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Western Water Policy Review Advisory
Commission (1997)

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Sacramento-San Joaquin River Basin Study

Sue McClurg

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Sacramento-San Joaquin River Basin Study

Sue McClurg
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Sacramento, California

Special Thanks to Rita Schmidt Sudman

**Report to the Western Water
Policy Review Advisory Commission**

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Policy Review Advisory Commission

August 1997

The Western Water Policy Review Advisory Commission

Under the Western Water Policy Review Act of 1992 (P.L. 102-575, Title XXX), Congress directed the President to undertake a comprehensive review of Federal activities in the 19 Western States that directly or indirectly affect the allocation and use of water resources, whether surface or subsurface, and to submit a report of findings to the congressional committees having jurisdiction over Federal Water Programs.

As directed by the statute, the President appointed the Western Water Policy Review Advisory Commission. The Commission was composed of 22 members, 10 appointed by the President, including the Secretary of the Interior and the Secretary of the Army, and 12 members of Congress serving *ex-officio* by virtue of being the chair or ranking minority member of the 6 congressional committees and subcommittees with jurisdiction over the appropriations and programs of water resources agencies. A complete roster is provided below.

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Albuquerque, New Mexico

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This is an Independent Report to the Commission

The report published herein was prepared for the Commission as part of its information gathering activity. The views, conclusions, and recommendations are those of the author(s) and are not intended to represent the views of the Commission, the Administration, or Members of Congress serving on the Commission. Publication by the Commission does not imply endorsement of the author's findings or recommendations.

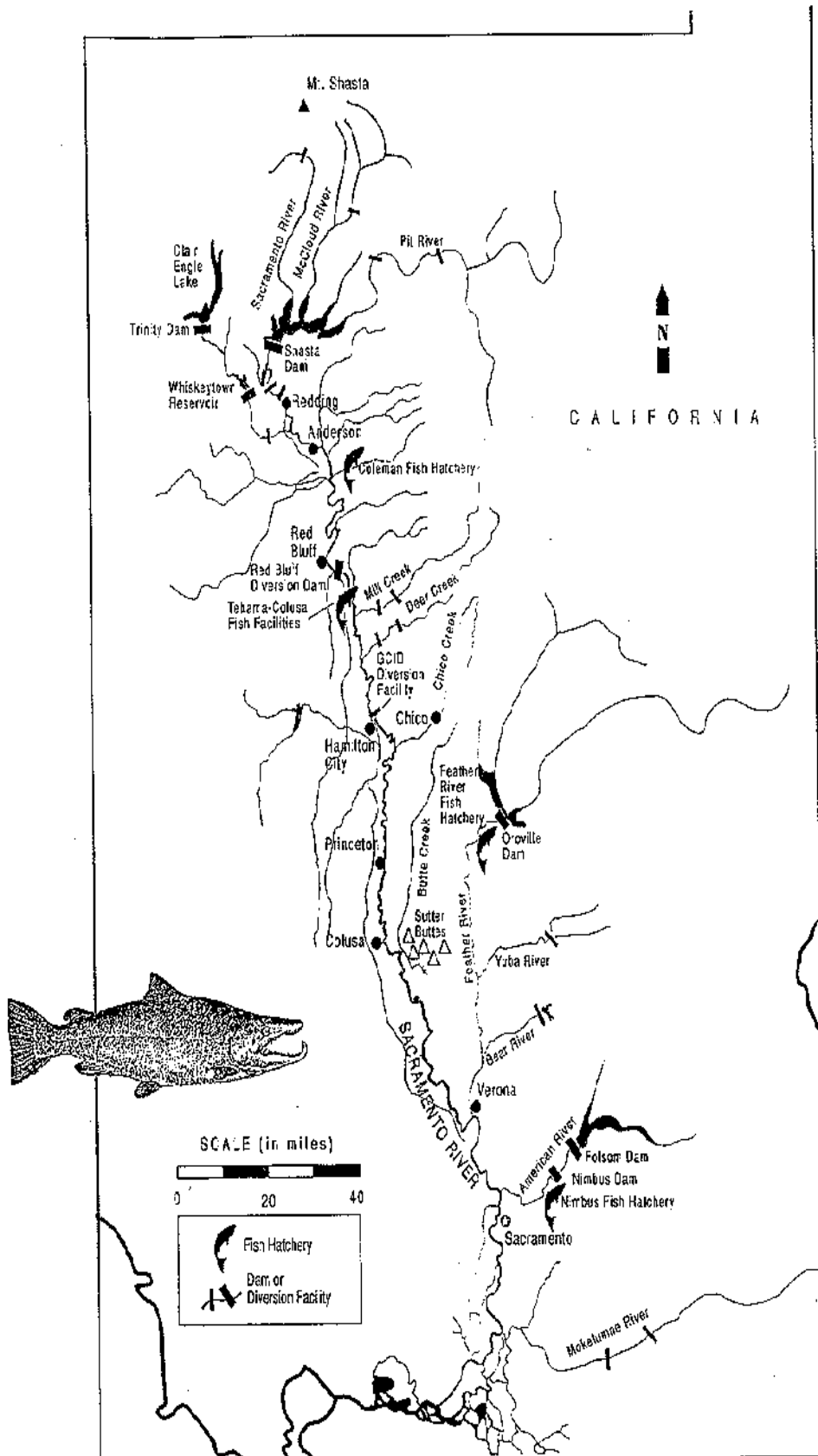
This report is published to share with the public the information and ideas gathered and considered by the Commission in its deliberations. The Commission's views, conclusions, and recommendations will be set forth in the Commission's own report.

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