad policy direction for a wide range of possible future actions while allowing the opportunity for flexibility to changing needs.

Each of the four primary objectives for the Program set forth on page 1-5 must be met to achieve the project purpose. Each alternative examined, including the Preferred Program Alternative, is designed to meet these objectives in a comprehensive, integrated manner.

The purpose of the Program is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. To practicably achieve this program purpose, CALFED will concurrently and comprehensively address problems of the Bay-Delta system within each of four resource categories: ecosystem quality, water

quality, water supply reliability, and levee system integrity. Important physical, ecological, and socioeconomic linkages exist between the problems and possible solutions in each of these categories. Accordingly, a solution to problems in one resource category cannot be pursued without addressing problems in the other resource categories.

Because of the complexity of the problems and solutions being considered, the following goals and objectives are described to explain how the Program intends to achieve the purpose within each of these four critical resource categories.

Ecosystem Quality. The goal for ecosystem quality 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. This can be accomplished by addressing the objectives, which collectively improve and increase aquatic and wetland habitats so that they can support the sustainable production and survival of estuarine and anadromous fish and wildlife species, and increase population health and population size to levels that assure sustained survival. The objectives in summary form are:

1. Increase the amount of shallow riverine, shaded riverine, tidal slough, and estuary entrapment and null zone habitats for aquatic species.

2. Improve the in-Delta, upstream, and downstream movement of larval, juvenile, and adult life stages of aquatic species.

3. Reduce water quality degradation.

4. Increase the amount of brackish tidal marsh, fresh-water marsh, riparian woodland, waterfowl breeding habitat, wintering range for wildlife, managed permanent pasture and floodplains, and associated riparian habitats for wildlife species.

5. Contribute to the recovery of threatened or endangered species and species of special concern.

Water Supply Reliability. The goal 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. This can be accomplished by addressing the objectives, which collectively reduce the conflict among beneficial water users, improve the ability to transport water through the Bay-Delta system, and reduce the uncertainty of supplies from the Bay-Delta system. These objectives in summary form are:

1. Maintain an adequate water supply to meet expected in-Delta beneficial use needs.

2. Improve export water supplies to help meet beneficial use needs.

3. Improve the adequacy of Bay-Delta water to meet Delta outflow needs.

4. Reduce the vulnerability of Bay-Delta levees.

5. Improve the predictability of the water supply available from the Bay-Delta system for beneficial use needs.

Water Quality. The goal for water quality in the Bay-Delta system is to provide good-quality water for all beneficial uses, including drinking water, agricultural uses (both in-Delta and exported), industrial uses, recreational in-Delta uses, and Delta aquatic habitats. This can be accomplished by addressing the objectives, which collectively provide for the improvement of water quality for all beneficial uses. The objectives in summary form are:

1. Improve the reliability and quality of raw water for drinking water needs.
2. Reduce constituents in agricultural water that affect operations and crop productivity.
3. Improve the reliability and quality of water for industrial needs.
4. Improve the quality of raw water for recreational uses including consumption of aquatic resources.
5. Improve the quality of water for environmental needs.

Levee System Integrity. The goal for levee system integrity is to reduce the risk to land uses and associated agricultural and other economic activities, water supply, infrastructure, and the Bay-Delta ecosystem from catastrophic breaching of Delta levees. This can be accomplished by addressing the objectives, which collectively provide management of the risk resulting from gradual deterioration of Delta conveyance and catastrophic breaching of the Delta levees. The objectives in summary form are:

1. Reduce the risk to land use from seepage and overtopping of the levees, subsidence of peat soils, and catastrophic inundation of Delta islands.

2. Reduce the risk to in-Delta and export water supply from sudden catastrophic island inundation and the resultant salinity intrusion.

3. Reduce the risk to in-Delta and export water supply facilities from sudden catastrophic island inundation.

4. Reduce the risk to the existing Delta ecosystem from seepage, erosion, and overtopping of levees; from peat soils; and from catastrophic island inundation and the resultant salinity intrusion.

The purpose statement responds to the following needs.

Ecosystem Quality. The health of the Bay-Delta system has declined as a result of a number of factors, including degradation and the loss of habitats that support various life stages of aquatic and terrestrial biota. Further, the decline in health has resulted from activities within and upstream of the Bay-Delta system. One early human-induced event was hydraulic mining in the river drainages along the eastern edge of the Central Valley. The mining degraded habitat in Central Valley streams as channel beds and shallow areas filled with sediment. In addition, the reduced capacity of the sediment-filled channels increased the frequency and extent of periodic flooding, accelerating the need for flood control measures to protect adjacent agricultural, industrial, and urban lands. Levees constructed to protect these lands eliminated fish access to shallow overflow areas, and dredging to construct levees eliminated the tule bed habitat along the river channels.

Since the 1850s, 700,000 acres of overflow and seasonally inundated lands in the Bay-Delta system have been converted to agricultural, industrial, and urban uses. Many of the remaining stream sections have been dredged or channelized to improve navigation and to increase stream conveyance capacity in order to accommodate flood flows and facilitate water export.

Upstream water development and use, depletion of natural flows by local diverters, and the export of water from the Bay-Delta system have changed seasonal patterns of the inflow, reduced the outflow, and diminished the natural variability of flows into and through the Bay-Delta system. Facilities constructed to support water diversions (upstream, in-Delta, and export facilities) cause straying or direct losses of fish (for example, through unscreened diversions) and can increase exposure of juvenile fish to predation. Entrainment and removal of substantial quantities of food-web organisms, eggs, larvae, and young fish further exacerbate the impacts of overall habitat decline.

Habitat alteration and water diversions are not the only factors that have affected ecosystem health. Water quality degradation caused by pollutants and increased concentrations of substances also may have contributed to the overall decline in the health and productivity of the Bay-Delta system. In addition, undesirable introduced species may compete for available space and food supplies, sometimes to the detriment of native species or economically important introduced species.

Water Supply Reliability. The Bay-Delta system provides the water supply for a wide range of in-stream, riparian, and other beneficial uses—such as drinking water for millions of Californians and irrigation water for agricultural land. While some beneficial water uses depend on the Bay-Delta system for only a portion of their water needs, others are highly or totally dependent on Bay-Delta water supplies. As water use and competition among uses has increased during the past several decades, conflicts have increased among users of Bay-Delta water. Heightened competition for the water during certain seasons or during water-short years has magnified the conflicts.

Water flow and timing requirements have been established for certain fish and wildlife species with critical life stages that depend on fresh-water flows. These requirements have reduced water supplies and flexibility to meet the quantity and timing of water delivered from the Bay-Delta system. Water suppliers and users are concerned that additional restrictions that may be needed to protect species would increase the uncertainty and further reduce the availability of Bay-Delta system water for agricultural, industrial, and urban purposes.

Delta levees and channels may fail. Water users are concerned that such failures could result in an interruption of water supply for both urban and agricultural purposes, and degradation of water quality and aquatic habitats.

Water Quality. Good-quality water is required to sustain the high-quality habitat needed in the Bay-Delta system to support a diversity of fish and wildlife populations. In addition, the Bay-Delta system is a source of drinking water for millions of Californians and is critical to the state's agricultural sector. The potential for increasingly stringent drinking water requirements that require new treatment technologies is spurring water providers to seek higher quality source waters and to address pollution in source waters. Pollutants enter the Bay-Delta system through a variety of sources, including sewage treatment plants, industrial facilities, forests, farm fields, mines, residential landscaping, urban streets, ships, and natural sources. The pollutants, pathogens, natural organics, and salts in the Bay-Delta system affect, in varying degrees, existing fish and wildlife, as well as human and agricultural uses of these waters. The salts entering the Bay-Delta system from the ocean and from return flows upstream and within the Delta decrease the utility of Bay-Delta system waters for many purposes, including the ecosystem, agriculture, and drinking water. The level of natural organics in the water (resulting primarily from the natural process of plant decay on many of the Delta peat soil islands) is of concern because of by-products formed from natural organics reacting with disinfection chemicals commonly used to meet public health requirements in water treatment.

Levee System Integrity. Levees were first constructed in the Delta during the late 1800s, when settlers began to turn tidal marshes into agricultural land. Over time, both natural settling of the levees and shallow subsidence (oxidation, which lowers the level of the land over time) of the Delta island soils resulted in a need to increase levee heights to maintain protection. There is a growing concern that this increased height, coupled with poor levee construction and inadequate maintenance, make Delta levees vulnerable to failure, especially during earthquakes or floods. Failure of Delta levees can result in flooding of Delta farmland and wildlife habitat. If a flooded island is not repaired and drained, the resulting large body of open water can expose adjacent islands to increased wave action and possible levee erosion. Levee failure on specific islands can affect water supply distribution systems, such as the Mokelumne Aqueduct. Similarly, levee failure on key Delta islands can draw salty water up into the Delta, as water from downstream rushes to fill the breached island. This is of particular concern in low-water years when less fresh water is available to repel the incoming salt water. Such a failure could interrupt the water supply for urban, agricultural, and environmental uses, and degrade water quality and aquatic habitats.

1.3 PROGRAM GEOGRAPHIC SCOPE

The geographic scope of analysis and actions for the Program that evolved through both technical and public forum discussions focuses on the Bay-Delta system for purposes of problem definition, while allowing solution generation from a much broader area.

1.3.1 CALFED PROBLEM AND SOLUTION AREAS

The Program is addressing problems that have been identified in or closely linked to the Suisun Bay/Suisun Marsh and Delta area (see Figure 1-3). However, the scope of possible solutions to these problems encompass any action that can be implemented by the CALFED agencies, or can be influenced by them, to address the identified problems—regardless of whether implementation takes place in the Delta/Suisun Bay/Suisun Marsh area.

Any problem currently associated with (1) the management and control of water in the Bay-Delta, or (2) the beneficial use of water in the Bay-Delta (including both environmental and economic uses) is within the purview of the Program if at least part of the problem is located in the Bay-Delta or is directly associated with conditions in the Bay-Delta.

In contrast to the problem scope, the solution scope is quite broad, potentially including any action that could help solve identified problems in the Bay-Delta. An expanded solution scope is necessary because many problems related to the Bay-Delta are caused by factors outside the Bay-Delta. Moreover, an expanded solution scope is desirable from a planning point of view because more benefits may be generated at lower cost if solutions are not limited to the geographic Bay-Delta. For example, the problem of declining salmon populations is linked to the Bay-Delta because of high salmon mortality during salmon migrations. However, the broader problem of declining salmon populations extends far beyond the Bay-Delta. One solution action might be to reduce salmon mortality during salmon migration through the Bay-Delta. However, it might be less expensive and more effective to combine that action with an effort to promote greater salmon protection upstream.

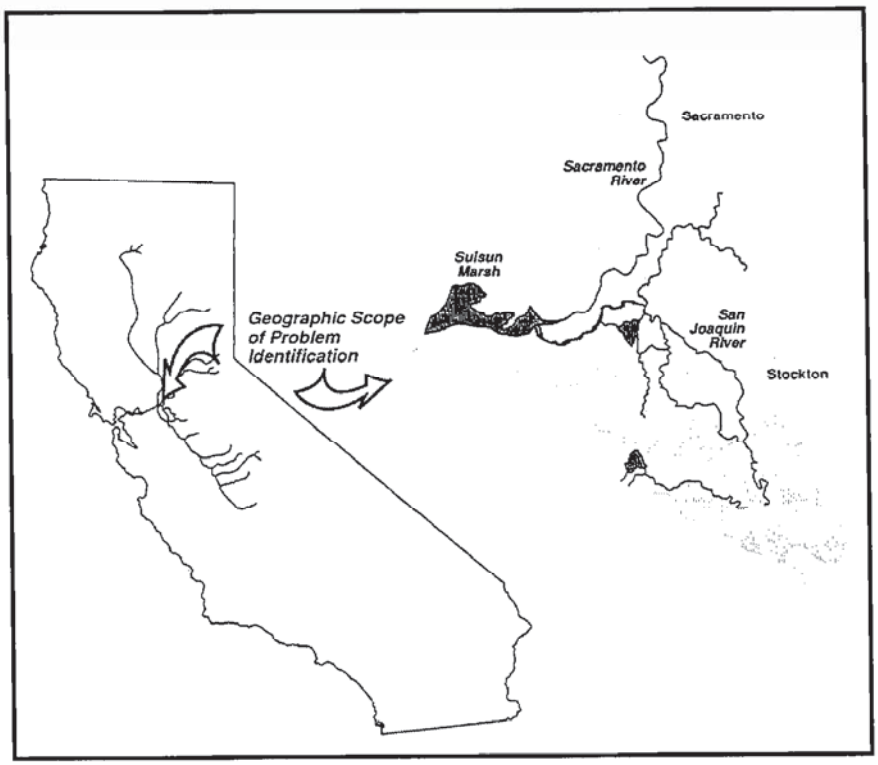


Figure 1-3. Geographic Scope of the Program Problem Area

1.3.2 DESCRIPTION OF THE STUDY AREA

The Program study area includes both the problem and solution areas mentioned in Section 1.3.1. The Program study area map is included as a pull out inside the back cover of this report. The study area has been broken down into regions: the Delta Region, the Bay Region, the Sacramento River Region, the San Joaquin River Region (including the Tulare Lake Basin), and the Other SWP and CVP Service Areas.

Delta Region

The Delta Region is defined in California Water Code Section 12220 and is comprised roughly of lowlands (lands approximately at or below the 5-foot contour) and uplands (lands above the 5-foot contour that are served water by lowland Delta channels). The Delta Region has been carved out of the Sacramento River and San Joaquin River watersheds because of its legal status and the Program's focus on this region.

Bay Region

The Bay Region includes Suisun Bay and Marsh, San Pablo Bay, and the San Francisco Bay watershed. In addition, an off-shore band, approximately 25 miles wide that runs from Point Conception to the Oregon border, has been included to cover anadromous fish along the California coast.

The upper watershed areas of the Bay Region include the unregulated watersheds that drain directly into San Francisco Bay, and the watershed areas upstream of existing reservoirs and fish migration barriers in the San Francisco Bay Area. These areas include the east-sloping drainages of San Mateo, San Francisco, and Marin Counties; north- and west-sloping drainages of Contra Costa and Alameda Counties; and the east- and north-sloping drainages of Santa Clara County. The major creeks in the Bay Region include Miller, Corte Madera, San Rafael, Novato, San Ramon, Walnut, Pacheco, Wildcat, Alameda, Berryessa, Coyote, Guadalupe, Stevens, and San Francisquito.

Sacramento River Region

The Sacramento River Region essentially is bounded by the ridge tops of the Sacramento River watershed or hydrologic region. The Trinity River is connected by a pipeline to the Sacramento River system and contributes to the CVP water supply. Because of this contribution, the watershed area from which Trinity River flows are diverted into the Bay-Delta system is included in the geographic scope of the Program study area. The Goose Lake watershed, in the northeast corner of California, has been left out of the study area because it rarely contributes to the flow of the Pit and Sacramento Rivers.

The upper watershed areas of the Sacramento River Region can be subdivided into three sub-regions on the north, east, and west sides of the Sacramento Valley. The upper watershed areas on the north side of the valley include all or portions of Shasta, Siskiyou, and Trinity Counties. The upper watershed areas on the east side of the valley include all or portions of the following counties: Butte, El Dorado, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Sierra, and Yuba. The upper watershed areas on the west side of the valley include all or portions of the following counties: Colusa, Glenn, Lake, Napa, Solano, Tehama, and Yolo.

San Joaquin River Region

The San Joaquin River Region includes both the San Joaquin and Tulare Lake hydrologic basins.

Upper watershed areas of the San Joaquin River Region encompass the watersheds and major tributaries upstream of the existing reservoirs and fish migration barriers in the San Joaquin River Region. During years of high flood flows, the region may include the areas of the Kings River drainage upstream of Pine Flat Reservoir. The major rivers of the San Joaquin River watershed include the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, San Joaquin, Chowchilla, and Fresno. The upper watershed areas include all or portions of the following counties: Calaveras, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, Tulare, and Tuolumne.

Other SWP and CVP Service Areas

The Other SWP and CVP Service Areas region includes two distinct, noncontiguous areas: in the north are the San Felipe Division's CVP service area and the South Bay SWP service area; to the south are the SWP service areas. The northern section of this region encompasses parts of the central coast counties of Santa Clara, San Benito, Santa Cruz, and Monterey. The southern portion includes parts of Imperial, Los

Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura Counties.

The upper watersheds in the Other SWP and CVP Service Areas are not described in this report because no specific watershed activities are proposed in these areas.

1.4 PROGRAM ALTERNATIVES DEVELOPMENT PROCESS

1.4.1 THE DEVELOPMENT, REVIEW, AND REFINEMENT OF ALTERNATIVES

In the past two decades, disagreements regarding the use and management of the Delta have increasingly taken the form of protracted litigation and legislative battles. These disagreements have not yielded solutions to the water-related conflicts centering in the Delta. The CALFED Program was established to reduce these conflicts and provide a solution that competing interests could support. The CALFED Program evaluated a wide range of alternatives to determine the best way to fulfill its mission (see page 1-5). Because both of the purposes composing the CALFED mission are essential to the success of the CALFED Program, only alternatives that would both restore ecological health and improve water management for beneficial uses of the Bay-Delta system were carried forward for detailed consideration. Each alternative (other than the No Action Alternative) considered in detail in this document would achieve these purposes.

In Phase I, CALFED initiated a lengthy, inclusive public process to develop alternatives in order to accomplish its mission. The Phase I process developed alternatives in six steps: identify problems, define objectives, identify actions, develop solution strategies, assemble alternatives, and refine alternatives. Early in Phase I, the Program identified 50 categories of actions to resolve Bay-Delta problems and achieve Program objectives. These action categories were drawn from existing literature and participation from CALFED agencies, the BDAC, and numerous workshops with stakeholders and the general public. Within these categories, hundreds of individual actions were defined. The action categories represent the building blocks of the alternatives—that is, each alternative is a combination of action categories reflecting differing approaches to achieving Program objectives and addressing solution principles (see page 1-5).

Given the large number of categories and the range of perspectives on solutions to Bay-Delta problems among stakeholders and CALFED agencies, thousands of potential alternatives could have been identified. A first step for the Program was to devise a methodology that would keep the number of alternatives to a manageable level while still representing the full range of approaches to resolving problems.

The methodology chosen to accomplish this was to define the critical conflicts that exist between beneficial uses and resources in the Bay-Delta and then to define approaches to resolving these conflicts. The following conflicts were identified:

- **Fisheries and Diversions.** The conflict between fisheries and 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, and reduced spawning success of adults when migratory cues are altered. The effects of diversions on species of special concern have resulted in regulations that restrict the quantities and timing of diversions.

- **Habitat and Land Use and Flood Protection.** Habitat to support various life stages of aquatic and terrestrial biota in the Bay-Delta has been lost because of land development and construction of flood control facilities to protect developed land. The need for habitat affects land development planning as well as levee maintenance and planning. Efforts to restore the balance often require that land used for agricultural production be dedicated to habitat.

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

- **Water Quality and Land Use.** Water quality can be negatively affected by land use, and ecosystem water quality needs are not always compatible with urban and agricultural water quality needs.

In assessing these conflicts, alternate approaches to conflict resolution and alternative levels of resolution were defined. Approaches for resolving the fisheries and diversions conflict included: (1) a fish productivity approach, and (2) a diversion modification approach. Approaches for resolving the habitat and land use and flood protection conflict included: (1) an existing land use pattern approach, and (2) a modified land use pattern approach.

Approaches for resolving the water supply availability and beneficial uses conflict included: (1) a demand reduction approach, and (2) a supply enhancement approach. Approaches for resolving the water quality and land use conflict included: (1) managing the quality of Delta inflows, and (2) managing in-stream water quality after discharges had occurred. Within each of these approaches, levels of conflict resolution ranging from less intensive to more intensive were identified.

This process produced 32 separate approaches to resolving the four conflicts. At this point, four teams of experts representing a variety of technical disciplines were formed—one team for each conflict area. These teams then were assigned an equal number of the 32 approaches (eight apiece), and directed to develop approximately three preliminary solution alternatives—sets of actions and action categories—for each of the eight approaches.

This procedure identified 100 preliminary solution alternatives that subsequently served as the foundation for the refinement process that defined the short list of three basic alternatives to be included in the Phase II analysis. In the Program's judgment, these 100 solution alternatives were representative of the larger number of possible combinations and bracketed the range of possible solutions to the four conflicts and, therefore, to the key problems facing the Bay-Delta. These "prototypical" alternatives helped to demonstrate the advantages and disadvantages of a wider range of alternatives. In addition, the solution principles guided the development of alternatives.

The 100 preliminary alternatives were very broad by design. Moreover, they tended to address the four critical conflicts in varying degrees—that is, they were not necessarily balanced in addressing Program objectives and solution principles.

At this point in the process, leadership responsibility for the four teams was moved from the technical experts to Program staff. This change was made to take advantage of staff's specific expertise on Bay-Delta issues and to more systematically include Program team members in the process, in order to ensure maximum sensitivity to the policies and positions of the CALFED agencies and stakeholder groups. The Program teams were instructed to begin balancing their alternatives, and to refine the initial set to approximately 6-10 per area by combining those alternatives with similar characteristics. This process produced a refined list of 31 alternatives.

Continued consolidation and balancing of the alternatives brought the number to 20. These 20 alternatives were presented to stakeholders, BDAC members, and the public at a workshop. Consolidation and refinement based on input from that workshop produced the 10 alternatives described in the Program's April 1996 Phase I Progress Report.

The makeup of the alternatives during the process of refinement and development utilized different combinations of water management tools. The alternatives also varied in the level of effort applied to actions related to water use efficiency, water quality, ecosystem quality, and levee system vulnerability components. Levels of effort characterized as modest, moderate, or extensive were applied to these four components. The two components that included distinctly different approaches were Delta conveyance and water storage. For example, one alternative contained modest efforts in Bay and Delta habitat restoration and water pollutant source control, moderate efforts in system stabilization, and extensive conjunctive use and groundwater storage efforts. This alternative included an in-Delta surface storage component but no isolated conveyance component. Another alternative contained extensive efforts in Bay and Delta habitat restoration and water pollutant source control, modest efforts in system stabilization, and moderate conjunctive use and groundwater storage efforts. This alternative contained a large isolated conveyance component but no surface storage component.

During April 1996, the Program conducted 8 public meetings around the state, a workshop in Sacramento, and a meeting of the BDAC to discuss the 10 alternatives.

The comments received at the meetings and workshop cover a wide range of technical, policy, and financial concerns. Oral comments were generally consistent with comments contained in the over 160 letters received by the Program. Some of the comments prompted consideration of modifying the structure and presentation of the alternatives, as follows:

- **The best possible source water quality is of paramount importance to urban water supplies.** Agencies that deliver drinking water are very concerned about the cost of meeting future drinking water quality standards, as well as the technical challenges associated with treating source water of degraded quality. This suggests strong pollutant source control measures in every alternative.

- **Delta levees will be needed to protect agriculture, infrastructure, and habitat no matter how water is conveyed in the Delta.** Delta levees protect many values, including farms, habitat, infrastructure, and Delta water quality. Even if a new conveyance facility is built that protects water quality for some export users, adequate levee integrity will still be required to protect water quality and many other values in the Delta. This argues for a similar level of Delta levee protection in each alternative.

- **Ecosystem actions at the modest and perhaps the moderate level appear inadequate; the Program needs a single coherent vision of ecosystem restoration.** The restoration of ecosystem functions and the recovery of Bay-Delta species likely will require diverse actions that will be extensive in scope. There is really no alternative to a single comprehensive plan for restoring ecosystem health. Adaptive management will be vital in guiding efforts to improve ecosystem quality. It is this adaptive management that will provide the needed flexibility in the Ecosystem Restoration Program.

- **Water use efficiency must be strongly pursued in all the alternatives.** This suggests that water use efficiency measures should be implemented at an increased level among all the alternatives, where previously some alternatives included efficiency at modest or moderate levels.

The next activity for the Program included additional refinement of alternatives, which led to selection of a set of Phase II alternatives that was large enough to offer a reasonable range of solutions while small enough to allow for detailed analysis. Application of the solution principles to the 10 draft alternatives provided for alternative refinement and consideration.

The refinement and consolidation of the 10 alternatives proceeded according to the following steps:

1. Review how each alternative satisfies the mission statement and primary objectives.

2. Review comments from CALFED, BDAC, scoping meetings, workshops, stakeholders, and the public on each alternative.

3. Evaluate and document how well each alternative satisfies each solution principle.

4. Determine potential ways to modify each alternative in order to improve any "low" solution principle ratings.

5. Verify that the alternative, if revised, would still meet the primary objectives and the other solution principles.

6. Review the alternatives and potential modifications to identify improved alternatives.

7. Merge similar improved alternatives into a single alternative.

Staff from CALFED agencies and the Program team evaluated alternatives against solution principles. As the detailed solution principles were applied to the 10 alternatives, and modifications were devised to improve low solution principle ratings, a pattern emerged. The results confirmed that the set of Phase II alternatives could be defined by combining the four common programs with the two variable components (storage and conveyance).

The above comments and the evaluation of alternatives against the solution principles supported the conclusion that water use efficiency, water quality, levee system integrity, and ecosystem quality were necessary in each of the alternatives to achieve the Program's purpose and needed to be composed of the same actions in all alternatives. Although the goal is to implement each of these programs at high levels in order to effectively achieve the Program's purpose, they will be implemented incrementally, or in

stages, over time. This approach will provide flexibility for monitoring and adapting actions in response to the results of the initial actions.

Based on this information, the fundamental structure of the alternatives was simplified. Three basic alternative approaches were formed around different configurations of Delta conveyance: existing system conveyance, modified through-Delta conveyance, and dual-Delta conveyance. Each approach includes the same set of four programs that are common to all alternatives and involves water use efficiency, water quality, levee system integrity, and ecosystem quality. Storage for each alternative could be evaluated to support these programs and the Delta conveyance, and to seek a balance between attainment of Program objectives and cost effectiveness. Phase I thus identified four essential common Program elements and two variable Program elements, storage and conveyance, that composed the Program alternatives.

1.4.2 Identification of the Preferred Program Alternative

The three basic alternative approaches from Phase I were carried into Phase II. A number of tasks were undertaken during Phase II to further refine the alternatives. Two program elements were added to each alternative because of their value in helping the Program meet its multiple objectives. (Water Transfers evolved as an outgrowth of the Water Use Efficiency Program, and watersheds arose from the Water Quality Program.) Eight Program elements thus were considered during Phase II: six common elements (water use efficiency, water quality, levee system integrity, ecosystem quality, water transfers, and watersheds) and two variable program elements (storage and conveyance).

Seventeen variations of the three basic alternative approaches then were developed to further explore potential refinements for the two variable Program elements, storage and conveyance. These included three variations for Alternative 1, four variations for Alternative 2, and five variations for Alternative 3. Five variations were eliminated from further consideration due to technical and other considerations (see Section 2.4). The narrowing process primarily focused on technical deficiencies and the conveyance options used in each alternative. Additionally, if alternatives provided the same conveyance function with similar impacts, the less expensive alternatives were retained. Alternatives with lower costs but higher adverse impacts were eliminated. The impacts of the 12 remaining variations were evaluated in the March 1998 Draft Programmatic EIS/EIR (State Clearinghouse Number 96032083 and Federal Draft Environmental Statement Number 98-09).

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. On the other hand, some aspects differ among the alternatives. These aspects, or distinguishing characteristics, guided the selection of the Preferred Program Alternative. The 18 distinguishing characteristics are in-Delta water quality, export water quality, diversion effects on fisheries, Delta flow circulation, storage and release of water, water supply opportunities, water transfer opportunities, operational flexibility, south Delta access to water, risk to export water supplies, total cost, assurances difficulty, habitat impacts, land use changes, socioeconomic impacts, consistency with solution principles, ability to phase facilities, and brackish water habitat.

The Preferred Program Alternative process began by examining how each of the 12 alternative variations performed when measured against the 18 distinguishing characteristics. (For additional discussion of the process of developing the Preferred Program Alternative, see the March 1998 Phase II Interim Report.) This assessment revealed the comparative technical advantages of each alternative.

In the assessment, 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.

Some of the 12 variations were eliminated or consolidated (see Section 2.4). Technical reasons for elimination included possible creation of conditions potentially damaging to the aquatic environment and the lack of a south Delta conveyance improvements component.

The 4 action alternatives evaluated in this report are very similar to 3 of the 12 action alternative variations evaluated in the March 1998 Draft Programmatic EIS/EIR.

Alternative 1 is similar to Alternative Variation 1C, with and without storage, from the March 1998 Draft Programmatic EIS/EIR, with the addition of the Suisun Marsh levees and potential channel dredging for channel enlargement.

Alternative 2 is similar to Alternative Variation 2B, with and without storage, from the March 1998 Draft Programmatic EIS/EIR, with the same Suisun Marsh levees and potential channel dredging for channel enlargement.

Alternative 3 is similar to Alternative Variation 3E, with and without storage, from the March 1998 Draft Programmatic EIS/EIR, with the same Suisun Marsh levees and potential channel dredging for channel enlargement. Alternative 3 also includes evaluation of an isolated facility, ranging in size from 5,000 to 15,000 cubic feet per second (cfs).

The **Preferred Program Alternative** incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a potential for a diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than under Alternative 2. If, after additional analysis, this new facility is not constructed, the Preferred Program Alternative would be most similar to Alternative 1.

The three basic Program alternatives and the Preferred Program Alternative are described in detail in Chapter 2. Section 2.4 discusses the alternative variations that were not carried forward for further evaluation in the Programmatic EIS/EIR.

1.5 NEXT STEPS

Following the ROD/CERT of the Programmatic EIS/EIR, the CALFED agencies will implement the Program.

1.5.1 Actions That Will Be Taken Based on This Document

It is anticipated that future lead agencies, responsible agencies, and stakeholder local agencies, such as water districts, will rely on the Programmatic EIS/EIR as they consider subsequent actions. As appropriate, subsequent actions will be subject to alternative analysis, environmental review, and permitting decisions before they are implemented.

The Multi-Species Conservation Strategy (MSCS) is a part of the Program. The environmental consequences of implementing the MSCS are described in the Programmatic EIS/EIR, in conjunction with the analysis of the Program as a whole. At a programmatic level, the environmental effects of implementing the conservation measures in the MSCS are within the parameters of the environmental effects described in the Programmatic EIS/EIR for implementing the various Program elements and the associated mitigation strategies. Additional environmental review of individual Program actions will tier from the Programmatic EIS/EIR and provide further detail about the environmental effects of implementing MSCS conservation measures.

Program EIS/EIR

This environmental document is a Program EIS/EIR that is intended to allow the co-lead agencies and responsible agencies to make an informed decision on approving and adopting the Preferred Program Alternative. The purpose of a Program EIS/EIR is to identify and assess the environmental impacts of a series of actions that comprise an overall program, such as the CALFED Long-Term Program Plan. As described in the State CEQA Guidelines Section 15168, a Program EIR:

> May be prepared on a series of actions that can be characterized as one large project and are related either: (1) geographically; (2) as logical parts in the chain of contemplated actions; (3) in connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or (4) as individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects which can be mitigated in similar ways.

California's Safe, Clean, Reliable Water Supply Act calls for the Programmatic EIS/EIR to include a schedule for implementing the long-term comprehensive plan. The schedule is presented in the Implementation Plan.

1.6 Relationship with Other Ongoing Programs

Due to the extent of the Program study area, many activities and studies are currently on-going or planned for the near future that could be affected by Program actions. Related studies and projects that have been conducted recently or are currently being completed are summarized in the following discussion. Not all of these actions are directly or indirectly related to the Program. Where appropriate, however, the effects of these actions are included in this Programmatic EIS/EIR. This listing should give the reader a general understanding of ongoing water resource issues in the State of California.

Water Rights Process for CVP and SWP (State Water Resources Control Board). As a followup to adopting the 1995 Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta Estuary (WQCP), the State Water Resources Control Board (SWRCB) is evaluating alternatives for implementing that plan. This process may increase the amount of water provided by other water rights holders to meet Bay-Delta water

quality standards. Consequently, operations of upstream projects may change. Because the outcome is not complete, a conservative assumption was used in modeling for the EIR prepared by the SWRCB for the project. It was assumed that the Bay-Delta Accord criteria would be the long-term plan for the Delta. If in-stream flows provided by the other water rights holders increases, some portion of the Ecosystem Restoration Program environmental flows could be satisfied by this water rights process, which may reduce the amount of water that the Program needs to acquire from willing sellers. Likewise, the CVP and SWP also may gain water if more of the responsibility for meeting the WQCP flows are allocated to water rights holders. The process also may reduce the amount of water that the Program needs to develop or may allow for the developed water to be used more effectively in meeting Program objectives. Any additional demand on water rights holders, beyond existing requirements, could decrease the amount of water available for transfer. The final results of the SWRCB process will need to be incorporated into the various components of the CALFED Bay-Delta system.

Central Valley Project Improvement Act (U.S. Bureau of Reclamation). On October 30, 1992, the President signed into law the Reclamation Projects Authorization and Adjustment Act of 1992 (Public Law 102-575) that included Title XXXIV, the Central Valley Project Improvement Act (CVPIA). The CVPIA amends previous authorizations of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses, and fish and wildlife enhancement as a project purpose equal to power generation. The impacts associated with the CVPIA have been analyzed in a Draft Programmatic EIS that was released in November 1997. The Final EIS was released in October 1999. The Program seeks to improve overall system reliability. The Program's objective of improving water reliability may help to offset any agricultural water impacts due to dedication of the 800 TAF to fish, wildlife, and habitat restoration purposes authorized under the CVPIA.

Place of Use EIR for CVP Water Supplies (U.S. Bureau of Reclamation/SWRCB). Some areas adjacent to the existing CVP service area have been served with CVP water. This process considered the impacts of expanding the SWRCB designated place of use for CVP water to include these areas. The SWRCB and U.S. Bureau of Reclamation (Reclamation) completed an EIR in November 1999 as part of the approval process. The modeling for this programmatic EIS/EIR assumes that the process will be completed by 2020, to include lands currently receiving CVP water. If it is not completed and approved, water would need to be used within the existing CVP service area. This may marginally increase the reliability of CVP deliveries and thereby marginally increase the overall reliability of the Program. The SWRCB reached a decision (D-1641) regarding expansion of the CVP place of use, finding that CVP water may be delivered to those lands that historically have received CVP water. Lands that historically have not received CVP water may be included in the CVP place of use only on a case-by-case basis, subject to appropriate CEQA documentation and SWRCB approval.

Trinity River Studies (U.S. Fish and Wildlife Service). In October 1984, the U.S. Fish and Wildlife Service (USFWS) began a 12-year study to describe the effectiveness of increased flows and other habitat restoration activities to restore fishery populations in the Trinity River. An EIS/EIR is being prepared under a concurrent program to evaluate alternatives to restore and maintain natural production of anadromous fish in the Trinity River mainstem downstream of Lewiston Dam. Historically, an average annual quantity of approximately 1.3 million acre feet (MAF) of water has been diverted from the Trinity River to the Sacramento River system (1964-1992). While the Trinity River is outside the Program study area, a change in the Trinity River flow requirements and a corresponding change in the amount of water diverted to the Sacramento River system will affect future flows to the Delta. Changes also could affect overall water supply reliability and carryover storage in Shasta Reservoir, and water quality and

temperature in the Sacramento River. A range of possible future Trinity River flow requirements has been considered in this programmatic evaluation (see Attachment A for additional detail).

Bulletin 160-98, California Water Plan Update (DWR). Bulletin 160, updated every 5 years by DWR, contains estimates of future water demands in the state. Modeling for the Programmatic EIS/EIR considers a range of possible future demands for the No Action Alternative and the Program alternatives. The high end of this range is bound by the most recent demand estimates prepared for Bulletin 160-98 for 2020. The low end of the range is bounded by the 1995 water-year demands.

Sacramento and San Joaquin River Basins Comprehensive Study (U.S. Army Corps of Engineers). In January 1997, California experienced one of the most costly and geographically extensive flood disasters in the history of the state. Major storms throughout California caused record flows on many rivers. In the Central Valley, storms stressed the flood management systems for the Sacramento and San Joaquin Rivers to their capacity and beyond. Although reservoir flood storage reduced flood flows by 50% or more, saving lives and significantly reducing property damage, levees failed in some areas. Two major levee breaks occurred on the Sacramento River and its tributaries. Many levees that did not fail were severely damaged and required extensive repairs. On the San Joaquin River, levees failed in more than two dozen places. Damages in both systems exceeded $0.5 billion.

In response to extensive flooding and damages in 1997, the U.S. Congress authorized the U.S. Army Corps of Engineers (Corps) to provide a comprehensive analysis of the Sacramento River and San Joaquin River basin flood management systems, and to partner with the State of California to develop master plans for flood management into the next century. The Corps and the California Reclamation Board are leading a Comprehensive Study to improve flood management by combining traditional flood damage reductions measures with nontraditional measures that include floodplain management concepts. The Comprehensive Study is examining policy issues that affect flood management and is seeking opportunities to integrate environmental restoration with flood damage reduction measures.

The Comprehensive Study will develop and begin to implement master plans within a watershed framework that will increase flood protection and improve the ecosystem or major rivers and tributaries in the Central Valley. Because this study is the first system-wide evaluation of the flood management systems in the Central Valley, it represents a change in how projects are identified, selected, and implemented.

The study will contribute directly toward meeting the goals of the Levee System Integrity Program in the Delta. The Comprehensive Study is part of the No Action Alternative.

Long-Term Management Strategy (U.S. Environmental Protection Agency/Corps/SWRCB/Regional Water Quality Control Board/Bay Conservation and Development Commission). Coastal managers have long expressed concern about environmental threats of disposing large volumes of sediments in ecologically sensitive areas. The long-range goals of the Long-Term Management Strategy (LTMS) are to reduce disposal in the estuary and to find beneficial uses for the dredged material. The LTMS already has resulted in designation of a deep ocean disposal site 50 miles offshore of San Francisco that is an ecologically superior alternative to disposal in the estuary itself. Since use of the ocean disposal site began in late 1995, over 4 million cubic yards of dredged material have been diverted from disposal in the Bay, and overall Bay disposal has dropped from historical averages of about 6 million cubic yards annually, to approximately 2.5 million cubic yards.

However, this is the short-term approach until beneficial use projects can be initiated. Dredged material can be reused in a variety of ways, including levee maintenance and stabilization, and restoration of habitat such as tidal wetlands. Using clean sediments from dredging projects, the LTMS agencies have participated in pilot levee maintenance projects and have constructed the Sonoma Baylands wetland restoration project. LTMS is now considering other projects and other ways of beneficially reusing dredged material. A specific policy of the LTMS is to pursue habitat restoration projects that are consistent with habitat goals and plans worked out in other venues, including the Program. Of particular interest are the cost-sharing opportunities of working with the Corps and other dredgers who must pay for the dredging in any event. These parties can provide the clean material to restoration projects much more efficiently than the restoration project could acquire the material.

Program and LTMS agencies will coordinate during Program implementation on potential joint levee construction and habitat restoration projects.

Vernalis Adaptive Management Plan (Reclamation/USFWS). The May 1995 WQCP contained water quality and flow objectives pertaining to the San Joaquin River basin. The member agencies of the San Joaquin River Group Authority release water to meet the required Vernalis Adaptive Management Plan (VAMP) flow. The member agencies that are making water available under their water rights have filed change petitions with the SWRCB pursuant to water code Sections 1707 and 1735 to change the place of use and purpose of use of their water rights in order to protect their water as it makes its way to Vernalis. The SWRCB held hearings on the change petitions as part of its Bay-Delta Water Rights hearing. In an effort to refine the science for the flow objective, the San Joaquin River interests collaborated to identify feasible actions that would protect the river's fish resources and implement the SWRCB's flow objectives. This collaboration led to the proposed scientifically based adaptive fishery management plan known as the VAMP. The VAMP will provide protective measures for fall-run chinook salmon and will gather scientific information on survival of salmon smolts through the Delta. The VAMP will be implemented through experimental flows on the San Joaquin River and export pumping rates with a temporary fish barrier on Old River during the 1-month period each year, from approximately April 15 to May 15. Additional attraction flows are targeted for October.

The VAMP includes proposed water acquisition in the form of a pulse flow at Vernalis during the April and May period, and other flows identified to meet anadromous fish flow objectives. VAMP flows should have beneficial effects for Delta smelt. Water will be acquired from willing sellers by Reclamation on the San Joaquin River and its tributaries.

The San Joaquin River Group Authority, Reclamation, and the USFWS adopted a final EIS/EIR for the San Joaquin River Agreement (SJRA). Reclamation issued an ROD. The EIS/EIR for the SJRA realized that because of the infinite combinations of hydrology and the uncertainty of the source of additional water, long-term environmental analysis could not be completed for the additional water. The acquisition of additional water will take place on an as-needed basis. In March 1999 and again in March 2000, environmental assessments were released for additional water acquisition for meeting VAMP flow objectives. The March 2000 Environmental Assessment/Initial Study was rescinded as there was no need to proceed with the action. The VAMP will directly contribute to meeting the restoration goals of the Ecosystem Restoration Program.

Category III. The Bay-Delta Accord included a commitment to develop and fund nonflow-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 CALFED's Restoration Coordination Program, which receives input from the Ecosystem Roundtable, the 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. These actions are consistent with any alternative configuration and provide early implementation benefits. This implementation also provides valuable information that can be used to adaptively manage the system. Actions funded through the Restoration Coordination Program must have appropriate environmental documentation, be justified independently of the Program, and must not prejudice the ultimate decision on the Program. As the CALFED long-term Program nears completion, the priorities and project selection process have been revised to ensure consistency with the Strategic Plan for Ecosystem Restoration (Strategic Plan), the Ecosystem Restoration Program objectives, and priority actions to pursue in Stage 1.

By June 1999, the Restoration Coordination Program had received more than 800 proposals and had funded 195 projects, for a total of approximately $228 million. Types of projects funded include fish screens, fish ladders, land acquisition, habitat restoration, and focused research and monitoring that were designed to provide information to improve future restoration efforts. 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 Ecosystem Restoration Program and the Strategic Plan.

Other Actions

California 4.4 Plan (Colorado River Board). The rights of seven states (including California) and Mexico to use Colorado River water is governed by a series of agreements, treaties, laws, and court decisions—collectively referred to as the "Law of the River." California is entitled to 4.4 MAF of water in a normal year. Agriculture has a right to 3.8 MAF out of the 4.4 MAF, or nearly 90% of California's normal-year entitlement. The balance goes to The Metropolitan Water District of Southern California (MWD), which operates the Colorado River Aqueduct to deliver water to urban users.

Historically, California has used more water than its normal-year entitlement. California's additional use has been made possible through its ability to use water not used by Arizona and Nevada, and recently "surplus" water. In 1997, the Colorado River provided about 5.2 MAF of the 8.4 MAF of water used for agriculture and urban uses in southern California. The Secretary of the Interior has directed California to devise a plan to live within its 4.4-MAF entitlement during years in which surplus water is not available and when Arizona and Nevada are using their full apportionment. Both Arizona and Nevada are approaching full use of their respective normal-year apportionment. The Secretary of Interior has made water available pursuant to surplus declarations since 1996.

The Secretary of the Interior has advised California that, absent a plan on how the state can live within its entitlement, the Secretary will be less likely in the future to make water available to California above

that normal-year entitlement. If California has an acceptable plan for living within its entitlement, the Secretary could make additional water available to the state through water surplus declarations.

The Colorado River Board, with assistance from the Director of DWR, is responsible for developing the California plan. The Board's latest draft plan, entitled "California's Colorado River Water Use Plan" (dated May 11, 2000), includes the following major components—all of which are focused on changes in the use, supply, or transfer of Colorado River water. The plan relies on a variety of firm and nonfirm conservation and transfer programs, conjunctive use programs, and water banking. These measures include inter-state storage agreements and revising the river's reservoir operations as provided for in the plan. Adoption of these measures likely would require approvals or other actions by the Secretary of the Interior.

If California were to live within its 4.4-MAF normal-year entitlement today, the immediate impact would fall mostly on MWD because almost all of the allocation to California above its normal-year entitlement now goes to urban users serviced by MWD. The Program has assumed that the plan will not lead to additional demand on Delta water because Delta demands are limited by existing SWP contracts.

Imperial Irrigation District and San Diego County Water Authority Water Transfer. Depending on local conditions, San Diego County obtains from 75 to 95% of its water from MWD, which imports water from the Colorado River and northern California. The San Diego County Water Authority (SDCWA) has negotiated an agreement for the long-term transfer of conserved water from the Imperial Irrigation District (IID) to the San Diego region. Under the negotiated contract, IID and its agricultural customers would conserve water and sell it to the SDCWA for at least 45 years. Either agency may extend the contract for another 30 years beyond the initial term. Deliveries in the first year of the contract would total 20 TAF and increase annually in 20-TAF increments until they reach a maximum of 200 TAF. The two agencies may agree to transfer an additional 100 TAF per year after year 10.

This agreement could play a significant role in helping the Colorado River Board develop a plan that allows California to live within its 4.4-MAF normal-year water entitlement from the Colorado River. The Program has assumed that this agreement will not change demand for Bay-Delta water because Bay-Delta demands are limited by the existing SWP contracts.

Chapter 2. Alternative Descriptions

This chapter describes the alternatives considered in this Final Programmatic EIS/EIR. The four Program alternatives represent approaches to meeting the CALFED Bay-Delta Program objectives.

2.1 PROGRAM ALTERNATIVES 2-1
2.2 NO ACTION ALTERNATIVE 2-18
2.3 ENVIRONMENTALLY PREFERABLE ALTERNATIVE 2-19
2.4 ALTERNATIVES NOT CARRIED FORWARD FOR FURTHER EVALUATION 2-22

2. Alternative Descriptions

This section describes the alternatives considered in this document. The CALFED Bay-Delta Program (Program) alternatives are discussed first, beginning with a brief summary of the alternatives that focuses on their differences, followed by an overview of each of the Program alternative elements. The No Action Alternative is then described. Next, the Environmentally Preferred Alternative is described. Finally, the other alternatives that were considered but not carried forward are noted, along with the rationale for eliminating them from further consideration.

The Preferred Program Alternative identified in this chapter consists of a set of broadly described programmatic actions that set the long-term, overall direction of the Program. However, detail at a greater level of specificity than is available in the programmatic description of the Preferred Program Alternative is important in understanding how this large, complex program may be implemented, funded, and governed in the future. Accordingly, the CALFED agencies have described their proposed actions for the first years following the ROD/CERT of the Programmatic EIS/EIR, as well as set out a long-term implementation strategy.

CALFED will annually review the status of implementation of all actions, the progress toward achievement of all goals and objectives, and compliance with Program schedules and financing agreements pertaining to the CALFED Program. In all Program areas, funds for implementation of the Program will continue to be available only if implementation of all actions, progress toward achievement of all goals and objectives, and compliance with schedules and financing agreements are occurring in a balanced manner. In the event that either the Governor or the Secretary of the Interior determines that the Program has not substantially adhered to this balanced implementation, then the Governor and the Secretary will develop and approve a revised program schedule and budget to achieve balanced implementation.

2.1 PROGRAM ALTERNATIVES

2.1.1 SUMMARY

The four Program alternatives represent differing approaches to conveying water through the Delta. Each of the alternatives includes the Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, Water Transfer, Watershed, Storage, and Conveyance elements. Four general categories of critical problems facing the Bay-Delta are defined—ecosystem quality, water quality, water supply

reliability, and levee system vulnerability. To practicably achieve the Program purpose of restoring ecological health and improving water management for beneficial uses of the Bay-Delta system, the CALFED alternatives will concurrently address problems within these four critical resource categories. Accordingly, a solution to problems in one resource category cannot be pursued without addressing problems in the other resource categories. Each Program alternative includes an assessment with additional storage up to 6 million acre-feet (MAF) and without additional storage.

Alternative 1 relies primarily on the current configuration of the Delta channels. One significant variation includes selected channel improvements in the south Delta, together with streamflow and stage barriers (or their equivalent) at selected locations. (See Figure 2-1.)

Alternative 2 adds improvements to north Delta channels that accompany the south Delta improvements contemplated in Alternative 1. The features include a 10,000-cubic foot per second (cfs) diversion facility on the Sacramento River near Hood. (See Figure 2-2.)

Alternative 3 adds a canal connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta, in addition to the north and south Delta facilities contemplated in Alternatives 1 and 2. (See Figure 2-3.)

Program Alternatives

Alternative 1 relies primarily on the current configuration of the Delta channels.

Alternative 2 adds improvements to north Delta channels that accompany the south Delta improvements contemplated in Alternative 1.

Alternative 3 adds a canal connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta.

The **Preferred Program Alternative** includes a screened facility on the Sacramento River and other north Delta improvements, if these features are determined necessary to meet drinking water quality goals and can be operated without adversely affecting fish populations.

The Preferred Program Alternative incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a new diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than Alternative 2. If after additional analysis this diversion facility and channel are not constructed, the Preferred Program Alternative would be most similar to Alternative 1. (See Figure 2-4.)

2.1.2 Overview of the Eight Program Elements

The descriptions of the alternatives are programmatic, defining broad approaches to meet Program purposes. The alternatives are not intended to define the site-specific actions that ultimately will be implemented in Phase III of the Program. A more complete description of the programmatic actions that may be implemented can be found in the Phase II Report and Implementation Plan.

Figure 2-1

General Features of Alternative 1 with a Focus on Delta Facilities

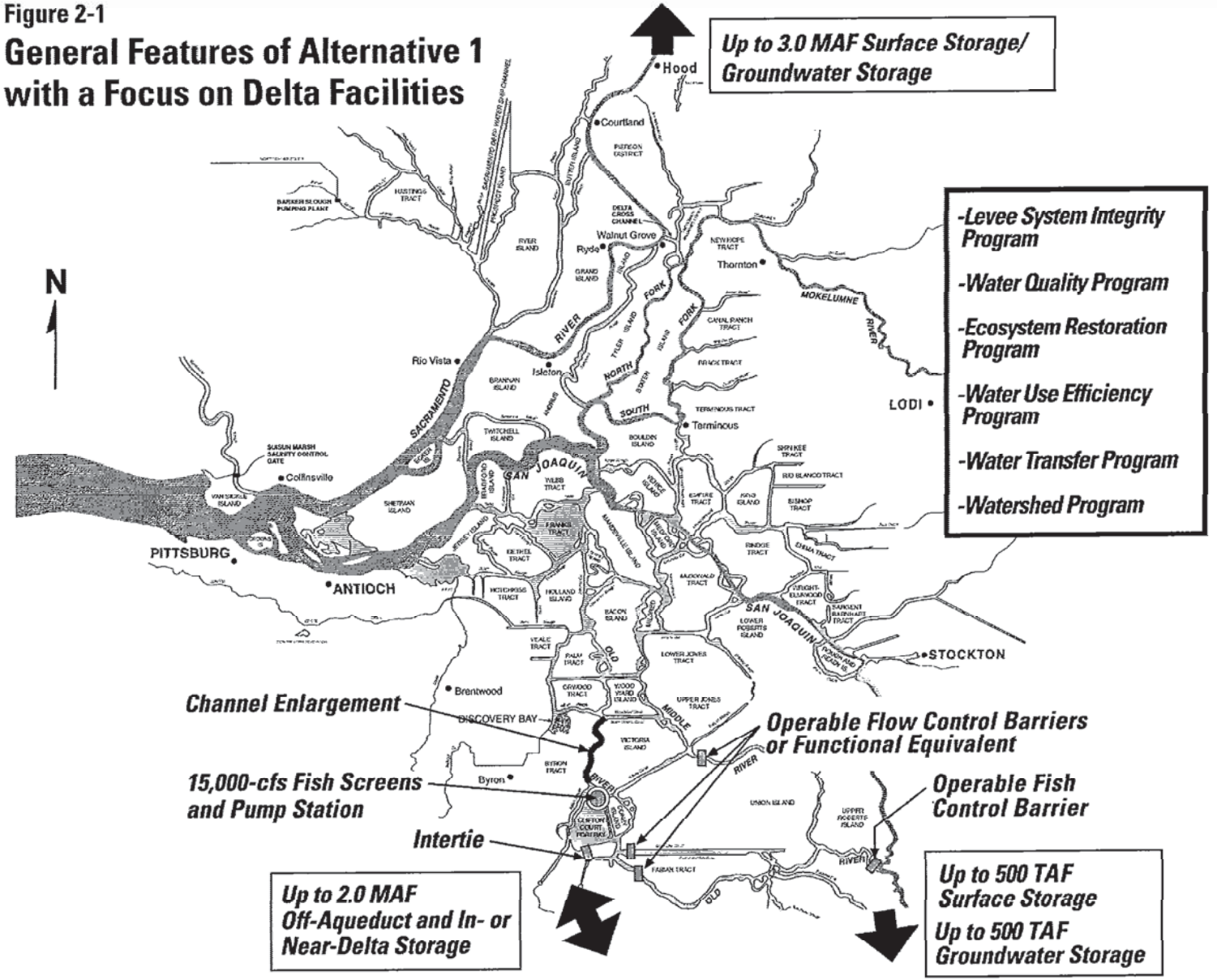


Figure 2-2

General Features of Alternative 2 with a Focus on Delta Facilities

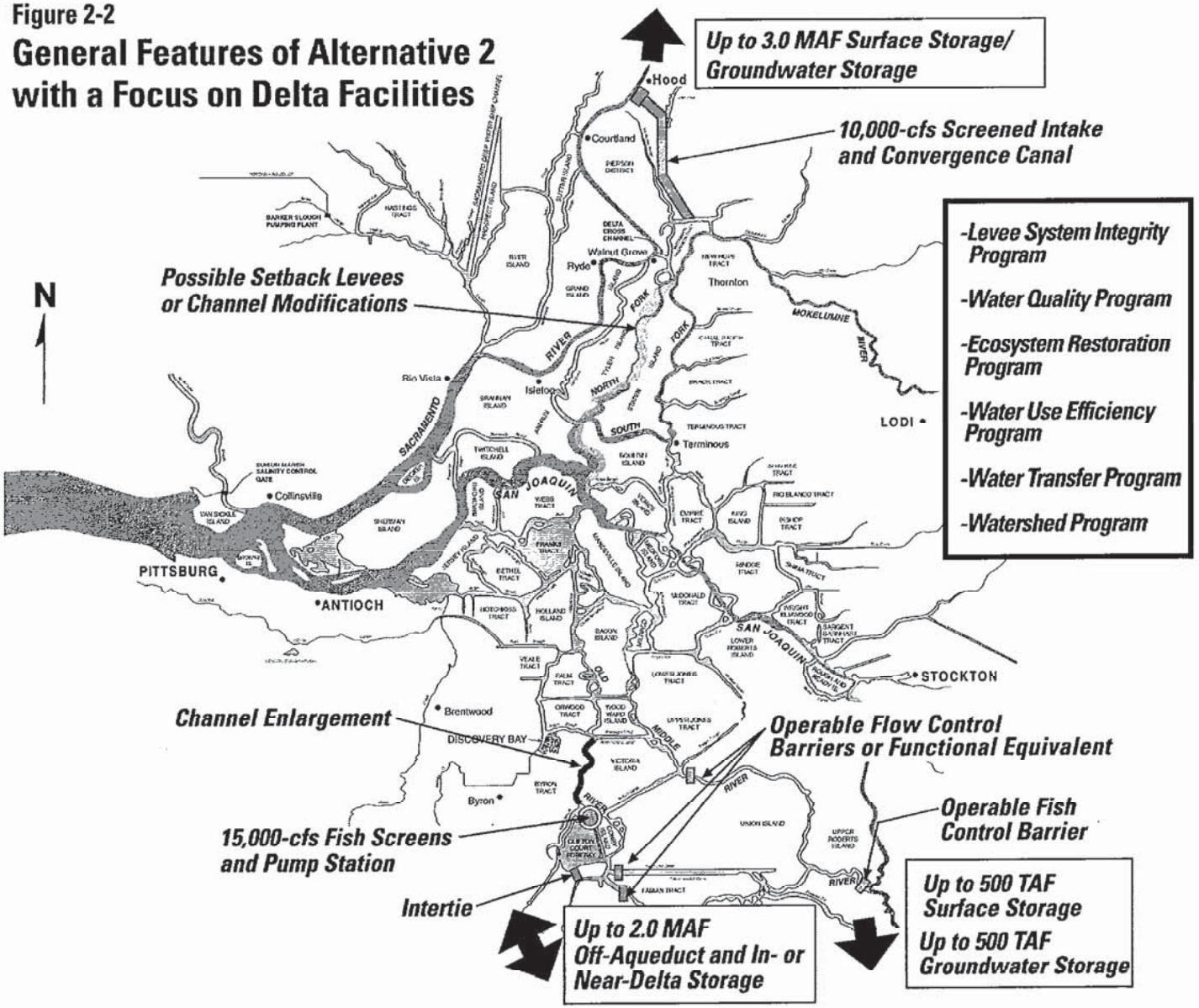


Figure 2-3

General Features of Alternative 3 with a Focus on Delta Facilities

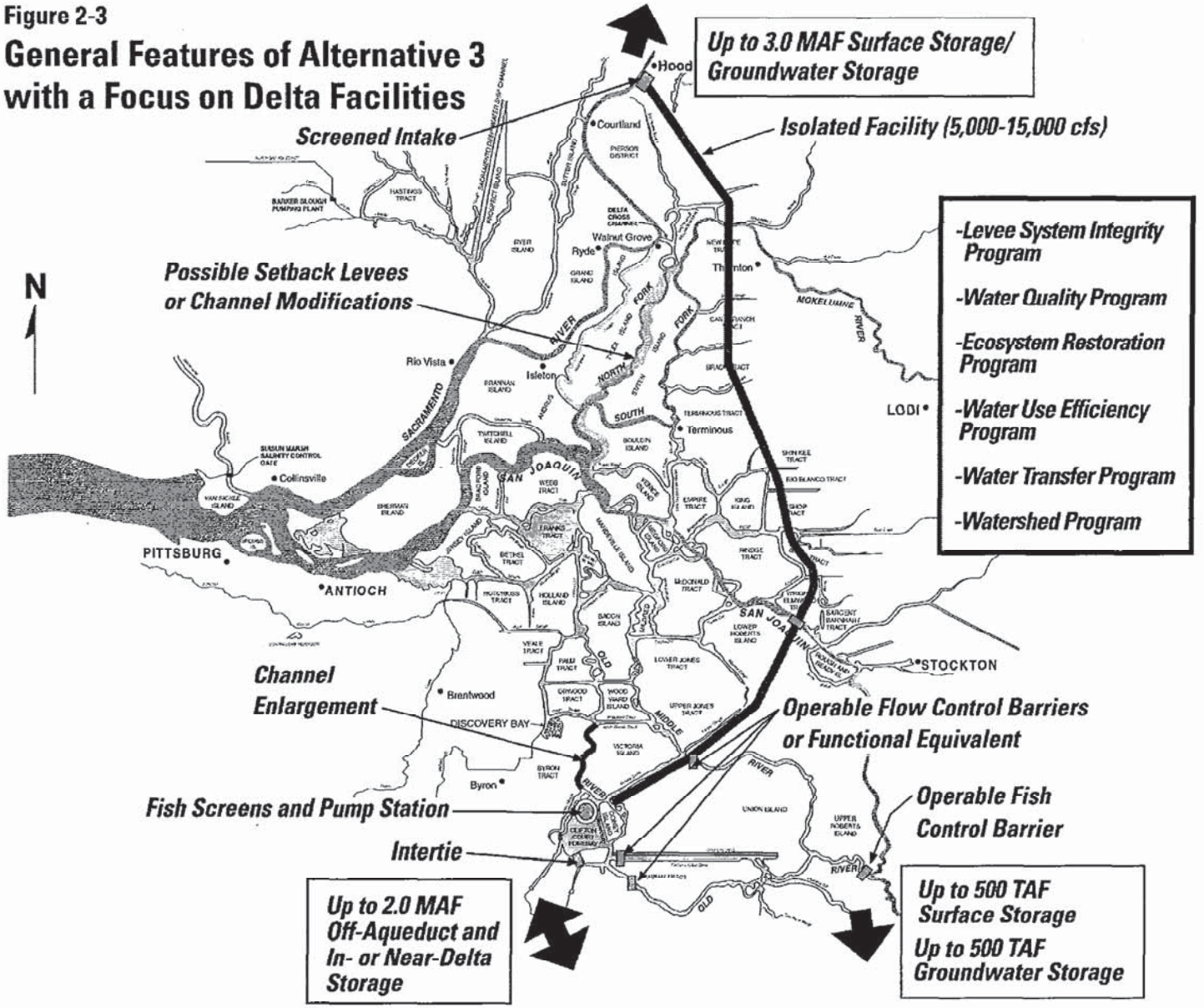
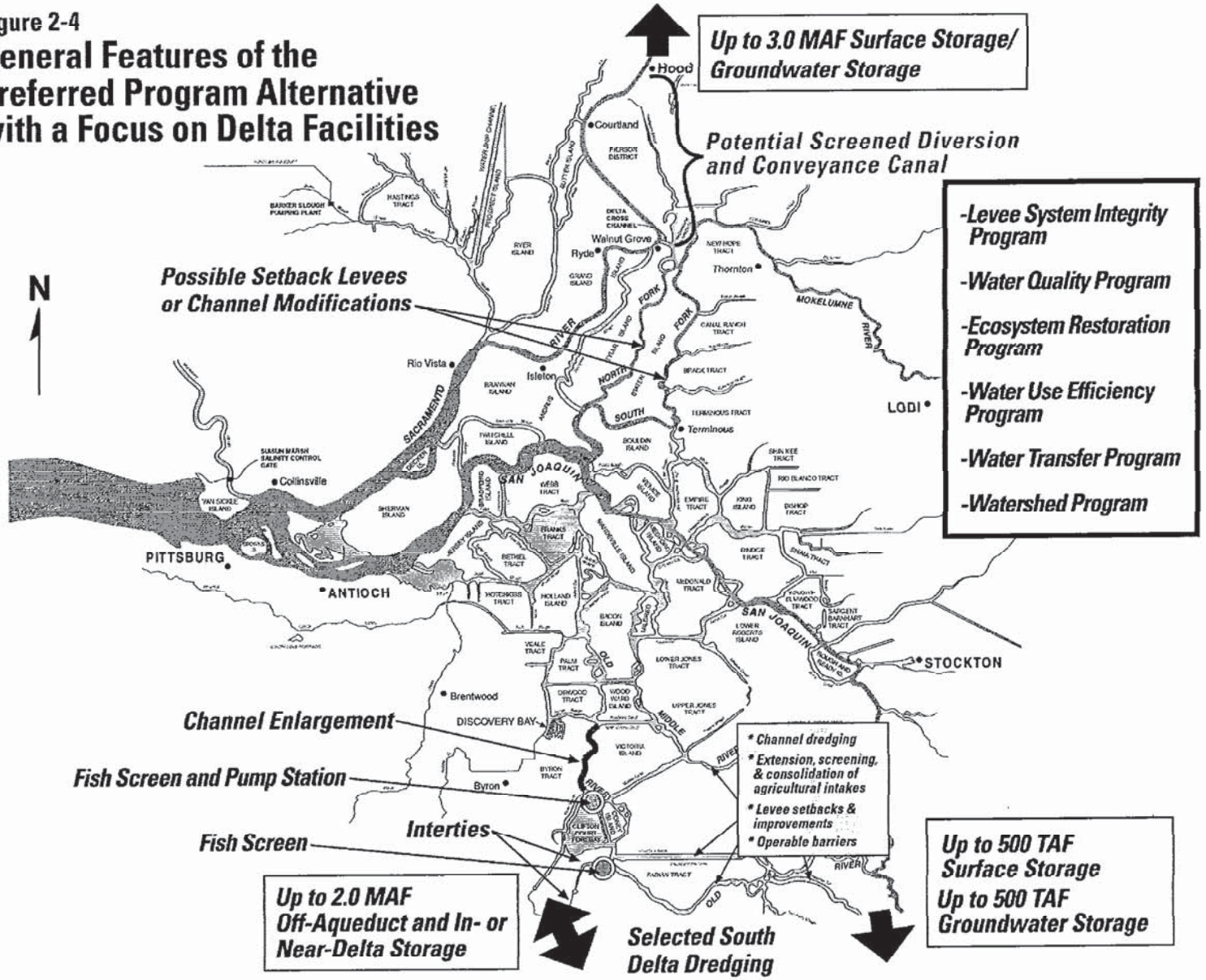


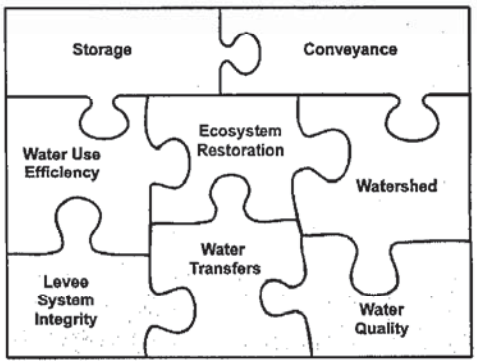
Figure 2-4

General Features of the Preferred Program Alternative with a Focus on Delta Facilities



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 (MSCS). 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 Ecosystem Restoration Program's Strategic Plan for Ecosystem Restoration (Strategic Plan). Nearly 100 restoration objectives have been developed that 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. 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 (CMARP).

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 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.

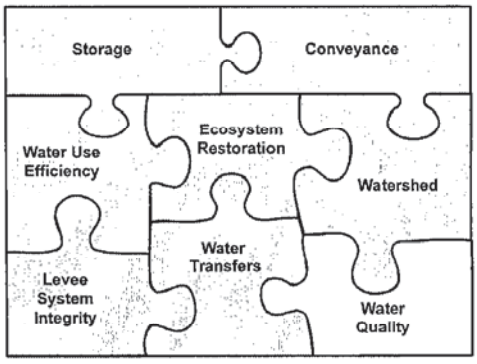
- Modifying or eliminating fish passage barriers, including removing dams, constructing fish ladders, and constructing fish screens that use the best available technology.

- Targeting research to provide information that is needed to define problems sufficiently and to design and prioritize restoration actions.

For more information, see the Ecosystem Restoration Program Plan and the Phase II Report.

Water Quality Program

The Program is committed to achieving continuous improvement in the quality of the waters of the Bay-Delta system—with the goals of minimizing ecological, drinking water, and other water quality problems and of 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.** Reducing the loads and impacts of bromide, total organic carbon (TOC), pathogens, nutrients, salinity, and turbidity through a combination of measures—including source reduction, alternative sources of water, treatment, storage, and, if necessary, conveyance improvements such as a screened diversion facility (up to 4,000 cfs) on the Sacramento River. The Conveyance section of this chapter discusses this potential improvement.

- **Pesticides.** Reducing the impacts of pesticides through (1) development and implementation of best management practices (BMPs) for both urban and agricultural uses; and (2) support of pesticide studies for regulatory agencies, while providing education about and assistance with implementation of control strategies for the regulated pesticide users.

- **Organochlorine pesticides.** Reducing the load of organochlorine pesticides in the system by reducing runoff and erosion from agricultural lands through BMPs.

- **Trace metals.** Reducing the impacts of trace metals, such as copper, cadmium, and zinc, in upper watershed areas near abandoned mine sites. Reducing the impacts of copper through urban stormwater programs and agricultural BMPs.

- **Mercury.** Reducing mercury levels in rivers and the estuary by source control at inactive and abandoned mine sites.

- **Selenium.** Reducing selenium impacts through reduction of loads at their sources, and appropriate land fallowing and land retirement programs.

- **Salinity.** Reducing salt sources in urban and industrial wastewater to protect drinking and agricultural water supplies; facilitating development of successful water recycling, source water blending, and groundwater storage programs. Salinity in the Delta would be controlled by limiting salt loadings from its tributaries through managing sea-water intrusion by such means as: (1) using storage capability to maintain Delta outflow and to adjust the timing of outflow, (2) managing exports, and (3) making modifications to the Delta and Bay.

- **Turbidity and sedimentation.** Reducing the turbidity and sedimentation that adversely affect several areas in the Bay-Delta and its tributaries.

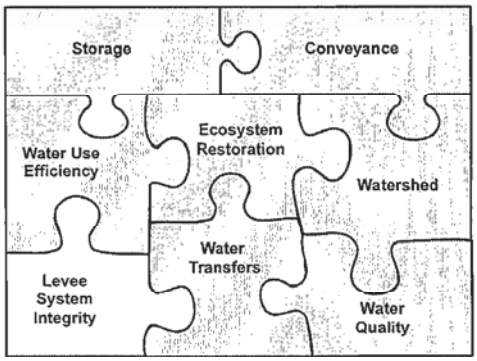
- **Low dissolved oxygen.** Reducing the impairment of rivers and the estuary from substances that exert excessive demand on dissolved oxygen.

- **Toxicity of unknown origin.** Through research and monitoring, identifying parameters of concern in the water and sediment, and implementing actions to reduce their impacts on aquatic resources.

For more information, see the Water Quality Program Plan and the Phase II Report.

Levee System Integrity Program

The Levee System Integrity Program focuses on improving 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 would indirectly improve water supply reliability. Levee actions also would protect water quality, particularly during low-flow conditions when a catastrophic levee breach would draw salty water into the Delta.



The Levee System Integrity Program consists of five main components plus the Suisun Marsh levee rehabilitation work:

- **Delta Levee Base Level Protection Plan.** Improving and maintaining Delta levee system stability to meet the Corps' Public Law (PL) 84-99 standard.

- **Delta Levee Special Improvement Projects.** Enhancing flood protection for key islands that provide statewide benefits to the ecosystem, water supply, water quality, economy, and infrastructure.

- **Delta Levee Subsidence Control Plan.** Implementing current BMPs to correct subsidence adjacent to levees and coordinating research to quantify the effects and extent of inner-island subsidence.

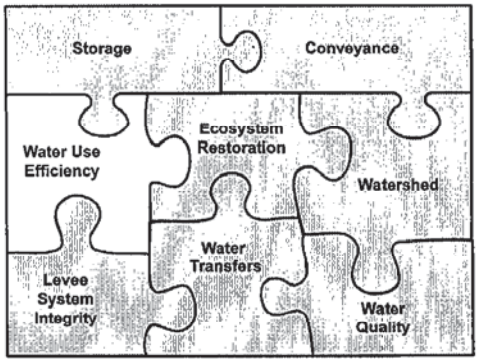
- **Delta Levee Emergency Management and Response Plan.** Implementing actions that will build on existing state, federal, and local agency emergency management programs.

- **Delta Levee Risk Assessment.** Performing a risk assessment to quantify the major risks to Delta resources from floods, seepage, subsidence, and earthquakes; evaluating the consequences; and developing recommendations to manage the risk.

- **Suisun Marsh levees.** Rehabilitating Suisun Marsh levees.

For more information, see the Levee System Integrity Program Plan and the Phase II Report.

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 also can 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 MAF annually by 2020 as a result of Program actions. Before execution of the ROD/CERT, the Program will identify measurable goals and objectives for its urban and agricultural water conservation programs, water reclamation programs, and managed wetlands programs.

Actions related to water conservation include:

- Implementing agricultural and urban conservation incentives programs to provide grant funding for water management projects that will provide multiple benefits and are cost effective at the statewide level, including improved water quality and reduced ecosystem impacts.

- Identifying, in region-specific strategic plans for agricultural areas, measurable objectives to ensure that water management is improved.

- Expanding state and federal programs to provide increased levels of planning and technical assistance to local water suppliers.

- Working 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.

- Working 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.

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

- Identifying and implementing practices to improve water management for wildlife areas.

- Gathering better information on water use, identifying opportunities to improve water use efficiency, and measuring the effectiveness of conservation practices.

- Conducting directed studies and research to improve understanding of conservation actions.

Actions related to water recycling include:

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

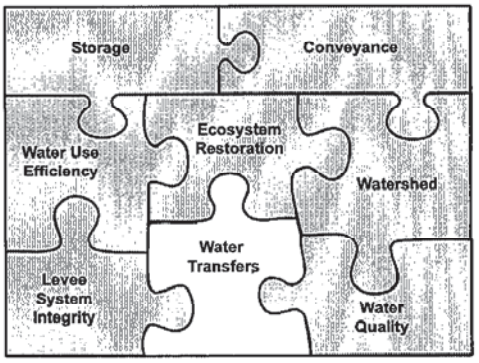
- Expanding state and federal recycling programs to provide increased levels of planning, technical, and financial assistance (both loans and grants) and to develop new ways of providing assistance in the most effective manner.

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

For more information, see the Water Use Efficiency Program Plan and the Phase II Report.

Water Transfer Program

The Water Transfer Program proposes a frame-work of actions, policies, and processes that, collectively, will facilitate water transfers and the further development of a statewide 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 also can help to match water demand with water sources of the appropriate quality, thus increasing the utility of water supplies.



The Water Transfer Program includes the following actions and recommendations:

- Establishing a California Water Transfer Information Clearinghouse to provide a public informational role. The clearinghouse would (1) ensure that information regarding proposed transfers is publicly disclosed, and (2) perform ongoing research and data collection functions to improve the understanding of water transfers and their potential beneficial and adverse effects.

- Requiring water transfer proposals submitted to DWR, Reclamation, or the SWRCB to include analysis of potential groundwater, socioeconomic, or cumulative impacts as warranted by individual transfers.

- Streamlining the water transfer approval process currently used by DWR, Reclamation, and the SWRCB. This action includes 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.

- Refining quantification guidelines used by agencies when they review proposed water transfers for approval. This action includes resolving issues between stakeholders and approving agencies regarding the application of current agency-based quantification criteria.

- Improving the accessibility of state and federal conveyance and storage facilities for the transport of approved water transfers.

- Clearly defining carriage water requirements and resolve conflicts over reservoir refill criteria so that transfer proponents are informed of the implications of these requirements.

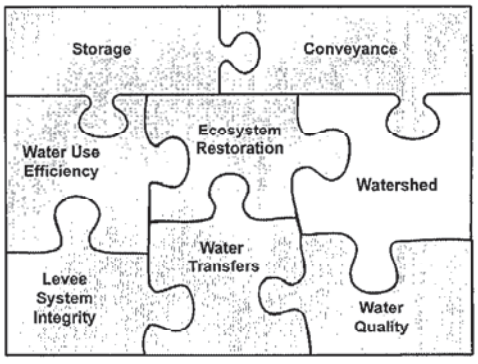
- Identifying appropriate assistance for groundwater protection programs through interaction with CALFED agencies, stakeholders, the State Legislature, and local agencies. This action is intended to assist local agencies in the development and implementation of groundwater management programs that will protect groundwater basins in water transfer source areas.

- Establishing accounting, tracking, and monitoring methods to aid in-stream flow transfers under California Water Code Section 1707.

For more information, see the Water Transfer Program Plan and the Phase II Report.

Watershed Program

The Watershed Program provides financial and technical assistance 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. These actions also help to maintain levee integrity during high-flow periods. Other watershed actions will improve water quality by reducing the discharge of parameters of concern.



The Watershed Program includes the following elements:

- Supporting local watershed activities. Implementing watershed restoration, maintenance, and conservation activities that support the goals and objectives of the Program, including improved river functions.

- Facilitating coordination and assistance. Facilitating and improving coordination and assistance between government agencies, other organizations, and local watershed groups.

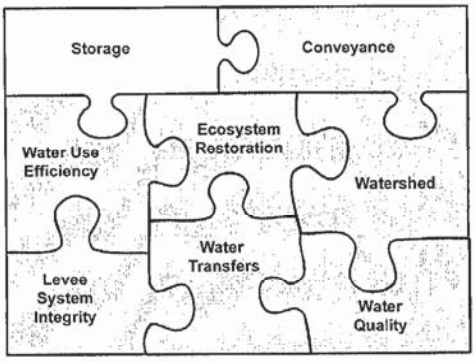
- Developing watershed monitoring and assessment protocols. Facilitating monitoring efforts that are consistent with Program protocols and support watershed activities that ensure that adaptive management processes can be applied.

- Supporting education and outreach. Supporting resource conservation education at the local watershed level, and providing organizational and administrative support to watershed programs.

- Defining watershed processes and relationships. Identifying the watershed functions and processes that are relevant to Program goals and objectives, and providing examples of watershed activities that could improve these functions and processes.

More detailed information is provided in the Watershed Program Plan and the Phase II Report.

Storage



Groundwater and 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.

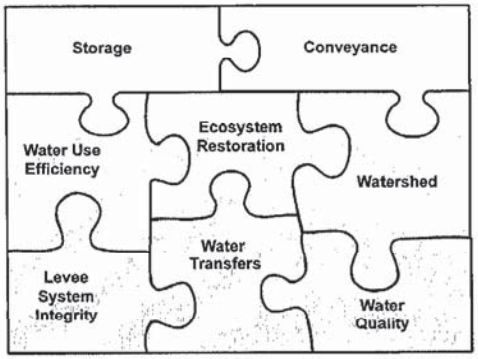
Decisions to construct groundwater or surface water storage will be predicated on compliance with all environmental review and permitting requirements, and maintaining balanced implementation of all Program elements. CALFED will undertake an annual review (see the third paragraph on page 2-1 of this document for more information about this review) to assess progress toward balanced implementation of the Program.

Subject to these conditions, new groundwater and surface water storage will be developed and constructed, together with aggressive implementation of water conservation, recycling, an improved water transfer market, and habitat restoration, as appropriate to meet CALFED Program goals. During Stage 1, through the Water Management Strategy (including the Integrated Storage Investigation) CALFED will continue to evaluate surface water and groundwater storage; identify acceptable site-specific projects; and initiate permitting, NEPA and CEQA documentation, and construction—if all conditions are satisfied.

The total volume of new or expanded surface water and groundwater storage evaluated by CALFED ranges up to 6 MAF. This document discusses the consequences of operating and constructing representative surface and groundwater storage reservoirs and related facilities in the Sacramento River Region, San Joaquin River Region, and Delta Region. Operating assumptions for reservoirs in the Sacramento River and San Joaquin River Regions are discussed in Attachment A. The impacts associated with potential operation of reservoirs in these regions were quantitatively assessed through modeling. In-Delta storage operations are not included in the modeling described in Attachment A due to the limitations of system operation modeling. The impacts associated with operation of in-Delta storage

reservoirs were assessed qualitatively for this Programmatic EIS/EIR and will be analyzed in more detail in subsequent, site-specific environmental documents. Possible related structures that are associated with reservoirs in general include inlets, outlets, siphons, roads, and conveyance and recreational facilities. Possible related structures that are associated with in-Delta storage include inlets from and outlets to Delta channels, siphons between storage islands, conveyance facilities located between storage islands and the state/federal pumps in the south Delta, and recreational facilities. Those surface and groundwater storage projects that appear most feasible are noted in the Phase II Report.

Conveyance



The Preferred Program Alternative employs a through-Delta approach to conveyance. Modifications in conveyance would result in improved water supply reliability, protection of and improvement in Delta water quality, improvements in ecosystem health, and reduced risk of supply disruption due to catastrophic breaching of Delta levees.

The four alternate conveyance approaches are described below.

Conveyance Features of Program Alternatives

Alternative 1 - Existing System Conveyance. Delta channels would be maintained essentially in their existing configuration. Several improvements would be made in the south Delta.

Alternative 2 - Modified Through-Delta Conveyance. Improvements to north Delta channels would accompany the south Delta improvements contemplated under Alternative 1.

Alternative 3 - Dual-Delta Conveyance. The dual-Delta conveyance alternative is formed around a combination of modified Delta channels and a canal or pipeline, connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta.

Preferred Program Alternative - Through-Delta Conveyance. The Preferred Program Alternative incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than Alternative 2. If, after additional analysis, this new facility is not constructed, the Preferred Program Alternative would be most similar to Alternative 1.

Alternative 1 - Existing System Conveyance. Delta channels would be maintained essentially in their existing configuration. Several improvements would be made in the south Delta.

South Delta Improvements. Under Alternative 1, south Delta improvements include:

- Old River would be enlarged in the reach north of Clifton Court Forebay (CCFB) to reduce channel velocities and associated scouring. Both dredging and levee setbacks are being considered to increase conveyance capacity.
- A new 15,000-cfs screened intake with low-lift pumps would be constructed at the head of CCFB.

- A new intertie facility would be constructed to connect the SWP and the CVP facilities.
- An operable fish control barrier would be constructed at the head of Old River.
- Operable flow control barriers would be constructed on Middle River, Grant Line Canal, and Old River or functional equivalents.

Operating Assumptions. Water management criteria play an important role in defining the Program alternatives. The flow, storage, and diversion of water must be simulated to identify differences among the alternatives that result from varying water management criteria. Many assumptions related to project operations and regulatory requirements needed to be made in order to complete the necessary water simulation modeling. The water management criteria for the Program alternatives include ranges of water demands and regulatory requirements. The range of water demands represents uncertainty in the future need for Bay-Delta water supplies due to uncertainty in projections of population, land use, implementation of water use efficiency measures, and the effects of water marketing. The range of regulatory requirements also represents uncertainty related to implementation of the state and federal ESAs and future SWRCB decisions. Due to their length, the operating assumptions for all Program alternatives are included in Attachment A.

Alternative 2 - Modified Through-Delta Conveyance. Significant improvements to north Delta channels would accompany the south Delta improvements contemplated under Alternative 1.

South Delta Improvements. Under Alternative 2, south Delta improvements include:

- As under Alternative 1, Old River would be enlarged in the reach north of CCFB. Also as under Alternative 1, both levee setbacks and dredging are being considered to increase conveyance capacity.
- As under Alternative 1, a new 15,000-cfs capacity screened intake with pumps would be constructed at the head of CCFB.
- As under Alternative 1, a new intertie facility would be constructed to connect the SWP and the CVP facilities.
- As under Alternative 1, operable flow control barriers or their equivalent would be constructed on Middle River, Grant Line Canal, and Old River.

North Delta Improvements. Under Alternative 2, north Delta improvements include:

- A new 10,000-cfs diversion facility from the Sacramento River near Hood to the Mokelumne River. The diversion would include a screened intake and pumping facilities.
- A fish ladder or equivalent would be constructed to convey fish upstream, past the pumps and screens that are associated with the diversion structure, to the Sacramento River.
- The Lower Mokelumne River channel would be widened to improve water conveyance and flood control from Interstate 5 (I-5) to the San Joaquin River.

Operating Assumptions. See Attachment A.

Alternative 3 - Dual-Delta Conveyance. The dual-Delta conveyance alternative includes a combination of modified Delta channels and a new canal or pipeline, connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta.

South Delta Improvements. Under Alternative 3, south Delta improvements include:

- A new appropriately sized screened intake with pumps at the head of CCFB.
- As under Alternative 1, Old River would be enlarged in the reach north of CCFB. Also as under Alternative 1, both levee setbacks and dredging are being considered to increase conveyance capacity.
- As under Alternative 1, operable flow control barriers or their equivalent would be constructed on Middle River, Grant Line Canal, and Old River.
- As under Alternative 1, a new intertie facility would be constructed to connect the SWP and the CVP facilities.
- As under Alternative 1, an operable fish control barrier would be constructed at the head of Old River.

North Delta Improvements. Under Alternative 3, these improvements generally run from the north to the south Delta and include:

- An open-channel isolated facility ranging in size from 5,000- (±2000) to 15,000-cfs capacity would be constructed. The intake to the isolated facility would be located near Hood and may include dual points of intake. The intake(s) would be screened. The isolated facility would be placed along the eastern side of the Delta and connected to CCFB.
- Connections would be constructed between south Delta islands, the Contra Costa and Tracy Pumping Plants, and portions of San Joaquin County and the new canal.
- As under Alternative 2, the Mokelumne River channel would be widened to improve water conveyance and flood control from I-5 to the San Joaquin River.

Operating Assumptions. See Attachment A.

Preferred Program Alternative - Through-Delta Conveyance. The Preferred Program Alternative incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than Alternative 2. If after additional analysis this new facility is not constructed, the Preferred Program Alternative would be most similar to Alternative 1.

South Delta Improvements. Under the Preferred Program Alternative, south Delta improvements include:

- Constructing a new screened intake at CCFB with protective screening criteria.
- Constructing either a new screened diversion at Tracy with protective screening criteria and/or expanding the new diversion at CCFB to meet the Tracy Pumping Plant export capacity.
- Implementing the Joint Point of Diversion (JPD) for the SWP and CVP, and constructing interties.
- Constructing an operable barrier at the head of Old River to improve conditions for salmon migrating up and down the San Joaquin River.
- Implementing actions to ensure the availability of water of adequate quantity and quality to agricultural diverters within the south Delta, and to contribute to restoring ecological health of aquatic resources in the lower San Joaquin River and south Delta. Actions may include channel dredging, extending and screening agricultural intakes, consolidating agricultural intakes, constructing operable barriers, and levee setbacks and levee improvements (such as reinforcing levees or controlling seepage). Actions will be staged, with appropriate monitoring and testing to guide the implementation process.
- Changing the SWP operating rules to allow export pumping up to the current physical capacity of the SWP export facilities.

North Delta Improvements. Under the Preferred Program Alternative, north Delta improvements include:

- Studying and evaluating a screened diversion facility on the Sacramento River with a range of diversion capacities up to 4,000 cfs as a measure to improve drinking water quality in the event that the Water Quality Program measures do not result in continuous improvements toward CALFED drinking water goals.

  The diversion facility on the Sacramento River likely would include a fish screen, pumps, and a channel between the Sacramento and Mokelumne Rivers. The diversion facility on the Sacramento River is to be considered only after three separate assessments are satisfactorily completed: first, a thorough assessment of Delta Cross Channel (DCC) operation strategies and confirmation of continued concern over water quality impacts from DCC operations; second, a thorough evaluation of the technical viability of a diversion facility; and third, satisfactory resolution of the fisheries concerns about a diversion facility. The assessments of the DCC and the diversion facility on the Sacramento River will be completed simultaneously. The result of all three of these evaluations will be shared with the Delta Drinking Water Council or its successor and the expert panel evaluating fish impacts of Delta conveyance. If these evaluations demonstrate that a diversion facility on the Sacramento River is necessary to address drinking water quality concerns and can be constructed without adversely affecting fish populations, the facility will be constructed as a part of the Preferred Program Alternative.

- Constructing new setback levees or dredging and/or improving existing levees along the channels of the lower Mokelumne River system from I-5 downstream to the San Joaquin River.

Operating Assumptions. See Attachment A.

The Preferred Program Alternative includes a process for determining the conditions under which any future additional conveyance facilities or water management actions would be taken. 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 parts per billion (ppb) bromide and 3 parts per million (ppm) TOC.

- An evaluation based on two independent expert panels' reports—one on the Program'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.

2.2 NO ACTION ALTERNATIVE

The No Action Alternative is a description of the anticipated physical, project operation, and regulatory features that would be in place in 2020 if the Program is not approved. The No Action Alternative was used as a basis for comparison of the Program alternatives. The purpose of this comparison is to highlight the changes to the environment that would take place as a result of implementing the various alternatives. The Program also is comparing the alternatives to existing conditions, referred to as the "affected environment" in this document.

Working with agencies, stakeholders, and interested public, the Program developed and applied criteria in the selection of physical features that would be included in the No Action Alternative. These criteria and the projects selected are presented in Attachment A. Generally, the physical features selected were under construction or recently constructed or approved as of June 1995 when scoping for this document began.

Water management criteria also play an important role in defining the No Action Alternative. The flow, storage, and diversion of water must be simulated to identify differences among alternatives. Many assumptions related to project operations and regulatory requirements needed to be made in order to complete the necessary water simulation modeling. The water management criteria for the No Action Alternative include ranges of water demands and regulatory requirements. The range of water demands represents uncertainty regarding future conditions that will affect demands for Bay-Delta water supplies; these conditions include rates and amounts of future population growth, land use change, implementation of water use efficiency measures, and effects of water marketing. The range of regulatory requirements also represents uncertainty related to implementation of state and federal Endangered Species Acts (ESAs) and future SWRCB decisions. For example, changes in future operations could require reinitiating ESA consultations with the National Marine Fisheries Service and USFWS. These consultations could result in new biological opinions and changes in regulatory requirements. While specific assumptions were made to complete the water simulation modeling, the Program's intention is to depict a general range of reasonably anticipated regulatory requirements. These assumptions should not be interpreted as specific predictions of future regulatory actions. The "bookend" assumptions used to bracket the water demand and regulatory requirement ranges are detailed in Attachment A.

Ranges also were used to describe possible flow changes in the Trinity and American Rivers due to the Trinity River Flow Analysis Study and implementation of the East Bay Municipal Utility District's (EBMUD's) CVP contract. These activities could result in changes in the availability of water to meet Program objectives. The assumed ranges were included in the No Action Alternative assumptions only to help decision makers better understand the potential consequences of these actions to the Program. No decisions have been made about the proposed Trinity River flows or American River diversions. The bookend assumptions used to bracket the potential outcome of these processes also are described in Attachment A.

Attachment A also lists the non-project and non-modeling assumptions, issues, or policies that are part of the No Action Alternative. In addition, Attachment A includes a comments and issues section that addresses a number of items that were considered throughout the development of the No Action Alternative.

2.3 ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The problems and potential solutions facing the Bay-Delta involve a complex set of interrelated biological, chemical, and physical systems. This complexity, coupled with the broad scope and number of actions needed to implement the Program, the 30-year or more implementation period, the need to test hypotheses, and resource limitations make it necessary to implement the Program in stages. Consequently, the Preferred Program Alternative provides for implementation of the Program in a staged manner and establishes mechanisms to obtain the necessary additional information to guide the next stage of decision making.

The Preferred Program Alternative consists of a through-Delta conveyance approach, coupled with ecosystem restoration, water quality improvements, levee system improvements, increased water use efficiency, improved water transfer opportunities, watershed restoration, and additional surface waters and groundwater storage. The Preferred Program Alternative meets the Program's multiple purposes, reduces adverse environmental effects, and provides a system of research and monitoring to determine whether modifications or additional actions are needed. It provides multiple benefits, including:

- Modifying the timing and magnitude of flow to restore ecological processes and to improve conditions for fish, wildlife, and plants in the Bay-Delta system.
- Improving and increasing aquatic and terrestrial habitats.
- Modifying and eliminating fish passage barriers.
- Constructing fish screens that use the best available technology.
- Reducing the loads and impacts of bromide, total organic carbon, pathogens, nutrients, salinity, and turbidity.
- Reducing the impacts of pesticides.

- Reducing the impacts of trace metals, mercury, and selenium.
- Improving and maintaining the stability of the Delta and Suisun Marsh levee system.
- Enhancing flood protection for key Delta islands.
- Expanding and implementing agricultural and urban conservation incentive programs.
- Implementing better water management for managed wetlands.
- Facilitating water transfers while protecting from third parties from potentially significant adverse impacts.
- Supporting local watershed restoration, maintenance, and conservation activities.
- Developing appropriate groundwater and surface storage in conjunction with specified water conservation, recycling, and water transfer programs to provide water for the environment at times when it is needed most, and to improve water supply reliability.
- Modifying existing Delta conveyance systems for improved water supply reliability and water quality, improved ecosystem health, and reduced risk of supply disruption due to catastrophic breaching of Delta levees.

Compared to the No Action Alternative and existing conditions, the Preferred Program Alternative provides significant improvements in terms of both its water quality and ecosystem health effects. Under the No Action Alternative, each of the four areas of critical concern—ecosystem quality, water quality, levee system integrity and water supply reliability—would continue to deteriorate, with resultant potentially significant adverse impacts on fisheries, endangered species, and species of concern and their habitats. In addition, the quality of both in-Delta and export water likely would decline under the No Action Alternative. This decline in water quality could result in potentially significant adverse impacts on fisheries, irrigated agriculture, ecosystem health, and drinking water quality. With the continued decline of the ecosystem, interruptions of water deliveries also likely would occur because of constraints on export pumping to protect threatened and endangered species. Finally, under the No Action Alternative, the Delta levees would continue to be vulnerable to failure because of limited maintenance in some locations and the lack of a comprehensive plan for effective emergency response.

There is concern whether a through-Delta conveyance approach can meet future water quality objectives and not adversely affect the recovery of threatened and endangered fish species. Although some scientific and engineering evidence suggests that a dual-Delta conveyance configuration may improve export water quality and achieve fish recovery more effectively, other evidence indicates that such a conveyance configuration can cause in-Delta water quality problems. In addition, during scoping and public meetings, some stakeholders and agencies voiced concern that moving water around the Delta instead of through it may:

- Cause difficulty in ensuring the appropriate operation of such a facility.
- Create impacts from construction.

- Increase the amount of land needed for the facility.

- Provide an engineered solution when non-structural modifications and reoperation of existing facilities may provide similar benefits.

Although the CALFED agencies did not rule out the possibility of constructing an isolated conveyance facility in the future, they were mindful that, even if approved immediately following the ROD/CERT, such a facility could not be studied, approved, funded, and constructed within the first stage (7 years) of implementation.

In light of the technical and feasibility issues discussed above, the CALFED agencies propose to begin with through-Delta modifications. As part of the Preferred Program Alternative, the Program also would:

- Continue to investigate storage opportunities in the context of the broader Water Management Strategy.

- Evaluate and implement storage projects, predicated on complying with all environmental review and permitting requirements. These efforts will be coordinated under CALFED's Integrated Storage Investigation.

- Implement the first stage of the Ecosystem Restoration, Water Quality, Water Use Efficiency, Water Transfers, Watershed, and Levee System Integrity Program Plans.

- Monitor the results of these actions to determine whether an isolated conveyance facility as part of a dual-Delta conveyance configuration is necessary to meet the Program objectives.

If the Program purposes cannot be fully achieved with the actions proposed in the Preferred Program Alternative, additional actions—including an isolated conveyance facility—may need to be added in the future. Until additional information is available to determine whether water quality objectives and fish recovery goals can be met and which, if any, additional actions will be necessary to achieve the Program goals and objectives, the Preferred Program Alternative is the best alternative to achieve overall project purposes and provide significant beneficial improvements over the conditions anticipated under the No Action Alternative, while establishing a process for obtaining this additional information. Moreover, the way the alternatives are structured, going forward with the Preferred Program Alternative does not preclude the Program's ability to undertake additional conveyance actions in the future, subject to appropriate environmental review.

As described above, the Preferred Program Alternative adopts a set of programmatic actions designed to achieve the objectives for each of the resource areas while evaluating the effectiveness of those actions, and assessing whether modifications may be needed to meet Program goals and objectives. The Preferred Program Alternative accordingly constitutes the "Environmentally Preferable Alternative" as that term is used in the National Environmental Policy Act (NEPA) and the "Environmentally Superior Alternative" as that term is used in CEQA. A comparison of impacts among alternatives can be found in summary form in Chapter 3 and more specifically in Chapters 5, 6, and 7.

2.4 ALTERNATIVES NOT CARRIED FORWARD FOR FURTHER EVALUATION

The three basic alternative approaches developed in Phase I of the Program were carried into Phase II. Seventeen alternative configurations of the three basic alternative approaches were developed to further explore potential refinements for storage and conveyance in Phase II. Of the 17 configurations, 5 were eliminated from further evaluation, and 12 were evaluated in the March 1998 Draft Programmatic EIS/EIR. Based on public and agency comments on the March 1998 EIS/EIR and additional technical analysis, the Program was able to further refine and narrow the number of alternative solutions to the four evaluated in this document.

The following explains the rationale for the elimination of alternative configurations from further evaluation prior to and after the release of the March 1998 Draft Programmatic EIS/EIR.

Elimination of Alternative Configurations prior to the March 1998 Draft Programmatic EIS/EIR. Five of the alternative configurations were eliminated based on the results of a narrowing process. The narrowing process primarily focused on technical deficiencies and the conveyance options used in each alternative. Additionally, if alternatives provided the same conveyance function with similar impacts, the less expensive alternatives were retained. Alternatives with lower costs but higher adverse impacts were eliminated. The evaluation used the following process and recommendations from technical work groups, operational modeling results, engineering prefeasibility studies, preliminary information from impact analysis, preliminary cost estimates, and other information:

- Identify and eliminate technical problems not evident when the alternatives were formulated that severely limit an alternative's chances for success.
- Identify alternatives with engineering or technical problems that must be resolved for the alternatives to proceed.
- Modify each alternative, if possible, to remove the technical problems.
- If modifications to the alternative cannot solve the problem, consider the alternative not practicable and eliminate it.
- Reduce the number of alternatives that achieve the same conveyance function with similar impacts.
- Identify alternatives that meet Program objectives to approximately the same degree and achieve the same conveyance function.
- Use engineering or technical and cost evaluations to compare the conveyance features of the alternatives. Consider adverse impacts of each alternative. If one alternative has significantly higher costs for conveyance and/or greater adverse impacts while achieving similar functions, it is not practicable and will be eliminated from further consideration.

Using the above criteria, five alternative configurations (2C, 3C, 3D, 3F, and 3G) were eliminated from further analysis.

Configuration 2C. The Multiple Intakes Conveyance Option in Configuration 2C would use three isolated conveyance channels to convey water to CCFB from two diversion locations on the San Joaquin River and one location on Old River near Franks Tract.

Configuration 2C was eliminated because the alternative would need to be modified to remove technical problems and, even after modification, hydraulically controlling the three water diversion "arms" would have been difficult. In addition, fish screens were needed to prevent fish entrainment at the pumps. Fish screens are costly because they require elaborate flow structures for the intake facilities. Configuration 2C is very expensive, with a total construction cost of $2.281 billion (in 1998 dollars) and a monitoring cost of $2.4 million (in 1998 dollars). Configuration 3I includes the same multiple Delta intake option, as well as options that address possible impacts on anadromous fish that are associated with Configuration 2C. Configuration 3I allows for more operational flexibility.

Configuration 3C. Configuration 3C uses a buried pipeline isolated facility to convey 5,000 cfs from a diversion on the Sacramento River at Hood along the east Delta to CCFB. No new storage is included in this alternative.

Configuration 3C was eliminated because Configuration 3A provides the same conveyance function at less cost. The alternatives are identical, except Configuration 3C proposed a pipeline isolated facility while Configuration 3A proposes an open channel. Configuration 3A would cost $857 million (in 1998 dollars), while Configuration 3C would cost $2.067 billion (in 1998 dollars). The environmental consequences of the pipeline are very similar to those of a channel; therefore, elimination of the pipeline did not result in the loss of an environmentally preferred alternative from the study.

Configuration 3D. As in Configuration 3C, Configuration 3D uses a buried pipeline isolated facility to convey 5,000 cfs from a diversion on the Sacramento River at Hood along the east Delta to CCFB. Configuration 3D differs from Configuration 3C in that it includes new storage.

Configuration 3D was eliminated because Configuration 3B provides the same conveyance function at less cost. The alternatives are identical, except Configuration 3D proposed a pipeline isolated facility while Configuration 3B proposes an open channel. Configuration 3B would cost $857 million (in 1998 dollars), while Configuration 3D would cost $2.067 billion (in 1998 dollars).

Configuration 3F. Configuration 3F, or "Chain-of-Lakes," uses a connected chain of up to eight lakes, created by flooding Delta islands, that would convey water via siphons beneath Delta channels to CCFB.

Configuration 3F was eliminated because of issues related to environmental damage, logistics, and cost. A major drawback of this configuration is the Delta land use conversion it entails. Approximately 37,000 acres of land would be required to create the chain of lakes. Conversion of this land is an environmental concern because some of the land (primarily on the water side of levees) currently provides aquatic habitat. The land currently has valuable agricultural uses, has habitat value for terrestrial wildlife species, and some of this land is intended for habitat restoration under the Ecosystem Restoration Program. In addition to the land use conversion concerns, this configuration creates a logistical concern related to achievement of water quality objectives—the storage of water on Delta peat soils may create TOC problems for urban water users. Finally, this alternative is estimated to cost approximately $2.4 billion (in 1998 dollars) compared to a cost of $1.7 billion (in 1998 dollars) for Configuration 3E,

which provides similar water storage and conveyance functions with fewer associated adverse environmental impacts.

Configuration 3G. Configuration 3G, the Western Delta Isolated Conveyance Facility, uses the Deep Water Ship Channel, and a west Delta conveyance pipeline, tunnel, and channel to convey 5,000 cfs from the intake on the Sacramento River near Sacramento to CCFB.

Configuration 3G was eliminated because its cost is estimated at $2.3 billion (in 1998 dollars), substantially more than the estimated $0.9 billion (in 1998 dollars) for Configuration 3B, which provides very similar water conveyance benefits and results in very similar environmental impacts.

Elimination of Alternative Configurations after the March 1998 Draft Programmatic EIS/EIR. The March 1998 Draft Programmatic EIS/EIR evaluated the impacts of the remaining 12 alternative configurations. The Program considered public comments on the March 1998 Draft Programmatic EIS/EIR and completed additional technical analysis to eliminate some of the configurations and consolidate others.

Configuration 1A. Configuration 1A used six Program elements (Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, Water Transfer, and Watershed Programs) without new storage and conveyance facilities. The Program has determined that a broad range of water management options, including storage, must be evaluated and implemented to achieve the Program's goals. Each alternative now includes a range of storage from 0 to up to 6.0 MAF. An alternative configuration without storage like Configuration 1A is represented in the analysis for zero storage in each of the four alternatives evaluated in this document. In addition, the Program has determined that the goals cannot be met without some south Delta conveyance improvements, which were not part of Configuration 1A.

Configuration 1B. Configuration 1B is similar to Configuration 1A, except for the addition of select south Delta conveyance improvements. Configuration 1B does not include storage. As discussed for Configuration 1A, the zero storage component is represented in the analysis for each of the four selected alternatives.

Configuration 2A. Configuration 2A includes north and south Delta channel modifications that are designed to improve water conveyance but does not include storage. Like Configurations 1A and 1B, this configuration is represented in the zero storage analysis for each of the four selected alternatives.

Configuration 2D. Configuration 2D includes modifications in the north and south Delta that are designed to improve water conveyance, to integrate habitat restoration with the conveyance improvements, and to provide new aqueduct storage south and downstream of the Delta. The alternative provides for more efficient water conveyance from the Sacramento River through the South Fork Mokelumne River and Old River near CCFB. The Program has determined that environmental concerns require separating the main water conveyance path from major new habitat. Locating major habitat away from the main water conveyance path would provide less chance of fish being carried to the south Delta export pumps. The habitat and its potential impacts in this configuration is still represented in the analysis of the Ecosystem Restoration Program element in each of the four selected alternatives. Separating the conveyance and the major new habitat also is preferable for water quality because it keeps the organic carbon that originates in the wildlife habitat out of the main water conveyance path.

Configuration 2E. Configuration 2E includes modifications in the north and south Delta that are designed to improve water conveyance, to provide significant habitat restoration, and to provide additional surface water and groundwater storage. The conveyance and habitat portions are similar to those in Configuration 2D, except for the addition of conveyance and habitat on Tyler Island and the elimination of the 10,000-cfs intake near Hood. Configuration 2E was eliminated for the same reasons that Configuration 2D was eliminated.

Configuration 3A. Configuration 3A includes north and south Delta channel modifications that are designed to improve water conveyance and a small (5,000-cfs) open-channel isolated facility. The configuration does not include new storage. Like the other no-storage configurations, the zero storage in this configuration is represented in the analysis of the four selected alternatives. Additionally, Configuration 3A is represented in the analysis for Alternative 3 in this document. Alternative 3 is examining a range of volumes (5,000 cfs, 10,000 cfs, and 15,000 cfs) for the isolated facility.

Configuration 3B. Configuration 3B includes north and south Delta channel modifications that are designed for water conveyance, a small (5,000-cfs) isolated facility constructed as an open channel, and surface water and groundwater storage. Configuration 3B is represented in the analysis for Alternative 3 in this document. Alternative 3 is examining a range of volumes(5,000 cfs, 10,000 cfs, and 15,000 cfs) for the isolated facility.

Configuration 3H. Configuration 3H includes modifications in the north and south Delta that are designed for water conveyance and significant habitat restoration, a small (5,000-cfs) isolated facility constructed as an open channel, and surface water and groundwater storage. The conveyance and habitat portions are the similar to those in Configuration 2D. Configuration 3H was eliminated for the same reasons that Configurations 2D and 3B were eliminated.

Configuration 3I. Configuration 3I includes three new diversion locations in the south Delta for Tracy and Banks Pumping Plants, a 15,000-cfs isolated facility, and surface water and groundwater storage. The new south Delta diversions were envisioned for use separately or in combination to provide increased operational flexibility. However, Configuration 3I was eliminated for several environmental and cost reasons. For example, the middle diversion on the San Joaquin River:

- Exposes the Eastside tributary and San Joaquin salmon to a new screen.
- Could adversely affect Delta smelt and striped bass.
- Would present problems in salvaging fish because of its location in a tidal zone.
- Could exacerbate water quality problems in the south Delta.

The western diversion is in an area that is critical for Delta smelt and is also in the tidal zone, requiring salvage of fish. The southern diversion on the San Joaquin River likely could be used for only short periods of time due to lack of San Joaquin River flows. The original concept involved no screen on each of these three diversions at their upstream ends but screens at common facilities for the Banks and Tracy Pumping Plants. Because of concern about predation that could occur in the slow-flowing channels, fish screens at the upstream ends were included in the alternative. Cost estimates are approximately $2 billion in 1998 dollars higher for Configuration 3I than for Alternative 3, which is evaluated in this document. Because of concerns about potentially damaging conditions to the aquatic environment and the substantially higher cost, Configuration 3I was eliminated from further consideration.

Chapter 3. Summary Comparison of Environmental Consequences

This chapter presents a summary of the programmatic environmental consequences of implementing the CALFED Bay-Delta Program that are discussed in Chapters 5, 6, and 7.

3.1 ENVIRONMENTAL RESOURCE IMPACTS AND ECONOMIC AND SOCIAL EFFECTS 3-1
3.2 SUMMARY OF GROWTH-INDUCING IMPACTS 3-3
3.3 SUMMARY OF SHORT- AND LONG-TERM RELATIONSHIPS 3-4
3.4 SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS 3-4
3.5 SUMMARY OF CUMULATIVE IMPACTS 3-5
3.6 MITIGATION STRATEGIES FOR CUMULATIVE IMPACTS 3-7

3. Summary Comparison of Environmental Consequences

3.1 ENVIRONMENTAL RESOURCE IMPACTS AND ECONOMIC AND SOCIAL EFFECTS

Section 3.1.1 discusses the environmental consequences of the Preferred Program Alternative and Alternatives 1, 2, and 3 compared to the No Action Alternative and existing conditions. Section 3.1.2 discusses expected benefits of the Preferred Program Alternative compared to the No Action Alternative. Section 3.1.3 discusses potentially significant avoidable and unavoidable adverse impacts of the Preferred Program Alternative compared to the No Action Alternative. Section 3.1.4 lists economic and social effects that may be caused by the Preferred Program Alternative. Some of the sections describe effects of the CALFED Bay-Delta Program (Program) by study regions, which are described in Chapter 2.

3.1.1 SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS

Table 3-1 (at the end of the chapter) provides a summary comparison of the environmental consequences of the No Action Alternative; Alternatives 1, 2, and 3; and the Preferred Program Alternative.

In general, impacts resulting from the Conveyance element vary by alternative. Impacts resulting from the other Program elements vary minimally among action alternatives. The Storage element includes a wide range of storage amounts, as described in Chapter 2. In Table 3-1, therefore, the impacts associated with the Storage and Conveyance elements are described separately for each alternative, while the description of the other Program elements encompasses all the alternatives. For details of how each of the Program elements would be specifically affected by the various alternatives, please see Chapters 5, 6, and 7.

The impacts identified in Table 3-1 for the Preferred Program Alternative include consequences associated with possible changes in project operations of the CVP and SWP. These project changes in operation also could be included in Alternatives 1, 2, and 3. To avoid repetition in the summary table and because, typically, the project changes in operation would cause environmental consequences that are similar among the action alternatives, these environmental consequences are not listed under Alternatives 1, 2,

and 3. Where analysis found that project changes in operation could cause different environmental consequences under different action alternatives, the information is presented in the table.

3.1.2 Summary of Beneficial Impacts

Table 3-2 (at the end of the chapter) summarizes the benefits to resources that are expected from implementing the Preferred Program Alternative. The benefits are estimates of effects resulting from implementing all of the proposed Program elements that make up the Preferred Program Alternative. At the programmatic level of analysis presented in this document, the benefits of other action alternatives are similar to those of the Preferred Program Alternative.

3.1.3 Summary of Potentially Significant Adverse Environmental Impacts

Table 3-3 (at the end of the chapter) identifies the potentially significant avoidable and unavoidable impacts on resources resulting from implementation of the Preferred Program Alternative. Based on currently available information, it is anticipated that measures are available to reduce the potentially significant avoidable impacts to a less-than-significant level as individual projects are reviewed and implemented. At this programmatic level of analysis, although mitigation strategies have been identified to reduce the severity of potentially significant unavoidable impacts, it is not anticipated that the strategies will be able to mitigate those impacts to a less-than-significant level. Specific analysis of environmental impacts, their significance, and the availability and choice of specific mitigation measures will be developed and presented in future second-tier environmental documents prepared, as necessary, prior to implementation of specific Program projects and actions. At the programmatic level of analysis presented in this document, the potentially significant adverse environmental impacts of other action alternatives are similar to those of the Preferred Program Alternative.

Social and economic changes resulting from a project are treated somewhat differently under CEQA and NEPA. Economic and social effects are presented in Section 3.1.4 below.

3.1.4 Summary of Economic and Social Effects

Table 3-4 below lists the economic and social effects that may result from implementation of the Preferred Program Alternative. At the programmatic level of analysis presented in this document, the economic and social effects of other action alternatives are similar to those of the Preferred Program Alternative.

Qualitative methods and professional judgment were used in the evaluation of economic and social effects summarized in Table 3-4. These effects are presented in greater detail in Sections 7.2, 7.3, 7.5, 7.10, 7.14, and 7.15. Quantitative information for determining costs and economic benefits is not available. This information will be developed in future planning studies and project-specific analysis.

Table 3-4. Summary of Economic and Social Effects of the Preferred Program Alternative

Agricultural economics	Generally enhances or maintains agricultural revenues but may reduce agricultural income in local areas, especially in the Delta Region, due to conversion of agricultural lands to other uses, and may increase production costs in some areas.
Agricultural social issues	Generally benefits the agricultural community but may cause localized adverse social effects.
Urban water supply economics	May lower regulatory and water treatment costs and increase water supply, but may add costs through payment for Program elements. Many economic effects cannot be determined until more specific information is available.
Regional economics	Generally benefits regional economies but may cause adverse effects in the Delta, Sacramento River, and San Joaquin River Regions. The amount and allocation of costs and benefits are currently uncertain.
Environmental justice	Beneficial or adverse effects to minority or low-income populations are possible. Project-specific evaluation is required to determine effects.
Indian trust assets	Adverse effects are not anticipated, but effects cannot be determined at the programmatic level of analysis. Project-specific evaluation is required to determine effects.

3.2 SUMMARY OF GROWTH-INDUCING IMPACTS

Although this is an issue about which there is a great deal of uncertainty, it is possible that the CALFED Program could cause growth-inducing impacts through improvements in water supply and/or water supply reliability, and through construction of surface water storage reservoirs.

Opinions differ concerning whether additional water supplies and/or improvements in water supply reliability would stimulate growth. For this programmatic level of analysis, the assumption was made that an increase in water supplies and/or improvements in water supply reliability that are associated with the Program would stimulate growth. Additional discussion of CALFED water supply/reliability and growth inducement is provided in Chapter 4 and in Section 5.1.10. Discussions of the growth-inducing effects of surface water storage facilities are presented in Section 7.7.10 for recreation resources and in Section 7.13.10 for visual resources.

The Program's effect on most of the resource categories discussed in this document will not lead to additional growth; however, they could be affected by additional growth. At this programmatic level, it is unknown where any increases in population growth or construction of additional housing would take place, or what level of growth might be associated with improved water supply reliability/availability or surface water storage facilities. Accordingly, it is premature to speculate on how growth would affect resources.

3.3 SUMMARY OF SHORT- AND LONG-TERM RELATIONSHIPS

This section provides a resource-specific summary of the balance between the short-term uses of the environment and the maintenance and enhancement of long-term productivity for the Preferred Program Alternative. Short-term uses versus long-term productivity for each resource category considered are summarized in Table 3-5 (at the end of the chapter). At the programmatic level of analysis presented in this document, the short- and long-term relationships of other action alternatives are similar to those of the Preferred Program Alternative.

Overall benefits to long-term productivity related to biological resources, water quality, water management, and flood control outweigh the short-term adverse impacts. Adverse short-term impacts caused by changes in land use are associated with geology and soils, agricultural resources, recreation, and cultural resources. However, long-term benefits to these resources also were identified.

Adverse short-term impacts, primarily related to construction activities, were identified for most resources. The short-term construction-related impacts would be minor and would cease when construction was complete. Where possible, avoidance and mitigation measures would be implemented as a standard course of action to lessen impacts on these resources.

3.4 SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

Table 3-6 (at the end of the chapter) lists the irreversible and irretrievable commitments of resources that are attributable to the Preferred Program Alternative. Irreversible and irretrievable commitments of resources result from the direct or indirect use or consumption of resources in such a way that they cannot be restored or returned to their original condition despite mitigation efforts. An irretrievable impact or commitment of resources occurs when a resource is removed or consumed. These types of impacts are evaluated to ensure that consumption is justified. At the programmatic level of analysis presented in this document, the irreversible and irretrievable commitments of other action alternatives are similar to those of the Preferred Program Alternative.

Irreversible commitments of resources could result from Program actions that involve construction and land conversion. Committed resources could include construction materials, labor, and energy needed for construction, operation, and maintenance. Land conversion due to Program use would commit agricultural, open space, and natural environments to other uses.

Specific resources that could be irreversibly and irretrievably committed as a result of the Program could include geology and soils, vegetation and wildlife, regional economics, agricultural resources, cultural resources, power production and energy, and visual resources. Where possible, avoidance and mitigation measures would be implemented as a standard course of action to lessen impacts on these resources. For additional discussion, refer to the resource-specific impact analyses in Chapters 5, 6, and 7.

3.5 SUMMARY OF CUMULATIVE IMPACTS

The CALFED Program involves the approval of a program to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The Program is a general description of a range of actions that will be further refined, considered, and analyzed for site-specific environmental impacts as part of second- and third-tier environmental documents prior to making a decision to carry out these later actions.

The Programmatic EIS/EIR focuses on a general overview of cumulative impacts and associated mitigation strategies. As a programmatic planning-level document, the Programmatic EIS/EIR does not analyze site-specific impacts of future projects at proposed locations. The impact analysis document therefore cannot predict with certainty which impacts will occur and what site-specific mitigation measures will be imposed. Similarly, a detailed analysis of the Program's contributions to cumulative impacts and the methods to mitigate those cumulative impacts cannot be analyzed with certainty at the programmatic level. Based on the type of information considered at the programmatic level, this document identifies those cumulative impacts to which Program actions likely will contribute. The document also includes mitigation strategies that, when applied to an individual project, will serve to avoid, reduce, or mitigate the project's contribution to cumulative impacts.

Later EIRs and EISs will be able to incorporate the cumulative and long-term impact analyses of this programmatic document and add detail about specific projects and their contribution to cumulative impacts. Similarly, subsequent project-level studies also will address the individual project's contribution to cumulative impacts. Where appropriate, these documents will consider proposed strategies and mitigation measures to avoid, reduce, or mitigate the project's contribution to cumulative impacts.

The following narratives and Table 3-7 (at the end of this chapter) identify by region the resource category where potentially significant (whether they are avoidable or unavoidable) cumulative adverse impacts are anticipated that result from the Preferred Program Alternative, when considered with the impacts of applicable projects and activities listed in Attachment A (Attachment A actions). The discussion of cumulative impacts in each of the resource sections in Chapters 5, 6, and 7 presents those impacts. The discussion differentiates between those potentially significant adverse cumulative impacts for which the Program's contribution could be avoided or mitigated to less than cumulatively considerable and the impacts that will remain unavoidable—regardless of efforts to avoid, reduce, or mitigate the impacts. It should be noted that even though the Program's contribution to a cumulative impact is considered unavoidable at the programmatic level of analysis, an individual project's contribution to cumulative impacts may be considered less than significant at the project level of review.

Due to the programmatic level of information considered, the analysis and conclusion regarding the significance of the Program's contribution to cumulative impacts (and the ability to avoid, reduce, or mitigate these impacts) are essentially the same as the analysis and conclusion regarding the CALFED Program's long-term impacts. This similarity is primarily because of the long-term nature of the Program and the wide range of actions that fall within the scope of the Program's potential future actions. The potentially significant adverse long-term impacts and mitigation strategies that can be used to avoid, reduce, or mitigate these impacts are listed in summary form at the beginning of each resource section in

Chapters 5, 6, and 7. Those impacts that cannot be avoided or mitigated to a less-than-significant level are noted on the list **in bold type**. The text in each resource section elaborates on potential long-term impacts.

The analysis of cumulative effects was based on information from this document, other available environmental documents and studies, and information about the effects of projects similar to the Attachment A actions. References are provided in Chapter 12, "Bibliography."

The following sections present a narrative summary of cumulative impacts by CALFED region. At the programmatic level of analysis, the cumulative impacts of other CALFED action alternatives are similar to the cumulative impacts of the Preferred Program Alternative.

3.5.1 DELTA REGION

In the Delta Region, potentially significant adverse cumulative impacts could occur in all resource categories that are addressed in this document due to the impact of the Preferred Program Alternative, when added to the development of water management projects, environmental restoration projects, and urbanization listed in Attachment A.

3.5.2 BAY REGION

In the Bay Region, potentially significant adverse cumulative impacts could occur due to the impact of the Preferred Program Alternative, when added to the development of water management projects, environmental restoration projects, and urbanization listed in Attachment A. The Preferred Program Alternative, in concert with these projects, potentially could cause adverse cumulative impacts on all resource categories in the Bay Region, except transportation, agricultural land and water uses, utilities and public resources, and flood control resources.

3.5.3 SACRAMENTO RIVER AND SAN JOAQUIN RIVER REGIONS

In the Sacramento River and San Joaquin River Regions, potentially significant adverse cumulative impacts could occur due to the impact of the Preferred Program Alternative, when added to the development of water management projects, environmental restoration projects, and urbanization listed in Attachment A. The Preferred Program Alternative, in concert with these projects, could potentially cause adverse impacts on all environmental resource categories in the Sacramento River and San Joaquin River Regions, except urban land use resources.

3.5.4 Other SWP and CVP Service Areas

In the Other SWP and CVP Service Areas, potentially significant adverse cumulative impacts could result from the impact of the Preferred Program Alternative, when added to the development of water management projects, environmental restoration projects, and urbanization listed in Attachment A. Resources potentially affected include water quality, water supply and water management, groundwater, and power and energy.

3.6 MITIGATION STRATEGIES FOR CUMULATIVE IMPACTS

As noted previously, the conclusions regarding the Program's ability to avoid, reduce, or mitigate its contribution to cumulative impacts are essentially the same as the conclusions regarding the Program's ability to avoid, reduce, or mitigate long-term impacts in each resource area. Accordingly, the same mitigation strategies that are applied to long-term impacts can be applied to the Preferred Program Alternative's contribution to cumulative impacts. A summary of the mitigation strategies are listed at the beginning of each resource section in Chapters 5, 6, and 7. The main body of text in each resource section elaborates on these strategies.

Finally, the CALFED Preferred Program Alternative is designed to be implemented under existing state and federal law, without affecting the regulatory authority of state and federal agencies. The Program's objectives to address problems systemwide and to not significantly redirect impacts also will serve to limit the potential for long-term or cumulative Program impacts.

Table 3-1. Summary Comparison of Environmental Consequences

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
WATER SUPPLY AND WATER MANAGEMENT					
Annual Delta exports could decrease by as much as 570 TAF or could increase by as much as 370 TAF over the long-term period. Reductions in annual Delta exports would result from more protective Delta water management criteria; increases in annual Delta exports would result from higher demands on the Bay-Delta system. During dry and critical years, annual Delta exports could decrease by as much as 610 TAF or could increase by as much as 130 TAF. Higher Bay-Delta system demands have a relatively small impact on Delta exports during dry and critical years because the system is generally supply-limited during droughts. For most parameters of interest, existing conditions fall within the range of uncertainty associated with the alternative.	Some improvements would be realized from improved export pumping capacity. Greater benefits may be obtained if additional storage facilities are constructed. Without additional storage, annual long-term period Delta exports would increase 270-390 TAF (dry and critical year exports would increase 30-90 TAF) over the No Action Alternative. With additional storage, annual Delta exports would increase 180-640 TAF (dry and critical year exports would increase 580-800 TAF) over the No Action Alternative.	Some improvements would be realized from improved export pumping capacity. Greater benefits may be obtained if additional storage facilities are constructed. Without additional storage, annual long-term period Delta exports would increase 230-410 TAF (dry and critical year exports would increase 30-200 TAF) over the No Action Alternative. With additional storage, annual Delta exports would increase 460-800 TAF (dry and critical year exports would increase 130-650 TAF) over the No Action Alternative.	Some improvements would be realized from improved export pumping capacity. Greater benefits may be obtained if additional storage facilities are constructed. The alternative was evaluated with both a 5,000- and 15,000-cfs isolated facility. Without additional storage, annual long-term period Delta exports would increase 140-590 TAF (dry and critical year exports could decrease 90 TAF or increase 440 TAF) over the No Action Alternative. With additional storage, annual Delta exports would increase 410-1,300 TAF (dry and critical year exports would increase 90-1,200 TAF) over the No Action Alternative.	Actions under the Water Use Efficiency and Water Transfer Programs would lead to more efficient allocation of existing supplies. The degree to which beneficial redistribution of water resources would occur is uncertain. Ecosystem Restoration Program actions could use more water than current agricultural land uses. The Levee System Integrity, Water Use Efficiency, and Water Transfer Programs would contribute to improved supply reliability. Actions under the Water Quality Program could increase the amount of water available for some beneficial uses and provide improved operational flexibility.	Some improvements would be realized from improved export pumping capacity. Greater benefits may be obtained if additional storage facilities are constructed. The alternative was evaluated with and without a screened diversion (2,000-4,000 cfs) from the Sacramento River to the Mokelumne River system. Without the diversion, consequences are similar to those under Alternative 1. With a new diversion and no additional storage, annual long-term period Delta exports would increase 250-380 TAF (dry and critical year exports would increase 50-180 TAF) over the No Action Alternative. With a new diversion and additional storage, annual Delta exports would increase 490-900 TAF (dry and critical year exports would increase 180-670 TAF) over the No Action Alternative. Changes in operations could affect water supply and management.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
BAY-DELTA HYDRODYNAMICS AND RIVERINE HYDRAULICS					
Changes in Bay-Delta hydrodynamics and riverine hydraulics could result either from more protective Delta water management criteria or higher demands on the Bay-Delta system. For most parameters of interest, existing conditions fall within the range of uncertainty associated with the alternative.	Small increases in reverse QWEST flow would occur with or without new storage. Circulation patterns and water levels would improve in south Delta channels through the operation of flow control structures. Bay-Delta X2 position may increase or decrease. Minor changes to riverine flows and existing reservoir operations would occur through implementation of new storage.	Substantial decreases in reverse QWEST flow would occur with or without new storage through the operation of a Hood diversion. Circulation patterns and water levels would improve in south Delta channels through the operation of flow control structures. Bay-Delta X2 position may increase or decrease. Minor changes to riverine flows and existing reservoir operations would occur through implementation of new storage.	The alternative was evaluated with both a 5,000- and 15,000-cfs isolated facility. Substantial decreases in Sacramento River flow at Rio Vista and reverse QWEST flow would occur with or without new storage through the operation of an isolated facility. Circulation patterns and water levels would improve in south Delta channels through the operation of flow control structures. Bay-Delta X2 position may increase or decrease. Minor changes to riverine flows and existing reservoir operations would occur through implementation of new storage.	The Ecosystem Restoration Program pulse flows and Delta outflow targets result in potentially substantial short-term increases in Sacramento River and San Joaquin River flows during selected periods from March to May. The Levee System Integrity Program could alter channel geometry and slightly increase channel depth, which could alter flow patterns. The Water Use Efficiency Program could reduce or eliminate the need for increased diversions as populations increase or demand grows. These changes would benefit streamflows overall, but detrimental in-stream flow reductions could occur in cases where streams are partially or entirely fed by return flows. Water Transfer Program actions could modify the timing and magnitude of streamflows. Effects of the Watershed Program could range from very limited changes in flows in localized stream reaches to large-scale changes in flow regimes. Program actions may increase retention of surface water in the watershed, resulting in less variable runoff patterns.	The alternative was evaluated with and without a new screened diversion (2,000-4,000 cfs) from the Sacramento River to the Mokelumne River system. Without a new diversion, consequences are similar to those under Alternative 1. With a new diversion, substantial decreases in reverse QWEST flow would occur with or without new storage. Circulation patterns and water levels would improve in south Delta channels through the operation of flow control structures. Bay-Delta X2 position may increase or decrease. Minor changes to riverine flows and existing reservoir operations would occur through implementation of new storage. Changes in operations could cause changes in Bay-Delta circulation patterns and reservoir releases.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
WATER QUALITY					
Delta water quality would gradually deteriorate.	Shift in timing of Delta inflow results in some improvements in Delta water quality in alternative with storage, but is offset by increased south Delta pumping. Salinity would increase in Delta in alternative without storage. With or without storage, average monthly salinities would be increased in parts of central and west Delta, Old River, CCFB, and San Joaquin River. Bromide concentrations would increase in Old and Middle Rivers.	Reduction in salinity and bromide concentrations due to improved circulation pattern and shift in timing of Delta inflow in alternative with storage. Salinity in lower Sacramento and San Joaquin Rivers in west Delta would increase due to diversion of water into central and south Delta. With or without storage, there are reductions in peak salinity levels in the central Delta, Old River, Middle River, DMC, and CCFB. Corresponding decreases in bromide levels are expected with lower salinity. Moderate increases in salinity in the west Delta under high water use with storage scenarios.	Quality of water exported to South-of-Delta SWP and CVP Service Areas improves substantially with isolated facility because water is taken from Sacramento River instead of Delta. Salinity increases at Rock Slough, and in south and central Delta. With or without storage, very good reductions in salinity are projected in CCFB and good reductions during peak salinity periods are projected for Old River and the DMC. Mixed changes in the interior Delta are expected. West Delta areas would experience some salinity increases during high water use scenarios.	All regions would experience potential benefits from source control measures of the Water Quality Program. The Ecosystem Restoration and Levee System Integrity Programs increase sediment loading and turbidity during construction and initial operation. Western Suisun Marsh levee rehabilitation could protect water quality. The Ecosystem Restoration Program would re-establish more natural flows, lowering water temperature and salinity, and increase dissolved oxygen at certain times of the year. The Ecosystem Restoration Program could increase production of methyl mercury.	Similar impacts as Alternative 1 without a diversion facility on the Sacramento River and similar impacts as Alternative 2, but less water quality impacts with a diversion facility on the Sacramento River. Changes in operations may significantly affect water quality in the Delta Region and quality-dependent beneficial uses. Reductions in export pumping rates could temporarily reduce the intrusion of ocean-derived salinity and bromides into the vicinity of the export pumps. Water quality benefits could result from beneficial increases in net Delta outflows and overall improvements in circulation patterns. Increases in reverse flows in Old River, during selected periods, could temporarily degrade central and south Delta water quality. Operational changes could cause increases in fresh-water inflows to the Bay and significant changes to the salinity gradient. Changes in pumping operations could move the position of X2 upstream or downstream by as much as 2 km, and about 1 km further upstream during selected periods. Significant improvements are expected in water quality exported to the San Joaquin River Region and the Other SWP and CVP Service Areas.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
GROUNDWATER RESOURCES					
Increased groundwater use with potential adverse impacts related to overdraft, subsidence, and water quality.	Alternative with surface water and groundwater storage could potentially reduce the potentially significant adverse impacts on groundwater resources throughout all regions.	Impacts similar to Alternative 1.	Impacts similar to Alternative 1.	The Ecosystem Restoration, Water Quality, and Levee System Integrity Programs would increase groundwater recharge. The Water Use Efficiency and Water Transfer Programs can result in greater reliance on groundwater resources during dry periods and potential reductions in groundwater recharge. These changes can adversely affect groundwater resources for third-party users.	Impacts similar to Alternative 1. Changes in operations could significantly affect groundwater resources, depending on the change of recharge rates and pumping due to the changes in operation in export water in the San Joaquin River Region and the Other SWP and CVP Services Areas. Changes in groundwater use could change subsidence rates, which could affect land use and water demands in the San Joaquin River Region and the Other SWP and CVP Service Areas.
GEOLOGY AND SOILS					
Conditions similar in type, but of greater magnitude than, existing conditions due to continued soil erosion, sediment contamination, subsidence, and channel degradation.	Reduced potential for erosion of channel, levee, and interior island soils through levee setbacks. Applied salt loads would be reduced in the Delta, Sacramento River, and San Joaquin River Regions. With new storage, increased ground disturbance, inundation, and shoreline wind and wave erosion.	Impacts similar to Alternative 1, but a larger area of land would be affected by additional conveyance facilities.	Impacts similar to Alternative 1, but a larger area of land would be affected by the isolated facility.	The Ecosystem Restoration Program would result in beneficial long-term effects in all geographic regions except the Other SWP and CVP Service Areas with respect to soil erosion, geomorphology, and sediment transport. The Water Use Efficiency Program would reduce erosion from agricultural lands. Watershed efforts could result in adverse short-term impacts on surface soil and channel erosion in the Sacramento River and San Joaquin River watersheds, but would result in beneficial long-term impacts on stream geomorphology by reducing sediment inputs from hillslope, bank, and channel erosion. The Levee System Integrity component could cause sediment loading and increased channel	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
GEOLOGY AND SOILS (continued)				depth. Beneficial impacts of the Suisun Marsh levee component include decreased soil salinity and increased protection of managed wetlands and tidally influenced lands due to increased flood protection.	
NOISE					
Conditions similar to existing conditions.	Construction of facilities would cause noise impacts that can be mitigated.	Impacts similar to Alternative 1.	Impacts similar to Alternative 1.	Impacts similar to Alternative 1.	Impacts similar to Alternative 1.
TRANSPORTATION					
Conditions similar to existing conditions, but traffic demands and traffic volume on existing roadways are expected to increase.	Potentially significant short- and long-term impacts where construction of levee, storage, and conveyance improvements may cause rerouting or temporary closure of traffic routes.	Impacts similar to Alternative 1. Additional short-term impacts would occur from construction of conveyance facilities.	Impacts similar to Alternative 2.	Construction activities associated with the Ecosystem Restoration and Levee System Integrity Program improvements may cause potentially significant short-term impacts on roadways and traffic routes if detours or road closures occur.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.
AIR QUALITY					
Conditions similar to existing conditions.	Short-term construction air quality impacts that can be mitigated would occur in the Delta, Sacramento River, and San Joaquin River Regions.	Impacts similar to Alternative 1. Additional short-term impacts would occur from construction of conveyance facilities.	Impacts similar to Alternative 2. Some additional impacts would be related to construction of an isolated facility.	Direct, short-term air quality impacts during construction. Increased emissions associated with fugitive dust; prescribed burning; equipment use and cultivation, agricultural chemical use, and crop shifting; and land use changes leading to higher residential, commercial, or recreational uses. Increased use of fossil fuels or other energy resources.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
FISHERIES AND AQUATIC ECOSYSTEMS					
Conditions similar to existing conditions, although increased *input of contaminants,* increased Delta exports, and increased distribution of Delta exports in Other SWP and CVP Service Areas would adversely affect some aquatic organisms and potentially limit opportunities for recovery of special-status species.	Adverse impacts, including increased entrainment loss, reduced productivity, and *delayed migration of fish* species would result from diversion to new storage and increased exports in the scenario that includes new storage. Without storage, change in flow conditions would be less, and impacts described above would be less.	Impacts related to increased diversion and subsequent effects on *flow conditions would* be similar to those under Alternative 1. Additional impacts on Delta channel flows would result from the diversion facility on the Sacramento River, including increased entrainment, reduced Delta productivity, negative impacts on upstream migration of adult anadromous fish, reduced survival of juvenile outmigrants, and habitat loss or degradation. Beneficial impacts could result from Delta flow conditions in the Lower San Joaquin River that improve fish migration to the Bay. Impacts from dredging operations and disposal of spoils could cause temporary degradation of water quality, structural characteristics, water flow variations, and habitat for fish and other aquatic organisms, as well as the delayed migration of fish species.	Impacts related to diversion and subsequent effects on flow conditions *would be improved* compared to those under Alternative 1. Impacts associated with a Hood diversion would be reduced compared to Alternative 2. An isolated facility could result in beneficial impacts in the east, central, and south Delta due to restored ecological processes related to Delta hydraulics, reduced entrainment losses, increased productivity, and improved juvenile fish outmigration. Dredging impacts would be less than those described for Alternative 2. If the isolated facility is sized adequately, the *south Delta barriers may* not be needed, and the im-pacts associated with those barriers avoided.	The Ecosystem Restoration and Water Quality Program actions would improve and increase aquatic *habitats and increase species* abundance under all alternatives in all regions except the Other SWP and CVP Service Areas. The Water Use Efficiency Program is expected to create ecosystem benefits through reduced diversion entrainment impacts, modifications in flow timing, and improved instream water quality. The Water Transfer Program may provide water for ecosystem purposes. The Levee System Integrity Program, including the Suisun Marsh levee component, could adversely affect fish and aquatic ecosystems through decreased water quality for fish and aquatic ecosystems, and loss of seasonal wetlands during levee rehabilitation; beneficial impacts could include decreased soil salinity and increased protection of managed *wetlands and tidally influenced* lands due to increased flood protection.	Impacts similar to Alternative 1 with or without a diversion facility on the Sacramento River. The diversion *facility would be constructed* contingent on satisfactory resolution of fisheries issues. Changes in operation could benefit fish and aquatic resources by reducing entrainment at the pumps and providing improved flow conditions in Delta channels. Make-up pumping could adversely affect fish and aquatic species through increased entrainment and flow changes in Delta channels. Changes in operations could reduce entrainment at the pumping facilities in the south Delta. Reoperation of reservoirs could potentially degrade water temperature conditions, and increase spawning and rearing mortality. Reduced flow could adversely affect transport of eggs and larvae.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
VEGETATION AND WILDLIFE					
Conditions similar to existing conditions.	Construction of alternative with storage would affect vegetation and wildlife communities by disruption and reduction of habitats, fragmentation and loss of habitat, and permanent loss of wetland and riparian habitat. Similar but reduced impacts in alternative without storage.	Greater adverse impacts on vegetation and wildlife than under Alternative 1, and benefits to some species from the creation of aquatic habitats. Dredging for increased conveyance could reduce the amount of terrestrial habitat that setback levees would affect but would not provide opportunities for the habitat creation that setback levees may offer.	Greater adverse impacts than Alternative 2 resulting from extensive facility construction.	The Ecosystem Restoration and Water Quality Programs would lead to improved habitats under all alternatives. The Water Use Efficiency Program may result in adverse impacts on some habitats by reducing or eliminating surface water runoff. Changes in crop mix as a result of increased efficiencies and water transfers may reduce the amount of wildlife-friendly crops. Beneficial impacts of the Levee System Integrity Suisun Marsh levee component include decreased soil salinity, and increased protection of managed wetlands, tidally influenced lands, and critical waterfowl and terrestrial species habitats from increased flood protection. The Suisun Marsh levee component may result in temporary loss of habitat and displacement of wildlife during levee rehabilitation.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.
AGRICULTURAL LAND AND WATER USE					
Shifts in production from field crops and grains to fruits and vegetables are expected. Water supply reliability probably would decline.	Agricultural lands, including up to approximately 15,700 acres of prime, statewide important and unique farmlands, would be converted; and potential conflicts between proposed actions and regional land use plans and policies could occur. Some of these effects cannot be avoided. Storage facilities could increase the amount of water available for agricultural production.	Agricultural lands, including up to approximately 19,500 acres of prime, statewide important and unique farmlands would be converted, and potential conflicts between proposed actions and regional land use plans and policies could occur. Some of these effects cannot be avoided. Storage facilities could increase the amount of	Agricultural lands, including up to approximately 21,000 acres of prime, statewide important and unique farmlands, would be converted, and potential conflicts between proposed actions and regional land use plans and policies could occur. Some of these effects cannot be avoided. Storage facilities could increase the amount of	The Ecosystem Restoration Program would convert up to approximately 152,000 acres of prime, statewide important and unique agricultural lands to other uses in the Delta, Sacramento River, and San Joaquin River Regions. These impacts cannot be fully mitigated. Habitat could use additional water supplies. The Water Quality Program would result in improved water quality of irrigation water, higher crop yields, and greater crop selection flexibility. Retirement of lands in the San	Agricultural lands, including prime, statewide important and unique farmlands, ranging from up to approximately 15,700 acres without a diversion facility on the Sacramento River to up to 19,500 with a facility, would be converted by storage anc conveyance facilities. Storage facilities could increase the amount of water available for agricultural production. Changes in operations may affect agricultural land and water use in the San Joaquin River Region and Other SWP and CVP Service Areas.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
AGRICULTURAL LAND AND WATER USE (continued)					
		water available for agricultural production. Dredging to increase conveyance reduces the amount of land that setback levees require. Dredging spoil disposal could occur on agricultural lands.	water available for agricultural production. Dredging to increase conveyance reduces the amount of land that setback levees require. Dredging spoil disposal could occur on agricultural lands.	Joaquin River Region could affect up to approximately 37,000 acres of agricultural land. The Levee System Integrity Program would convert up to approximately 35,000 acres of Delta Region farmland but provide greater protection to farmland from flooding and salinity intrusion.	
AGRICULTURAL ECONOMICS					
The cost of water is expected to continue to increase.	Conversion of farmland may result in adverse economic effects.	Effects similar but more pronounced than Alternative 1. Dredging to increase conveyance could reduce the amount of agricultural land setback levees require and reduce effects on agricultural production.	Effects similar but more pronounced than Alternatives 1 or 2.	The Ecosystem Restoration and Watershed Programs would convert agricultural lands from production, resulting in adverse economic effects on revenue generation, employment, and local spending, but could increase spending related to other activities like hunting and fishing. The Water Quality Program would reduce long-term production costs and generate higher crop yields. Jobs and economic income would be lost in the San Joaquin River Region as lands are retired. Levee System Integrity Program would potentially convert agricultural land from production but would provide increased protection to farmlands, resulting in short-term adverse effects but creating long-term benefits. Water transfers may result in changes to local economies as a result of the sale of water. The type of effect would depend on how revenues from the sale are spent and how local economies are affected because of the transfer of water into	Effects similar to Alternative 1 without a diversion facility on the Sacramento River and effects similar to Alternative 2 with a diversion facility on the Sacramento River. Changes in operations may affect agricultural economics in the San Joaquin River Region and Other SWP and CVP Service Areas. Reductions in water supply could reduce agricultural production and industry, and adversely affect local rural economies. Increases in water supply could benefit the agricultural economy. The Watershed Program would alter land use practices in the upper watershed, which may result in foregone economic opportunities.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
AGRICULTURAL ECONOMICS (continued)				or away from a region. The Watershed Program would alter land use practices in the upper watershed, which may result in foregone economic opportunities.	
AGRICULTURAL SOCIAL ISSUES					
Conditions similar to existing conditions.	Job losses could occur as agricultural land is converted to other uses.	Job losses similar to, but more pronounced than, Alternative 1.	Job losses similar to, but more pronounced than, Alternative 1.	The Ecosystem Restoration Program would result in a significant loss of jobs due to the conversion of agricultural lands for habitat restoration. The Water Quality Program could result in a loss of jobs in the San Joaquin River Region as lands are retired. The Water Use Efficiency Program would result in increased yield for farmers but may reduce on-farm jobs associated with irrigation activities. Water transfers may result in the loss of farm worker jobs and other job-related effects in the selling region. The loss of farm worker jobs in the receiving region, if the water is purchased for agricultural use, may be avoided by a transfer.	Effects similar to Alternative 1 without a diversion facility on the Sacramento River and effects similar to Alternative 2 with a diversion facility on the Sacramento River. Changes in operations may affect agricultural social issues in the San Joaquin River Region and Other SWP and CVP Service Areas. Reductions in water supply could reduce agricultural production and industry, and adversely affect local rural economies. Increases in water supply could benefit the agricultural economy by increasing jobs.
URBAN LAND USE					
Continued development trends would cause displacement of some residents, disruption of some existing communities, and local and regional land use plan inconsistencies.	Urban effects could include displaced residents, disruption of existing communities, and inconsistencies with local and regional land use plans.	Effects similar to Alternative 1 but potentially more pronounced.	Effects similar to Alternative 1 but potentially more pronounced than Alternative 1 or 2.	Other programs are expected to result in only negligible effects on urban land uses but could require relocation of major infrastructures.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
URBAN WATER SUPPLY ECONOMICS					
Water supply reliability and quality would continue to decline, and supply costs would increase.	Water supply costs and water supply reliability would increase, depending on the amount of storage. Changes in water quality would result in beneficial and adverse economic effects.	Effects similar to Alternative 1, with some improvement in Delta export water quality.	Effects similar to Alternative 1, with more improvement in Delta export water quality.	Other programs are not expected to significantly affect urban economics.	Effects similar to Alternative 1. Changes in operations may affect urban water supply economics in the San Joaquin River Region and the Other SWP and CVP Service Areas.
UTILITIES AND PUBLIC SERVICES					
Demand for utilities and public services is expected to increase significantly.	Alternative 1 could increase demand for utilities and public services, and require the relocation of some utility infrastructure components.	Alternative 2 causes effects that are similar to, but more pronounced than, Alternative 1.	Alternative 3 causes effects that are similar to, but more pronounced than, Alternative 2.	The Ecosystem Restoration Program may require the relocation of utility infrastructure components.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.
RECREATION RESOURCES					
Increased demand for recreational opportunities.	Alternative 1 with storage facilities would create new recreational opportunities while displacing some existing opportunities. Barriers in the Delta for fish and flow control would restrict boat travel, and affect marina access and use. These impacts cannot be fully mitigated.	Impacts similar to, but more pronounced than, Alternative 1. Dredging for increased conveyance would not cause the degree of long-term impacts on recreational resources or offer the opportunities for habitat enhancement that setback levee construction may provide.	Impacts similar to Alternative 2. Isolated facility may affect additional recreational facilities.	The Ecosystem Restoration Program could convert existing open space uses in the Delta, Sacramento River, and San Joaquin River Regions. The Levee System Integrity Program improvements may result in beneficial impacts by creating beach slopes associated with new levees and reduced exposure to flooding for existing recreational facilities. Some facilities could be closed or relocated, depending on the location of the levee improvements. Some public fishing areas may be temporarily disrupted during levee rehabilitation for the Suisun Marsh levee component.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
FLOOD CONTROL					
Property values in the Delta Region would continue to increase, but flood protection levels would slightly decline.	Small potential benefits or costs to flood control would be experienced in the Sacramento River and San Joaquin River Regions. Alternative with storage may provide additional flood control benefits.	Similar to Alternative 1, but greater benefits to flood control in the Delta, Sacramento River, and San Joaquin River Regions from channel improvements, setback levees, and dredging. Dredging for increased conveyance could provide flood control benefits by increasing channel capacity. Dredged spoil disposal over peat soils could prevent oxidation and continued subsidence.	Similar to Alternative 2.	The Ecosystem Restoration, Water Quality, and Levee System Integrity Programs are expected to substantially benefit flood control. The levee system component could protect water quality, structures, and resources in the Delta. The Suisun Marsh levee component could increase channel depth slightly as levees are standardized.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.
POWER PRODUCTION AND ENERGY					
The No Action Alternative would affect power and energy resources due to changes in water demand, conveyance, and pumping strategies.	Alternative 1 with storage would increase project energy use as operations change, would decrease the amount of CVP energy available for sale, and would increase the SWP's net energy requirement.	Effects similar to Alternative 1.	Effects similar to Alternative 1.	Other Program elements may affect power production and energy, but would not significantly affect CVP and SWP hydroelectric generating capacity, power production economics, or energy generation.	Effects similar to Alternative 1. Changes in operations may affect power production and energy resources in all regions. Changes in the amount of water exported from the pumping plants in the Delta and changes in operations of storage reservoirs could reduce or increase power production and energy use.
REGIONAL ECONOMICS					
Conditions similar to existing conditions adjusted for population growth.	Adverse effects are expected from loss of agricultural production, and beneficial effects would result from increased recreation and water supply.	Effects similar to those of Alternative 1 but would provide more beneficial recreational effects and water supply.	Effects similar to Alternative 2. In addition, this alternative would provide greater water supply reliability as a result of additional conveyance flexibility.	The Ecosystem Restoration and Levee System Integrity Programs would remove agricultural lands from production, resulting in adverse economic effects.	Effects similar to Alternative 1 without a diversion facility on the Sacramento River. Effects similar to Alternative 2 with a diversion facility on the Sacramento River but with less export water quality improvement.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
CULTURAL RESOURCES					
Additional development could result in impacts on cultural resources.	Disturbance of some cultural resources in all regions is expected except in the Other SWP and CVP Service Areas.	Impacts similar to Alternative 1. Dredging to increase conveyance could reduce the amount of land that setback levees require. Disposal of dredged spoils could affect buried archeological sites.	Impacts similar to Alternative 2 but greater due to construction of isolated facility.	The Ecosystem Restoration Program could adversely affect cultural resources in all regions except the Other SWP and CVP Service Areas. The Levee System Integrity Program could adversely affect cultural resources in the Delta.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.
PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS					
Some adverse impacts on public health and beneficial impacts on environmental hazards are expected.	Construction activities may expose people to hazardous materials and waste. Alternative 1 with storage could benefit firefighting.	Impacts similar to Alternative 1.	Impacts similar to Alternative 1.	The Ecosystem Restoration, Water Quality, and Levee System Integrity Programs may increase the amount of mosquito breeding habitat. Wetland and levee activities may release contaminants to Delta waters. Reduced surface water pollution would reduce health risks and may discourage mosquitoes.	Effects similar to Alternative 1.
VISUAL RESOURCES					
Continued development could result in some visual impacts. Flooding caused by levee failure could be considered an adverse visual impact.	Adverse visual impacts in the Delta from flow control structures. Facilities may obstruct views or be visually obtrusive. Alternative 1 with storage would cause shoreline "ring" effects.	Impacts similar to Alternative 1, additional adverse impacts could occur in the Delta from new conveyance facilities and channel enlargement.	Impacts similar to Alternative 2, with additional impacts caused by the isolated facility.	The Ecosystem Restoration Program would cause short-term construction impacts; but long-term benefits in the Delta; and beneficial and adverse impacts in the Bay, Sacramento River, and San Joaquin River Regions. The Levee System Integrity Program, including the Suisun Marsh levee component, could result in temporary construction and long-term visual impacts in the Delta.	Impacts similar to Alternative 1 without a diversion facility on the Sacramento River. Impacts similar to Alternative 2 with a diversion facility on the Sacramento River.

Table 3-1. Summary Comparison of Environmental Consequences (continued)

NO ACTION ALTERNATIVE	STORAGE AND CONVEYANCE			OTHER PROGRAMS	PREFERRED PROGRAM ALTERNATIVE AND CHANGES IN OPERATION
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3		
ENVIRONMENTAL JUSTICE					
Conditions similar to existing conditions.	Some actions could disproportionately affect minority and low-income populations, including migrant workers, as agricultural land is converted to other uses.	Effects similar to Alternative 1.	Effects similar to Alternative 1.	The Ecosystem Restoration Program could disproportionately affect minority and low-income populations, including migrant workers, as agricultural land is converted to other uses. The Levee System Integrity Suisun Marsh levee component could displace some low-income houses on or near the levees during levee rehabilitation.	Effects similar to Alternative 1. Changes in operations may result in environmental justice effects in all regions. Reductions in water supply caused by changes in export water to the San Joaquin River Region or the Other SWP and CVP Service Areas could affect employment of minority and low-income populations. Increases in water supply caused by changes in export water to these regions could result in a beneficial impact.
INDIAN TRUST ASSETS					
Conditions similar to existing conditions.	Some programs could adversely affect the Sacramento River and San Joaquin River Regions.	Effects similar to Alternative 1	Effects similar to Alternative 1.	The Ecosystem Restoration Program could benefit from water or fishing rights.	Effects similar to Alternative 1.

Notes:
CCFB = Clifton Court Forebay.
DMC = Delta-Mendota Canal.
km = Kilometer.
TAF = Thousand acre-feet.

Table 3-2. Summary of Beneficial Impacts Associated with the Preferred Program Alternative

RESOURCE CATEGORY	BENEFICIAL IMPACTS
Water supply and water management	Improvements in water supply are expected through coordinated implementation of Water Use Efficiency, Water Transfer, Water Quality, and Watershed Programs; facilities reoperation and integration; and, if appropriate, additional groundwater and/or surface water storage. Without storage, implementation of water use efficiency measures and transfers would lead to more efficient allocation of existing supplies, addressing some beneficial use needs. The adequacy of these non-storage measures in meeting beneficial use needs is uncertain.
Bay-Delta hydrodynamics and riverine hydraulics	Environmental implications of changes in Bay-Delta hydrodynamics and riverine hydraulics are discussed in other sections of the report in the context of each of the resources affected by the changes.
Water quality	Improved water quality for environmental and urban or agricultural uses from reduced concentrations of many contaminants, including heavy metals, pesticide residues, salts, selenium, pathogens, suspended sediments, total organic carbon, and bromides.
Groundwater resources	In areas undertaking managed conjunctive use programs, long-term increased groundwater levels, reduced pumping-induced subsidence, improved groundwater recharge, locally reduced potential for salt-water intrusion or pumping-induced migration of existing contaminants, and reduced groundwater extraction and reduced long-term lift costs.
Geology and soils	Reduced soil and wind erosion; reduced soil salinity, selenium concentrations, and sediment contamination; decreased soil subsidence; decreased loadings of toxic metals and organic compounds; reduced sediment transport; and reduced potential for seismically induced catastrophic failure of levees.
Noise	Reduced traffic or farm machinery noise associated with land use changes and reduced noise from modifying existing filtration plants, well fields, and pump stations.
Transportation	Roadway improvements, improved traffic flow, and accessibility to newly created wildlife or recreation areas.
Air quality	Decreased emissions from preparing agricultural land, burning fossil fuels, and applying herbicides and pesticides; reduction in fugitive dust production; and reduced crop burning due to crop shifting.
Fisheries and aquatic ecosystems	Reactivated and maintained ecological processes and structures that sustain healthy fish, wildlife, and plant populations; increased abundance and distribution of desired aquatic species; improved streamflow, sediment supply, floodplain connectivity, stream temperature, and biological productivity; and reduced entrainment losses.
Vegetation and wildlife	Net increases in target habitat types, increased protection for natural habitats, reduced toxic organic and inorganic constituents in the food web; increased quality and quantity of wetland and riparian habitats; increased habitat diversity; improved vigor of target populations (including special-status species); and long-term flood protection for existing and restored wetland, riparian, upland, and agricultural habitats.
Agricultural land and water use	Increased certainty in availability of irrigation water, potential for higher value crops and higher grazing productivity because of better water quality, increased property protection and reduction of salt-water intrusion, updated aging and inefficient irrigation systems, and opportunities for water transfers that could make irrigation water available where it may not have been otherwise.

Table 3-2. Summary of Beneficial Impacts Associated with the Preferred Program Alternative (continued)

RESOURCE CATEGORY	BENEFICIAL IMPACTS
Agricultural economics	Protection, long-term savings, increased revenues, and certainty for the agricultural economy.
Agricultural social issues	Some localized increases in agriculture-related employment, protection of agricultural jobs and income from catastrophic loss due to levee failure, and reduced future social dislocations due to water reliability.
Urban land use	Greater flood protection for urban centers.
Urban water supply economics	Lower treatment and regulatory costs, improved water quality, relocated water supply intakes, reduced risk of export interruptions caused by levee failure, and increased water supply availability.
Utilities and public services	Reduced risk to electrical or natural gas transmission lines, utility facilities, communication infrastructure, and emergency service centers due to levee failure.
Recreation resources	Increased open space; enhanced or restored wetland or wildlife habitat; improved water quality; increased fishing, hunting, and wildlife viewing opportunities; more recreation-related jobs; increased quality of recreational experience; increased flood protection for camping facilities and boat launches; and increased or improved access to public recreation areas.
Flood control	Easier inspection, maintenance, and repair of the flood control system; improved flood flow conveyance capacities; and reduced incidences of instability and overtopping failures. Additional system-wide flood control benefits from levees improved to the Public Law 84-99 standards and restored floodplains.
Power production and energy	Some increase in hydropower generation if new storage is constructed.
Regional economics	Increases in recreation-related or construction-based economies, increased land values due to flood protection, reduced cost to some water supplies due to increased storage, and some increases in regional revenues and jobs associated with the Storage element.
Cultural resources	Protection of cultural resources that are present on a site purchased and placed under federal ownership.
Public health and environmental hazards	Better water quality, which could reduce opportunities for disease transmission and mosquito breeding habitat; reduced sediment loading in streams and rivers; reduced surface water pollution from agricultural field drainage; improved human safety from flood control and fire management capabilities; and reduced exposure to hazardous materials.
Visual resources	Restored woodland, riparian, and wetland habitats; increases in visual variety to the landscape and possible upgrade of variety class; and improvement or preservation of natural watershed landscape character.
Environmental justice	Short-term restoration-related employment, restored fishing and hunting opportunities for populations that rely on fishing or hunting for subsistence, and reduced threat of death and economic devastation from flooding.
Indian trust assets	Possible improvements in water and fishing rights.

Table 3-3. Summary of Potentially Significant Adverse Avoidable and Unavoidable Impacts Associated with the Preferred Program Alternative

RESOURCE CATEGORY	POTENTIALLY SIGNIFICANT ADVERSE IMPACTS
Water supply and water management	Temporary local water supply interruptions due to turbidity of water during construction of facilities and habitat restoration activities.
Bay-Delta hydrodynamics and riverine hydraulics	None identified; changes in this category may cause effects in other resource categories.
Water quality	Increases in concentrations of bromide, salinity, total dissolved solids, and total organic carbon in the Delta. Increased diversion of water from the Delta, reducing outflow to the Bay and changing Bay salinity. Releases of inorganic or organic suspended solids, or toxic substances into the water column in the Delta. Increased water temperatures and decreased dissolved oxygen concentrations in the Delta. Potential decreased in-stream water quality from reduced in-stream flows associated with new storage facilities. Possible increase in methyl mercury production from wetlands. **Possible increases in salinity (expressed as EC) in localized areas of the central Delta. Without operation of a diversion facility on the Sacramento River, increases in salinity would be more widespread in the central Delta.**
Groundwater resources	Increased groundwater extractions in the Sacramento Valley, and, to a lesser extent, the San Joaquin Valley, resulting in land subsidence, lower groundwater levels, and higher pumping costs; degradation of groundwater quality; or losses of existing wells. In areas where groundwater basins are recharged mainly from percolation of applied water, agricultural and landscape water use efficiency could reduce recharge and result in declines of shallow water tables.
Geology and soils	Increases in agricultural land soil conversion, local subsidence, soil erosion and soil salinity, construction-related short-term soil erosion, and sediment deposition or soil compaction from heavy equipment. Changes to geomorphology downstream of surface water storage facilities. Ground disturbance, inundation, and shoreline wind and wave erosion.
Noise	Increased noise from heavy construction equipment operation, traffic along major access and haul routes, and vehicle traffic associated with the construction labor force; facility operation of spillways, pumping generating plants, and switchyards; and additional automobile or boat traffic associated with recreational use.
Transportation	Changed traffic flows around construction sites, detoured traffic as new roadways and railroad bridges are constructed, and added construction vehicles to existing traffic levels. **Relocated or permanently closed roads.** Impeded or blocked patrol or rescue boats in Delta sloughs where fish barriers and flow control structures are installed.
Air quality	Direct, short-term air pollutant emissions during construction activities. Increased emissions associated with fugitive dust, prescribed burning programs, equipment use and cultivation, agricultural chemical use, and crop shifting; and land use changes leading to higher residential, commercial, or recreational uses. Increased use of fossil fuels or other energy resources.
Fisheries and aquatic ecosystems	**Increased non-native species abundance distribution**; blocked access to habitat and potentially altered water quality and flow conditions from placement of barriers in the south Delta. Altered natural ecosystem structure, removal of benthic communities, and creation of conditions that may damage habitat for desired species from dredging activities. Short-term disturbance of existing biological communities and species habitat, mobilized sediments, and input contaminants from construction activities. Reduced streamflow and Delta outflow, changed seasonal flow, water temperature variability, and changes in salinity potentially resulting in reduced habitat abundance, impaired species movement, and increased loss of fish to diversions. Increased entrainment loss of chinook salmon and other species from diversions to new off-stream storage. Reduced frequency and magnitude of net natural flow conditions in the south and central Delta from Delta Cross Channel operations and south Delta barriers. With a diversion facility on the Sacramento River, impacts on individual organisms of special-status species from reduced net flow conditions in the Sacramento River downstream of the diversion; increased juvenile fish mortality through abrasion, increased predation, and delay at a new fish screen facility; and delayed migration and reduced spawning success for adult fish.

Table 3-3. Summary of Potentially Significant Adverse Avoidable and Unavoidable Adverse Impacts Associated with the Preferred Program Alternative (continued)

RESOURCE CATEGORY	POTENTIALLY SIGNIFICANT ADVERSE IMPACTS
Vegetation and wildlife	**Fragmentation of existing habitat corridors on small or ephemeral tributaries as a result of inundation by storage reservoirs, potentially blocking the movement and interchange of populations of some wildlife species from upper to lower watershed locations. Loss of habitat and direct impacts on special-status species.** Loss of incidental wetlands and riparian habitats that depend on agricultural water use inefficiencies. Temporary or permanent loss or disturbance of wetland and riparian communities, wintering waterfowl habitat, portions of rare natural communities and significant natural areas, and quantity or quality of forage for species of concern.
Agricultural land and water use	Conversion of prime, statewide important, and unique farmland; conflicts with local government plans and policies; and conflicts with adjacent land uses.
Urban land and water use	Displacement of existing urban residences, physical disruption or division of established communities, and potential conflicts with local general plans.
Utilities and public services	Relocation or modification of major infrastructure components; increased risk of gas line ruptures during construction.
Recreation resources	Temporary or permanent closure of some recreation areas or facilities; reduced access to recreation facilities and decreased recreation opportunities from changes in reservoir levels. **Loss of terrestrial and on-stream recreation by inundation from reservoirs. Temporary and permanent changes to motorized boating in the Delta from speed limits, channel closures, and installation of flow and fish control barriers.** Decrease in flooded lands suitable for wildlife viewing, hunting, and fishing. Reduced water-contact recreation quality from releases of reservoir cold water.
Flood control	Reduced levee stability and reductions in a channel's flood flow conveyance from barriers in the channel. Increases in seepage, wind-fetch, and wave erosion on landside levee slopes; level of flooding downstream of diversions after removal of Sacramento River tributary diversion structures and other flow obstructions; flood stages along streams. Localized subsidence, resulting in levee slumping or cracking if occurring near levees. Adverse impacts on water quality from use of dredged materials.
Power production and energy	Decrease in amount of energy available for non-project uses, possible air quality and land use impacts from new power plants to replace lost power.
Cultural resources	Impacts on cultural resources from ground-disturbing activities; new construction, excavation, or fill; inundation; altering existing facilities; altering the historic setting of a cultural resource; and introducing elements out of character with a cultural resource site.
Public health and environmental hazards	Increases in mosquito breeding habitat. Increases in risk of groundwater contamination from naturally occurring or spilled hazardous materials and from improper handling of hazardous materials; exposure to hazardous materials and waste from construction; and water quality degradation, resuspension of contaminants, and exposure to hazardous materials from wetland and levee activities, and placement of contaminated dredged spoils.
Visual resources	Visual impacts from construction activities, such as vegetation removal, construction of staging areas, night-time glare from construction lights, haul routes, and dust. **Presence of constructed linear and obtrusive features (such as levees, dams, and spillways), view obstructions, and a bathtub ring effect caused by fluctuating reservoir water levels; new levees and embankments that could visually dominate the surrounding flat, open landscape; and new facilities.** Degraded views in visually sensitive areas from Program actions, such as creating borrow pits for gravel replacement, installing fish screens in areas with high visual sensitivity, and altering timber harvesting practices.

Bold indicates a potentially significant unavoidable impact.

Table 3-5. Summary of Short- and Long-Term Associated Relationships with the Preferred Program Alternative

RESOURCE CATEGORY	RELATIONSHIPS
Water supply and water management	Short-term construction-related impacts may disrupt deliveries. Long-term improvements in supply and reliability.
Bay-Delta hydrodynamics and riverine hydraulics	No relationships identified. Changes in this category may cause impacts on other resources and are addressed in other resource categories.
Water quality	Short-term construction-related impacts. Long-term improvements in water quality.
Groundwater resources	No relationships identified.
Geology and soils	Short-term construction-related and long-term impacts, including ground disturbance, inundation, and changes to geomorphology. Long-term benefits resulting from reduced erosion, salinity, and soil subsidence.
Noise	Short-term noise from construction activities. No long-term increase in noise levels.
Transportation	Short-term construction-related impacts. Long-term adverse impacts, such as relocating or closing roads. Long-term benefits due to road improvements.
Air quality	Short-term construction-related impacts. No long-term effects.
Fisheries and aquatic ecosystems	Short-term construction-related impacts. Flow conveyance facilities and operations could result in short-term and long-term impacts. Long-term benefits to fish and aquatic ecosystems productivity could be realized with structural and operational changes.
Vegetation and wildlife	Short-term construction-related impacts. Long-term benefits to vegetation and wildlife resources.
Agricultural land and water use	Long-term benefits from increased irrigation water quality and supply reliability, and from levee protection. Long-term loss of agricultural land used for Program purposes.
Agricultural economics	No relationships identified.
Agricultural social issues	No relationships identified.
Urban land use	Short-term construction-related impacts. Long-term benefits from improved water quality and supply reliability.
Urban water supply economics	No relationships identified.
Utilities and public services	Short-term construction-related impacts. Long-term effects associated with increased demand for utilities and public services.
Recreation resources	Short-term construction-related impacts. Long-term benefits from improvements in other environmental resources. Long-term impacts on motorized boating in the Delta Region and possible stream inundation.
Flood control	Short- and long-term benefits from improved flood protection.
Power production and energy	Short-term construction-related impacts. Long-term decrease in power available to other users, requiring replacement power.
Regional economics	Short-term construction-related impacts. No long-term effects.
Cultural resources	Short-term construction-related impacts. Long-term benefits if lands with cultural resources are obtained and receive federal protection.
Public health and environmental hazards	Short-term construction-related impacts. Long-term benefits from improved water quality, flood control, water use efficiency, and fire management. Long-term adverse impacts due to increased mosquito breeding habitat.
Visual resources	Short-term construction-related impacts. Long-term improvements due to improvements in other environmental resources. Long-term adverse effects from constructed linear and obtrusive features and view obstructions.
Environmental justice	Short-term impact from reduction in agricultural lands and fewer opportunities for hunting and fishing. Long-term benefits from increases in agricultural- and recreation-related employment, and from fish and hunting opportunities.
Indian trust assets	Effects appear unlikely but must be determined at a project-specific level.

Table 3-6. Summary of Irreversible and Irretrievable Commitments of Resources Associated with the Preferred Program Alternative

RESOURCE CATEGORY	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS
Water supply and water management	Displacement of water supplies from one region or use to another region or use.
Bay-Delta hydrodynamics and riverine hydraulics	No commitments identified. Changes in this category may cause impacts to other resources as noted below.
Water quality	No commitments identified.
Groundwater resources	Long-term degradation from overdraft, subsidence, and contamination.
Geology and soils	Ground disturbance, inundation, and changes to downstream geomorphology. Commitments of construction material and land conversion.
Noise	No commitments identified.
Transportation	Displacement of roads.
Air quality	No commitments identified.
Fisheries and aquatic ecosystems	Reestablished habitat types under the Ecosystem Restoration Program; constructed elements for conveyance and storage that alter ecosystem structure and connectivity.
Vegetation and wildlife	Habitat losses from construction activities, changes in habitat types.
Agricultural land and water use	Conversion of agricultural land to other uses.
Agricultural economics	No commitments identified.
Agricultural social issues	No commitments identified.
Urban land and water use	Commitments of resources, such as construction material, labor, and energy for facilities. Conversion of small amounts of land currently in urban uses to other uses.
Urban water supply economics	Costs and resources committed to a fixed water supply structure are not easily reversed.
Utilities and public services	Increased demand on energy, utility infrastructure, and transmission line capacity.
Recreation resources	Increased recreation access and facilities, changes in boating access and circulation patterns in the Delta Region, and inundation of flowing streams and rivers from enlarging existing storage reservoirs.
Flood control	Improvements in levees, channel conveyance capacity, and other flood control features.
Power production and energy	Commitments of the nonrenewable energy resources needed to construct, implement, and maintain project structures and programs. Increase in project energy use at pumping plants would cause commitments of resources if nonrenewable resources are used to generate electricity for the pumping plants.
Regional economics	No commitments identified.
Cultural resources	Loss of cultural resources. Data recovery techniques ameliorate this loss, but cultural resources cannot be replaced or reproduced once they are lost, regardless of mitigation activities.
Public health and environmental hazards	Changes in amount of mosquito breeding habitat, levels of fuels that contribute to forest fires, and water supply to help fight forest fires.
Visual resources	Changes to visual settings caused by Program actions.
Environmental justice	No commitments identified.
Indian trust assets	No commitments identified.

Table 3-7. Summary of Potentially Significant Adverse Cumulative Impacts

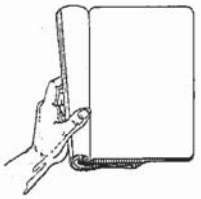
	PROGRAM REGION				
RESOURCE	DELTA	BAY	SACRAMENTO RIVER	SAN JOAQUIN RIVER	OTHER SWP AND CVP SERVICE AREAS
Water supply and water management	✓	✓	✓	✓	✓
Bay-Delta hydrodynamics and riverine hydraulics	✓	✓	✓	✓	
Water quality	**✔**	✓	✓	✓	✓
Groundwater resources	✓	✓	✓	✓	✓
Geology and soils	✓	✓	✓	✓	
Noise	✓	✓	✓	✓	
Transportation	**✔**		**✔**	**✔**	
Air quality	✓	✓	✓	✓	
Fisheries and aquatic ecosystems	**✔**	**✔**	✓	✓	
Vegetation and wildlife	✓	✓	**✔**	**✔**	
Agricultural land and water use	**✔**		**✔**	**✔**	
Urban land use	✓	✓			
Utilities and public services	✓		✓	✓	
Recreation resources	**✔**	✓	**✔**	**✔**	
Flood control	✓		✓	✓	
Power production and energy	✓	✓	✓	✓	✓
Cultural resources	✓	✓	✓	✓	
Public health and environmental hazards	✓	✓	✓	✓	
Visual resources	**✔**	✓	**✔**	**✔**	

Bold and larger font indicates a potentially significant cumulative impact that may be unavoidable given the level of information used for the programmatic analysis.

Chapter 4. Guide to Impact Analyses and Description of Land Use Assumptions

This chapter provides a road map for the impact analyses. It also explains some of the approaches used in assembling the range of land use changes that may occur as a result of CALFED Bay-Delta Program implementation.

4.1 GUIDE TO IMPACT ANALYSES 4-1
4.2 CEQA DOCUMENT REQUIREMENTS 4-8
4.3 ESTIMATED LAND USE CHANGES DUE TO THE PROGRAM 4-9



4. Guide to Impact Analyses and Description of Land Use Assumptions

4.1 GUIDE TO IMPACT ANALYSES

This chapter is included to help readers understand how the impact analyses are presented in Chapters 5, 6, and 7. Information on the environmental consequences of the alternatives presented in this document was derived primarily from a series of technical reports. These technical reports were prepared for many of the resource categories and form the basis for the affected environment and environmental consequences descriptions in the March 1998 Draft Programmatic EIS/EIR and Chapters 5, 6, and 7 of this report. Since the CALFED Bay-Delta Program (Program) alternatives described in this report incorporate elements of the alternatives presented in the March 1998 Draft Programmatic EIS/EIR and the impacts are similar, information in the technical reports was verified and used in these analyses—along with additional modeling runs for the operations and water supply, and updated information where it was available.

Because the Preferred Program Alternative was identified after the preparation of the March 1998 Draft Programmatic EIS/EIR, the Program decided to rewrite the Draft Programmatic EIS/EIR rather than simply update or supplement the March 1998 version. Comments received on the March 1998 Draft Programmatic EIS/EIR were catalogued, and many of the issues noted in those comments were incorporated into the revised program plans. Where possible, they are also identified and addressed in the impact analyses.

Resources evaluated in this Programmatic EIS/EIR have been grouped into three main categories, as illustrated in Table 4-1.

- Physical environment
- Biological environment
- Land use, social issues, and economics

To provide a quick visual reference for the reader, a topic illustration is included in the footer for each resource. For example, the reference illustration for the air quality resource impact analysis is a hot air balloon.

Table 4-1. Resource Categories Evaluated in the Final Programmatic EIS/EIR

CHAPTER 5
PHYSICAL ENVIRONMENT

- Water Supply and Water Management
- Bay-Delta Hydrodynamics and Riverine Hydraulics
- Water Quality
- Groundwater Resources
- Geology and Soils
- Noise
- Transportation
- Air Quality

CHAPTER 6
BIOLOGICAL ENVIRONMENT

- Fisheries and Aquatic Ecosystems
- Vegetation and Wildlife

CHAPTER 7
LAND USE, SOCIAL ISSUES, AND ECONOMICS

- Agricultural Land and Water Use
- Agricultural Economics
- Agricultural Social Issues
- Urban Land Use
- Urban Water Supply Economics
- Utilities and Public Services
- Recreation Resources
- Flood Control
- Power Production and Energy
- Regional Economics
- Cultural Resources
- Public Health and Environmental Hazards
- Visual Resources
- Environmental Justice
- Indian Trust Assets

The Program currently consists of multiple possible actions that are diverse, geographically dispersed, and described in general terms. Some or all of these actions will be carried out over the course of many years. In addition, the timing, location, and magnitude of many of the actions is not yet known, which results in some uncertainty regarding the precise outcome of Program actions. Consequently, the Program will be implemented in stages, using the information gained in each stage to modify and refine Program actions over time, within the framework of the Preferred Program Alternative. Given the uncertainties, the large scope of the Program area, and the conceptual nature of the proposed actions, the Program elected to prepare a Programmatic EIS/EIR.

This document provides a broad and comprehensive overview of the potential actions that could be taken by the Program. It describes, in a broad sense, the overall and long-term environmental consequences of all the potential proposed actions at the end of the Program's 30-year time span. This Programmatic EIS/EIR is structured to be used as a tiering document. Individual, second-tier projects can use this analysis as a basis from which to supplement and refine the level of detail and can incorporate by reference relevant provisions in the Programmatic EIS/EIR, such as the cumulative impacts. Mitigation strategies are included to address potentially significant adverse environmental impacts and will be applied to guide the formulation of project-level mitigation measures. Any subsequent actions or facility construction stemming from the programmatic actions in the Preferred Program Alternative must be developed in compliance with NEPA, CEQA, and other applicable laws and regulatory processes.

The organization of a typical resource discussion is depicted in Figure 4-1. The impact analysis for most resource categories is divided into several parts, including a summary, a description of the affected environment/existing conditions, and discussions of environmental consequences—including such topics as cumulative and growth-inducing impacts. Each of these divisions is explained more fully below.

Summary. The summary provides the conclusions of the detailed impact analysis. It gives an overview of the benefits and potentially significant adverse impacts that could result from implementing the Program, and lists possible mitigation strategies to lessen potentially significant impacts. Information presented in the summary for each resource is the basis for the summary comparison of impacts presented in Chapter 3. Tables in each resource section summarize the most significant adverse impacts and mitigation

strategies that apply to them. However, not all impacts and mitigation strategies are listed in the tables. Please see the text of each resource category for additional detail.

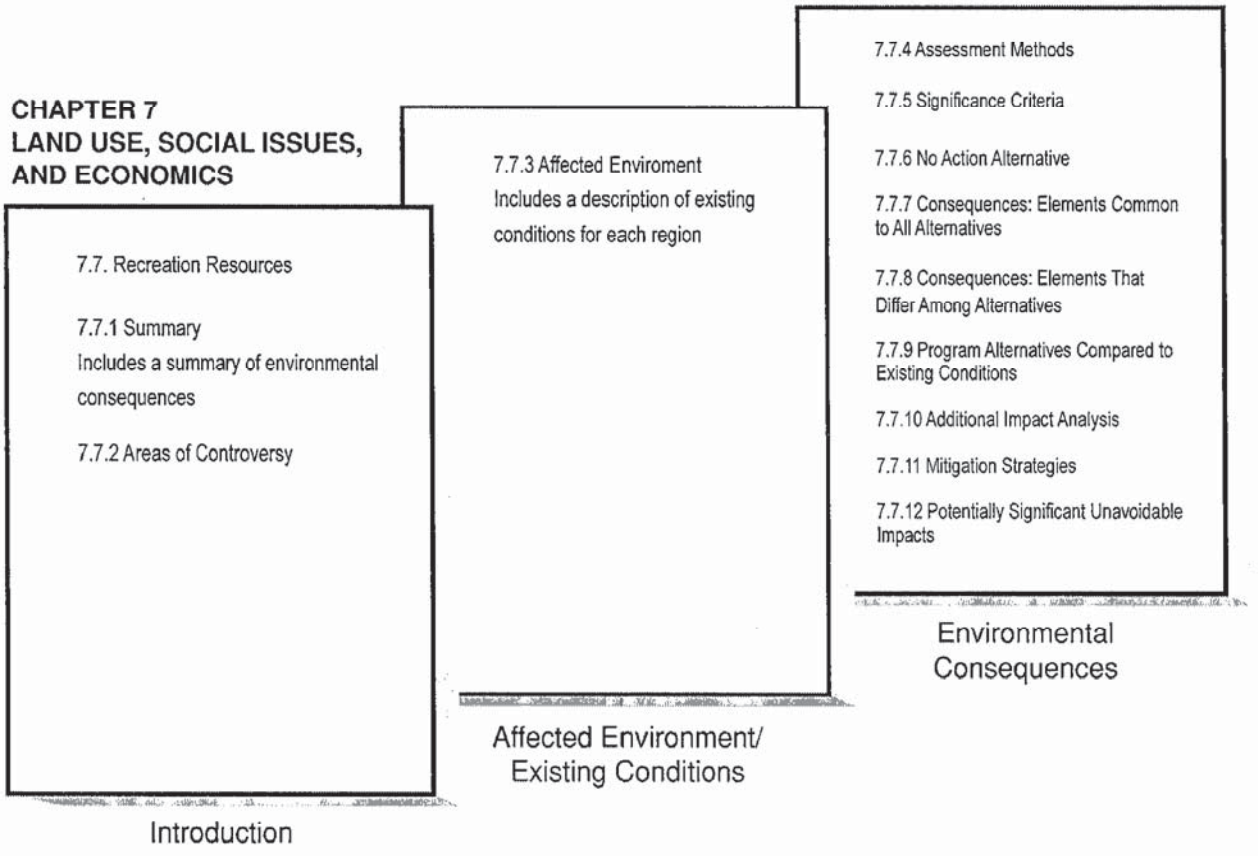


Figure 4-1. Organization of a Resource Discussion Using Recreation as the Example

Areas of Controversy. As used in CEQA, areas of controversy include differences of opinion among technical experts. The opinions of technical experts can differ, depending on which assumptions or methodology they use. Areas of controversy were identified by comments from CALFED agencies, public comments, and new information developed since the March 1998 Draft Programmatic EIS/EIR. For some resources, issues that do not meet areas of controversy as used in CEQA have been raised by a number of people. For recreation resources, for example, the effects on motorized boating in the Delta or of flooding free-flowing rivers by enlarging existing reservoirs are controversial issues but do not represent disagreement among the technical experts. These types of issues also are noted in the "Areas of Controversy" section. Although listing areas of concerns is not required by NEPA or CEQA, the Program decided to acknowledge concerns mentioned in the public review process. In most cases, the concerns are addressed in the impact analyses. In some cases, however, the concerns cannot be addressed at the programmatic level and will need to be addressed in second-tier documents.

Affected Environment/Existing Conditions. The "Affected Environment/Existing Conditions" section provides a historical perspective and an overview of the current conditions for each resource. The description of

current conditions uses verified information. The discussions are organized by region, in the following order:

- Delta Region
- Bay Region
- Sacramento River Region
- San Joaquin River Region
- Other SWP and CVP Service Areas

The regulatory framework that is part of the existing conditions can be found in Section 2 of Chapter 8, "Compliance with Applicable Laws, Policies, and Plans and Regulatory Framework."

Program regions are combined into a single discussion when their existing conditions/affected environment discussions are similar. Upper watershed descriptions for each resource are discussed, where relevant, under the various regions.

Assessment Methods. Descriptions of assessment methods are resource specific, and provide the approach used to identify and assess the environmental consequences for the resource category. Analytical models used in the evaluation also are identified.

Significance Criteria. The threshold of significance for many of the environmental resources discussed in this impact analysis is described in qualitative terms and covers a broader spectrum of impacts than would be included in a site-specific, project-level analysis. This is in part because the Program covers a wide variety of types of actions that will take place in many different physical settings over a 30-year period. Consequently, the thresholds for most resources cannot be established with a precise, quantitative measurement. The measure of significance will vary depending on the nature and type of the proposed actions, the site characteristics where the actions take place, and how they affect the existing conditions at the time of the proposed actions. The thresholds used in this Programmatic EIS/EIR are intended to identify potentially significant impacts at a programmatic level and to provide guidance for developing significance criteria at the second tier. The thresholds also provide a tool to predict whether it is likely that the impacts identified as potentially significant at the programmatic level can be avoided, reduced, or mitigated to a less-than-significant level.

No Action Alternative. This section presents the environmental consequences of the No Action Alternative compared to existing conditions. The No Action Alternative makes predictions about the future condition of environmental resources, taking into consideration recently constructed projects and projects proposed for construction. For the No Action Alternative, assumptions based on current expectations are made about existing trends that may continue into the future and about future water project operations. For example, urbanization that is expected to continue would require additional land and water resources, with consequences on a variety of environmental resources. A list of projects included in the No Action Alternative impact analysis and water operation modeling assumptions are provided in Attachment A.

The impacts of each of the four Program alternatives are compared to both the No Action Alternative and the existing conditions/affected environment in Chapters 5, 6, and 7, of the impact analysis section of this Programmatic EIS/EIR. Under the No Action Alternative, it is assumed that certain changes in the environment will occur regardless of whether any of the Program alternatives are implemented. For example, it is anticipated that trends in population growth and urbanization will continue, but the rate at which these trends will continue and the locations where they will occur cannot be projected except very generally. The same is true for any environmental impacts caused by growth and urbanization. It is

likely that these changes would result in potentially significant impacts on the resources evaluated (land use, air quality, water quality, vegetation and wildlife, fisheries, and others), but there is no accurate way to predict how severe those impacts may be or where they will occur.

Because of the broad programmatic nature of the project, the 30-year planning horizon, and the inability to precisely predict future conditions, it is difficult to distinguish in any meaningful way the differences between the conditions under the No Action Alternative and existing conditions. Consequently, the environmental impacts of the actions included in the Program alternatives when compared to existing conditions are described as being very similar to the impacts of those alternatives when compared to what is expected to happen under a future no-action scenario.

Program Alternatives. This section presents the consequences of the four Program alternatives.

Social and economic changes resulting from a project are treated somewhat differently under CEQA and NEPA. CEQA does not treat economic or social changes resulting from a project as significant effects on the environment. However, if a physical change in the environment is caused by economic or social effects, the physical change may be regarded as a significant effect when using the same criteria for other physical changes from the project. In addition, economic and social effects of a project may be used to assess the significance of a physical effect. Under NEPA, economic or social effects must be discussed if they are inter-related to the natural or physical environmental effects of a project. Economic and social effects are presented and methods to avoid or reduce adverse social and economic effects are addressed, as applicable, in the text of each environmental consequences chapter in the Programmatic EIS/EIR.

For most resources, the Levee System Integrity Program actions would affect only the Delta and Bay Regions, and the program is not discussed for other Program regions. The Levee System Integrity Program impacts on Suisun Marsh are discussed under the "Bay Region."

Because of the system-wide nature of the resource, the power and energy section is presented in a system-wide format. The water supply and Bay-Delta hydrodynamics and riverine hydraulics sections modify the definition of the San Joaquin River Region and the Other SWP and CVP Service Areas to better describe consequences affecting water supplies and flows in those regions.

Program Elements with Consequences Common to All Alternatives. This section presents the environmental consequences of the Program elements that are similar to all alternatives. Generally, the environmental consequences of all Program elements are the same for each alternative. This description of environmental consequences also is presented by Program region. For brevity, regions are combined when environmental consequences are similar.

Program Elements with Consequences That Differ Among Alternatives. The consequences of Program elements that differ among the alternatives primarily are associated with conveyance in the Delta Region; therefore, this section is presented by alternative rather than by region. Other regions are included as subsections, where applicable. For brevity, Program regions are combined where environmental consequences are similar.

Program Alternatives Compared to Existing Conditions. Under CEQA, the existing conditions are normally the baseline for comparison of the effects of the project and are presented in this section. This discussion ensures that all potentially significant impacts are identified. In most cases, because of the programmatic nature of the environmental assessment and the long planning horizon, the conditions present under the existing conditions baseline are similar to those under the No Action Alternative. In these situations,

differences between existing conditions and No Action Alternative cannot be distinguished in a meaningful way at the programmatic level, and the results of comparison of each alternative to the No Action Alternative and to existing conditions are the same. Where potential meaningful differences exist between the comparison to existing conditions and the No Action Alternative, the differences are identified and discussed in the this section.

Additional Impact Analysis. Four other topics are included in the impact analysis: cumulative impacts, growth-inducing impacts, the relationship between short-term uses of the environment and maintaining and enhancing long-term productivity, and irreversible and irretrievable commitments of resources. A summary of each of these topics is included in Chapter 3, and they are described below.

Cumulative Impacts. Cumulative environmental impacts must be addressed in EIRs and EISs under both CEQA and NEPA. NEPA defines cumulative impacts as those impacts that result from the "incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency...or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The definition of cumulative impacts under CEQA is similar: "Cumulative impacts refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Attachment A to this Programmatic EIS/EIR contains a list of other projects and activities considered in the cumulative impact analysis.

The analysis of cumulative impacts in this document considers the long-term environmental impacts of the CALFED Program, including those that would be less than significant, together with similar impacts of other projects. The other projects reviewed for this analysis are listed in Attachment A. Since the CALFED Program actions will affect a large geographic area over a 30-year time frame, many impacts of the Program that might not be significant in a short-term, site-specific analysis are treated as significant at this programmatic level of review. No additional environmental impacts that individually would be minor, but collectively significant, were identified. As a result, the analysis of the Project's contribution to cumulative impacts is very similar to the analysis of its long-term impacts. The mitigation strategies identified for the CALFED Program impacts are also applicable to mitigate the CALFED Program's cumulative impacts.

The CALFED Program involves the approval of a program to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The Program is a general description of a range of actions that will be further refined, considered, and analyzed for site-specific environmental impacts as part of second- and third-tier environmental documents prior to making a decision to carry out these later actions. The Programmatic EIS/EIR focuses on a general overview of cumulative impacts and associated mitigation measures. Because this Programmatic EIS/EIR does not analyze the site-specific impacts of any projects, a detailed analysis of the Program's contributions to cumulative impacts and the methods to mitigate the cumulative impacts of second-tier projects tiering from this Programmatic EIS/EIR is not possible for most resource categories.

Later EIRs and EISs will incorporate the relevant cumulative and long-term impact analyses of this programmatic document and add detail about specific projects and their contribution to cumulative impacts. Any significant environmental impacts, including contributions to a cumulative impact, that this Programmatic EIS/EIR does not address will be evaluated in subsequent environmental reviews.

In general, the analysis of cumulative impacts is qualitative. Impacts were identified based on: (1) information extracted from existing environmental documents or studies for the resource categories

potentially affected by each project, and (2) knowledge of expected effects of similar projects in the study area. Because of the preliminary phase of most of the projects considered (environmental reviews may not have been initiated, drafted, or finalized), comparable environmental information for identifying cumulative impacts was sparse.

Chapter 3 contains a table that identifies, by region, the resource category where potentially significant cumulative adverse impacts resulting from the incremental impact of the Preferred Program Alternative, when added to the impacts of applicable projects and activities listed in Attachment A, are anticipated.

Growth-inducing Impacts. This section discusses the growth-inducing impacts that may result from implementation of the CALFED Program. Discussions of whether additional water supplies and/or improvements in water supply reliability cause growth-inducing impacts often result in differences of opinion among experts; therefore, this topic is considered an area of controversy as used in CEQA. Because this issue cannot be predicted with certainty, for this programmatic level of analysis, the assumption was made that any increase in water supplies and/or improvements in water supply reliability that are associated with the Program would stimulate growth, as discussed in Section 5.1. The effect of the Preferred Program Alternative on the majority of the resources discussed in this document will not induce additional growth; however, these resources could be affected by additional growth. At this programmatic level, it is unknown where any increases in population growth or construction of additional housing would take place, or what level of growth might be associated with improved water supply reliability/availability. Accordingly, it is premature to speculate on how this new growth would affect resources. When and if growth occurs, changes resulting from growth will be subject to local land use decisions by individual cities and counties. Future development at the local level is guided by many considerations, only one of which is the reliability of water supply. These other factors include the policies in local general plans and zoning ordinance restrictions; the availability of a wide range of community services and infrastructure, such as sewage treatment facilities and transportation infrastructure; the availability of developable land; the types and availability of employment opportunities; and the analysis and conclusions based on an environmental review of proposed projects pursuant to CEQA. These local land use decisions and the environmental impacts associated with these site-specific decisions are outside the scope of this Programmatic EIS/EIR but can and should be considered by the local governments acting on future development proposals.

For the chapters that address agricultural economics, agricultural social issues, urban water supply economics, regional economics, environmental justice, and Indian trust assets, the section is entitled "Growth-Inducing Effects" because social and economic changes from a project are treated somewhat differently under CEQA and NEPA.

Relationship Between Short-Term Uses and Long-Term Productivity. This section discusses the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. Resource-specific summaries of the short-term uses in the project areas and the maintenance and enhancement of long-term productivity in those areas are provided.

Irreversible and Irretrievable Commitments. This section fulfills the requirement to address irreversible and irretrievable commitments of resources. Irreversible impacts are those that cause, through direct or indirect effects, use or consumption of resources in such a way that they cannot be restored or returned to their original condition despite mitigation. If unavoidable, potentially irreversible impacts are documented in this report. An irretrievable impact or commitment of resources occurs when a resource is removed or consumed. These types of impacts are evaluated to ensure that consumption is justified.

Mitigation Strategies. Because this Programmatic EIS/EIR does not evaluate site-specific actions, no specific mitigation measures are presented. Instead, general mitigation strategies are identified as ways to avoid, minimize, restore, or compensate for potentially significant adverse impacts. For some resources, specific mitigation measures are provided as examples to display the array of techniques available in order to carry out the strategy. For example, construction activities can cause erosion of soils that leads to adverse impacts on water quality. A mitigation strategy would be to avoid and minimize the impact. Mitigation measures available to carry out this strategy include conducting work during dry periods and using erosion-control fencing or straw bales, water detention basins, and so forth.

The economic and social information analyses (agricultural economics, agricultural social issues, urban water supply economics, regional economics, and environmental justice) do not contain a separate mitigation strategies section. However, the Program has presented possible methods to alleviate potential adverse effects on these resources in the discussion of potential effects.

Potentially Significant Unavoidable Impacts. The final section is a discussion of potentially significant unavoidable impacts for each resource category. This section identifies potentially significant adverse impacts that are anticipated to remain significant even after implementing mitigation strategies and measures. For the economic and social information analyses, this section is titled "Adverse Effects."

4.2 CEQA DOCUMENT REQUIREMENTS

CEQA requires that certain subjects be documented in an environmental impact analysis. The following explanation is provided to assist the reader in locating these subjects. The locations of discussions about the subjects are noted following each subject.

- Environmental setting. Descriptions of the affected environment that are relevant to each resource area addressed are included in each resource chapter, in Chapters 5, 6, and 7. This section includes discussions of historical and existing conditions.

- The significant environmental effects of the proposed project. Chapter 3 provides a table of all potentially significant environmental effects of the Preferred Program Alternative. The potentially significant environmental effects of each of the alternatives are discussed by resource category in Chapters 5, 6, and 7.

- Any potentially significant environmental effects that cannot be avoided if the proposal is implemented. Each environmental resource category begins with a summary. Potentially significant environmental effects that cannot be avoided are noted in these summaries.

- Cumulative impacts. Cumulative impacts are addressed in each environmental resource category in Chapters 5, 6, and 7. The potentially significant environmental effects that cannot be avoided are discussed by environmental resource category in Chapters 5, 6, and 7.

- Mitigation measures proposed to minimize the potentially significant effects. Since this is a programmatic EIS/EIR, site-specific actions are not evaluated. Accordingly, no specific mitigation measures are presented, but general mitigation strategies and a general mitigation monitoring plan are provided. Mitigation strategies can be found in the summaries and text for each environmental resource in Chapters 5, 6, and 7. The proposed NEPA/CEQA monitoring is presented in Chapter 9.

- Alternatives to the proposed action including the No Action (or "No Project") Alternative and the environmentally superior (or "environmentally preferable") alternative. Chapter 2 describes alternatives, and Section 2.3 discusses the environmentally superior alternative.

- Growth-inducing impacts of the proposed action. These impacts are discussed in Chapter 3 and addressed in the environmental resource categories in Chapters 5, 6, and 7.

- The relationship between local short-term uses of mankind's environment and the maintenance and enhancement of long-term productivity. This relationship is summarized in Chapter 3 and addressed in the environmental resource categories in Chapters 5, 6, and 7.

- Any significant irreversible environmental changes that would be involved in the proposed action should it be implemented. These changes are discussed in Chapter 3 and addressed in the environmental resource categories in Chapters 5, 6, and 7.

- Summary (with major conclusions, areas of controversy, and issues to be resolved). A summary is included in each impact analysis for all environmental resource categories.

- Program description. The Program description is found in Chapter 1. This discussion includes the Program purpose and need, Program goals and objectives, Program solution principles, Program study area and geographic scope, and the next steps in the process.

4.3 ESTIMATED LAND USE CHANGES DUE TO THE PROGRAM

Because of the general and programmatic nature of this document, it is impossible to specifically define the land use changes that will result from implementing the Program. The extent and specific locations of the Program actions have yet to be decided. To evaluate the environmental consequences of Program actions at a programmatic level, it is necessary to estimate the amount of land that could be disturbed by Program actions. The Program identified the maximum ranges of acreage that could be affected by the various Program elements to give decision makers and the public a sense of the "worst-case" land use impact.

Although impacts in the range of these acreage estimates are theoretically possible, the affected acreage likely would be considerably less because these estimates do not include reductions in the land use changes that could take place based on measures that may be implemented in Phase III to avoid, minimize, or mitigate these changes.

Because the Ecosystem Restoration Program actions could affect the largest amount of land, particularly agricultural lands, information is offered to illustrate actions that could be taken during Phase III to minimize the extent of lands, particularly in the Delta, adversely affected by the Program. The environmental, economic, and social consequences of these proposed land use changes and other adverse and beneficial impacts associated with the Program can be found in Chapters 5, 6, and 7.

Estimated land use changes are presented here to provide a system-wide perspective regarding potential land use conversions and to reduce repetition in the document. These changes also are discussed in Chapters 5, 6, and 7 as appropriate.

Other Program elements most likely to influence land use changes are water quality, levee system integrity, storage, and conveyance. The Water Transfer Program may influence land use changes if transfers from agriculture to urban or environmental uses are facilitated by the program. The extent of these potential changes are not known at the present time; therefore, no estimates of land changes relating to these programs are presented. Water Use Efficiency and Watershed Program measures are not expected to directly affect current land uses; therefore, no estimates of land changes relating to these programs are presented.

4.3.1 ECOSYSTEM RESTORATION PROGRAM

Table 4-2 summarizes the actions currently contemplated, along with estimates of the acreage that could be affected by each action.

Table 4-2. Estimate of Land Area Affected by the Ecosystem Restoration Program (in acres)

HABITAT TYPE	BAY REGION	DELTA REGION	SACRAMENTO RIVER REGION	SAN JOAQUIN RIVER REGION
Tidal perennial aquatic	1,500	7,000	0	0
Tidal perennial aquatic (shoals)	0	500	0	0
Nontidal perennial aquatic	1,600	2,600	0	0
Tidal sloughs	300-400	700-1,600	0	0
Midchannel islands	0	200-800	0	0
Fresh emergent wetland (tidal)	0	30,000-45,000	0	0
Fresh emergent wetland (nontidal)	0	17,000	0	0
Seasonal wetland	1,000-1,500	28,000	0	0
Riparian	200-300	1,200-1,900	3,600	5,400-5,900
Saline emergent wetland (tidal)	7,500-12,000	0	0	0
Stream meander corridor	0	0	15,000	1,000
Perennial grassland	5,000	4,000-6,000	0	0
Total acres	**17,100-22,300**	**91,200-110,400**	**18,600**	**6,400-6,900**

Note:
Ongoing Program refinement has shifted restoration acres among the regions and reduced the total acres required since publication of the June 1999 Draft Programmatic EIS/EIR.

The Ecosystem Restoration Program would coordinate and assist in restoration activities currently under way and future activities outside the Ecosystem Restoration Program that could lead to the habitat restoration goals identified in the program. For example, actions under the Central Valley Project Improvement Act and the Central Valley Habitat Joint Venture are designed to protect and restore significant areas of land in the Central Valley. To the extent that these activities and programs establish

habitat that is also proposed in the Ecosystem Restoration Program, the amount of land needed to achieve the Ecosystem Restoration Program goals would be reduced.

The Program would take a variety of steps to reduce effects on farmland, including:

- Implementation of the Ecosystem Restoration Program would occur over many years. The implementation process would include extensive local community, landowner, and stakeholder involvement.
- The Program would obtain easements on existing farmland that would allow for continued farming with minor changes in agricultural practices, thus increasing the value of the crops to wildlife.
- Habitat restoration efforts would focus first on developing habitat on public land where appropriate.
- If no public land is available, restoration efforts would focus next on land acquired from willing sellers and that provides substantial benefits for ecological processes, habitat, or species.
- Where small parcels of land are needed for waterside habitat, acquisition efforts would seek out points of land on islands where the ratio of levee miles to acres farmed is high.
- Where possible, floodplain restoration efforts would include provisions for continued agricultural practices.

4.3.2 WATER QUALITY PROGRAM

Facilities to control and treat various discharge effluents would directly affect current land uses. The extent and locations of these facilities are unknown at this time; consequently, the acreage that could be affected cannot be forecast in a meaningful way. These facilities will need to be evaluated for environmental impacts when the facilities are being planned.

Land retirement is not a specific objective of the CALFED Water Quality Program. However, it is a tool available to help meet the program's water quality objectives in the San Joaquin Valley that are aimed at controlling degradation from selenium associated with agricultural drainage. Land retirement along the west side of the San Joaquin River watershed is included in the CALFED No Action Alternative to reflect actions planned by the federal government under the Central Valley Project Improvement Act (CVPIA). These actions would occur irrespective of the CALFED Program. As outlined in the Water Quality Program Plan, other water quality management tools will be used to their fullest extent before any land retirement is initiated under the CALFED Program. As outlined in the Water Quality Program Plan, CALFED initially will focus on implementing water quality management tools that will retain current agricultural lands in agricultural production. If the salinity objectives in the program plan are not met using those tools, non-sustainable measures such as land retirement could be initiated under the CALFED Program. The selected non-sustainable measures should retain much of the current agricultural lands in production.

Should land retirement still be deemed necessary, CALFED would consider implementing a program to retire lands in order to help meet water quality objectives for selenium under a tiered approach. Initially, up to 3,000 acres of land in the San Joaquin Valley with the greatest concentrations of selenium could be

retired. If that is insufficient, land retirement would be expanded up to a total of 37,000 acres with high selenium concentrations. These values are based on the report titled "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley," a collaboratively published report coordinated by Reclamation and published in September 1990. The report is commonly referred to as the "Rainbow Report."

The tiered approach to land retirement is intended to limit the need for land retirement to the least amount necessary in order to meet the water quality objectives.

4.3.3 Levee System Integrity Program

Levee restoration would cause both temporary and permanent land disturbance near existing levees. Land disturbed temporarily during construction would be restored through revegetation and likely would return to preconstruction conditions. These temporary losses are estimated at between 1,000 and 1,500 acres. Other land would be permanently affected by the larger footprint of the new levees. Levee reconstruction could require approximately 15,000 acres. About 625 of the 1,100 miles of Delta levees would be upgraded, and a 200-foot-wide piece of land is needed for each levee mile. The Program also projected that 100 miles of setback levees could be constructed, affecting an area 500 feet wide per levee mile. Subsidence control could affect about 14,000 acres. In total, an estimated range of 34,000-35,000 acres could be permanently affected by the Levee System Integrity Program. These estimates are the upper range of the possible acreage that could be affected. The Program will refine these estimates as the process continues.

Suisun Marsh levee restoration also would result in land disturbance. Assuming a similar footprint as the Delta levees, restoration of the Suisun Marsh levees could affect from 5,000 to 5,600 acres. Affected land uses are primarily wildlife habitat.

4.3.4 Storage

Acreage permanently affected by constructing or modifying storage facilities would be determined by the number, size, and location of sites eventually selected for those facilities. A range of additional groundwater storage also is included in the alternatives. Table 4-3 shows preliminary calculations of land that could be affected by the footprint of new storage facilities. Several representative storage sites were examined to provide a better perspective on the potential magnitude of land use changes, as well as other storage-related consequences. Estimates do not include land that might be affected outside the reservoir footprint, such as water diversion structures, canals, pipes, and access roads. The actual areas and land uses that would be affected depend on the siting, design, and operation of the reservoir. This information will be developed in subsequent project-specific environmental documents.

The following sites were investigated as examples for preliminary land use change analysis in this document:

- Sites/Colusa and Thomes-Newville Reservoir sites were selected to represent surface water storage on Sacramento River tributaries. Assuming a storage capacity of 3 MAF, the potential land affected by a new reservoir could range from 16,700 acres (Thomes-Newville) to 29,600 acres (Sites/Colusa). This range is included in the Sacramento River Region in Table 4-3.

- The Montgomery Reservoir site was the representative example for surface water storage on San Joaquin River tributaries. Assuming a storage capacity of 500 thousand acre-feet (TAF), the land that would be affected by a new reservoir at this site was estimated at 8,050 acres. This value is included in the San Joaquin River Region in Table 4-3.

- Groundwater storage was estimated at 1,500 acres in both the Sacramento River and San Joaquin River Regions. These values are included in the respective regional areas in Table 4-3.

- The Los Vaqueros Reservoir site was the example for the surface water storage off-aqueduct option. Assuming a storage capacity of 1 MAF, the potential land affected by enlarging the existing reservoir was estimated at 7,000 acres. This value is included in the San Joaquin River Region in Table 4-3.

- Victoria, Bacon, Holland, and Woodward Islands were the example sites for the in-Delta storage. The islands occupy an area of 18,000-19,500 acres. It is estimated that a storage facility on these islands would affect approximately 15,000 acres. These values are included for the Delta Region in Table 4-3.

4.3.5 CONVEYANCE

The estimated amounts of land area (for example, agriculture, and fish and wildlife habitat) that would be affected by conveyance features are shown in Table 4-3. Additional lands may be necessary for new facilities and related infrastructure, such as access roads. Estimates do not include land that might be affected outside the reservoir site.

Table 4-3. Estimates of Land Area Affected by Storage and Conveyance (in acres)

	DELTA REGION		SACRAMENTO RIVER REGION	SAN JOAQUIN RIVER REGION	ALL REGIONS
ALTERNATIVE	STORAGE [a,c]	CONVEYANCE	STORAGE [a]	STORAGE [a]	TOTAL
PPA [b]	0-15,000	100-4,500	0-32,000	0 to16,600	100-68,100
1	0-15,000	100-700	0-32,000	0 to16,600	100-64,300
2	0-15,000	4,000-4,500	0-32,000	0 to16,600	4,000-68,100
3	0-15,000	4,500-6,000	0-32,000	0 to16,600	4,500-69,600

Notes:
PPA = Preferred Program Alternative.

- Estimates assume that channel capacity is enlarged by using setback levees. For each configuration, the estimate of land area associated with conveyance changes is based on the following: operable barriers and channel modifications—100-700 acres; screened intake on the Sacramento River and north Delta channel modifications—3,500-3,800 acres; and isolated open channel (45 miles long and 1,000 feet wide)—4,000-5,000 acres. Range of storage is the same for all alternatives. The upper end of the range reflects the variation possible, depending on which size reservoir is eventually selected.

- Ongoing Program refinement has modified these estimates since publication of the June 1999 Draft Programmatic EIS/EIR.

[a] Estimates do not include lands that might be affected outside the reservoir site.
[b] The Preferred Program Alternative conveyance estimate ranges from without the diversion facility on the Sacramento River to including a facility.
[c] This figure, based on conjectural projects, could increase about 1,000 acres if the proposed Delta Wetlands Project, as currently configured, is approved, built, and used for CALFED purposes.

4.3.6 IMPORTANT FARMLAND

Program activities could affect lands designated as prime farmland, unique farmland, and farmland of statewide importance. Table 4-4 (at the end of the chapter) summarizes the acreages by farmland type that could be affected by the Program. Except as noted, the acreage estimates assume that all Program activities would occur on these three types of farmland.

In addition to the long-term land use changes, the Program expects that construction activities will result in temporary conversion of additional agricultural land. Mitigation necessary to offset impacts on wildlife as a result of implementing the levee system integrity, water quality, conveyance, and storage elements may also affect agricultural lands. These additional acres of agricultural land are included in the range of acres presented in Table 4-4.

The mitigation strategies presented in each environmental resource category are guidelines for formulating measures that may be chosen by CALFED agencies or other implementing agencies in second-tier environmental reviews, which will be completed before post-ROD project actions occur. Specific mitigation measures will depend on project location, site impacts, size of the project, and other variables that cannot be determined at a programmatic level. Mitigation measures will be included, if a significant impact is identified, in these second-tier environmental documents. Implementing some mitigation measures could result in additional environmental effects, as a result of the mitigation measures themselves. However, until site-specific projects are analyzed and specific mitigation measures are selected, it is not possible to identify these additional effects at this time. Mitigation measures for these potential secondary effects also will be addressed in second-tier environmental documentation.

The mitigation strategies are designed to reduce and mitigate the Program-wide impacts associated with conversion of agricultural land as the Program is implemented through tiered, second-level projects. As the Program is implemented, project-level mitigation measures will be included to address the impacts of conversion of agricultural lands, as applicable to the site-specific conditions of each project. Until it is known which sites will be subject to specific Program projects, and what the proposals for specific locations are, it is difficult to identify the most appropriate and effective mitigation measures. Not all mitigation measures will be applicable to all projects because site-specific projects will vary in purpose, location, timing, and scope.

Table 4-4. Estimates of Important Farmland Potentially Converted by Program Elements (in acres)

		ECOSYSTEM RESTORATION PROGRAM [b]			LEVEE SYSTEM INTEGRITY PROGRAM [b,e]			STORAGE [b,c,g,h]			CONVEYANCE [b,e,f]			WATER QUALITY PROGRAM [a,b,d]	
ALTERNATIVE/REGION		P	S	U	P	S	U	P	S	U	P	S	U	0	TOTAL
PPA	Delta	85,800-101,600	3,200-6,500	1,400-3,500	31,000	2,500-3,000	500-1,000	0-14,000	0-1,000	0	100-3,800	0-200	0-500	0	124,500-166,100
	Sacramento River	21,700-28,800	3,300-3,900	600-1,300	0	0	0	0	0	0	0	0	0	0	25,600-34,000
	San Joaquin River	3,500-5,000	400-500	100-300	0	0	0	0	0	0	0	0	0	37,000	41,000-42,800
	Total	111,000-135,400	6,900-10,900	2,100-5,100	31,000	2,500-3,000	500-1,000	0-14,000	0-1,000	0	100-3,800	0-200	0-500	37,000	191,100-242,900
1	Delta	85,800-101,600	3,200-6,500	1,400-3,500	31,000	2,500-3,000	500-1,000	0-14,000	0-1,000	0	100-300	0-100	0	0	124,500-162,000
	Sacramento River	21,700-28,800	3,200-3,900	600-1,300	0	0	0	0	0	0	0	0	0	0	25,500-34,000
	San Joaquin River	3,500-5,000	400-500	100-300	0	0	0	0	0	0	0	0	0	37,000	41,000-42,800
	Total	111,000-135,400	6,900-10,900	2,100-5,100	31,000	2,500-3,000	500-1,000	0-14,000	0-1,000	0	100-300	0-100	0	37,000	191,100-238,800
2	Delta	85,800-101,600	3,200-6,500	1,400-3,500	31,000	2,500-3,000	500-1,000	0-14,000	0-1,000	0	3,500-3,800	100-200	400-500	0	128,400-166,100
	Sacramento River	21,700-28,800	3,200-3,900	600-1,300	0	0	0	0	0	0	0	0	0	0	25,500-34,000
	San Joaquin River	3,500-5,000	400-500	100-300	0	0	0	0	0	0	0	0	0	37,000	41,000-42,800
	Total	111,000-135,400	6,900-10,900	2,100-5,100	31,000	2,500-3,000	500-1,000	0-14,000	0-1,000	0	3,500-3,800	100-200	400-500	37,000	195,000-242,900
3	Delta	85,800-101,600	3,200-6,500	1,400-3,500	31,000	2,500-3,000	500-1,000	0-14,000	0-1,000	0	4,000-4,800	300-900	200-300	0	128,900-167,600
	Sacramento River	21,700-28,800	3,200-3,900	600-1,300	0	0	0	0	0	0	0	0	0	0	25,500-34,000
	San Joaquin River	3,500-5,000	400-500	100-300	0	0	0	0	0	0	0	0	0	37,000	41,000-42,800
	Total	**111,000-135,400**	**6,900-10,900**	**2,100-5,100**	**31,000**	**2,500-3,000**	**500-1,000**	**0-14,000**	**0-1,000**	**0**	**4,000-4,800**	**300-900**	**200-300**	**37,000**	**195,400-244,400**

Notes:

PPA = Preferred Program Alternative.

Types of Farmland

- Prime (P): Land with the best combination of physical and chemical features for the production of agricultural crops.
- Statewide importance (S): Land with a good combination of physical and chemical features for the production of agricultural crops.
- Unique (U): Land of lesser quality soils used for the production of the state's leading agricultural cash crops.

[a] Acreages of farmland of statewide importance cannot be accurately estimated at this time because mapping has not been completed in the San Joaquin River Region. It is possible that farmland of statewide importance would be affected by the Water Quality Program in the Grasslands area of the San Joaquin River Region.

[b] Estimates assume that all land conversion occurs on lands currently in use for agricultural purposes.

[c] Outside the Delta, estimates assume that potential storage reservoirs sites are typically foothill grasslands and do not contain significant amounts of important farmland; small amounts of important farmland could be affected if reservoirs are sited in valleys containing alluvial deposits that support important agricultural farmland.

[d] Total includes maximum acreage potentially affected by the Water Quality Program.

[e] Estimates assume that all Delta channel capacity is enlarged by constructing setback levees.

[f] The Preferred Program Alternative estimate ranges from without the diversion facility on the Sacramento River to including a facility.

[g] In-Delta storage, based on conjectural projects, could increase by about 1,000 acres if the proposed Delta Wetlands Project, as currently configured, is approved, built, and used for CALFED purposes.

[h] Estimates do not include land that might be affected outside the reservoir footprint, such as access roads and appurtenant project facilities.

Modifications to acreage estimates presented in Tables 4-2 and 4-3 are not included in this table. In comparison to the June 1999 Draft Programmatic EIS/EIR, total acreage of important farmlands affected by the Ecosystem Restoration Program has been reduced by approximately 2% in all alternatives; the acreage necessary for Delta conveyance features for Alternative 1 has increased by less than 1%. *These minor changes do not appreciably alter the impacts on important farmland that were presented in the June 1999 Draft Programmatic EIS/EIR.* Accordingly, the description of impacts in this table and in the many resource sections remains the same as those in the June 1999 Draft Programmatic EIS/EIR.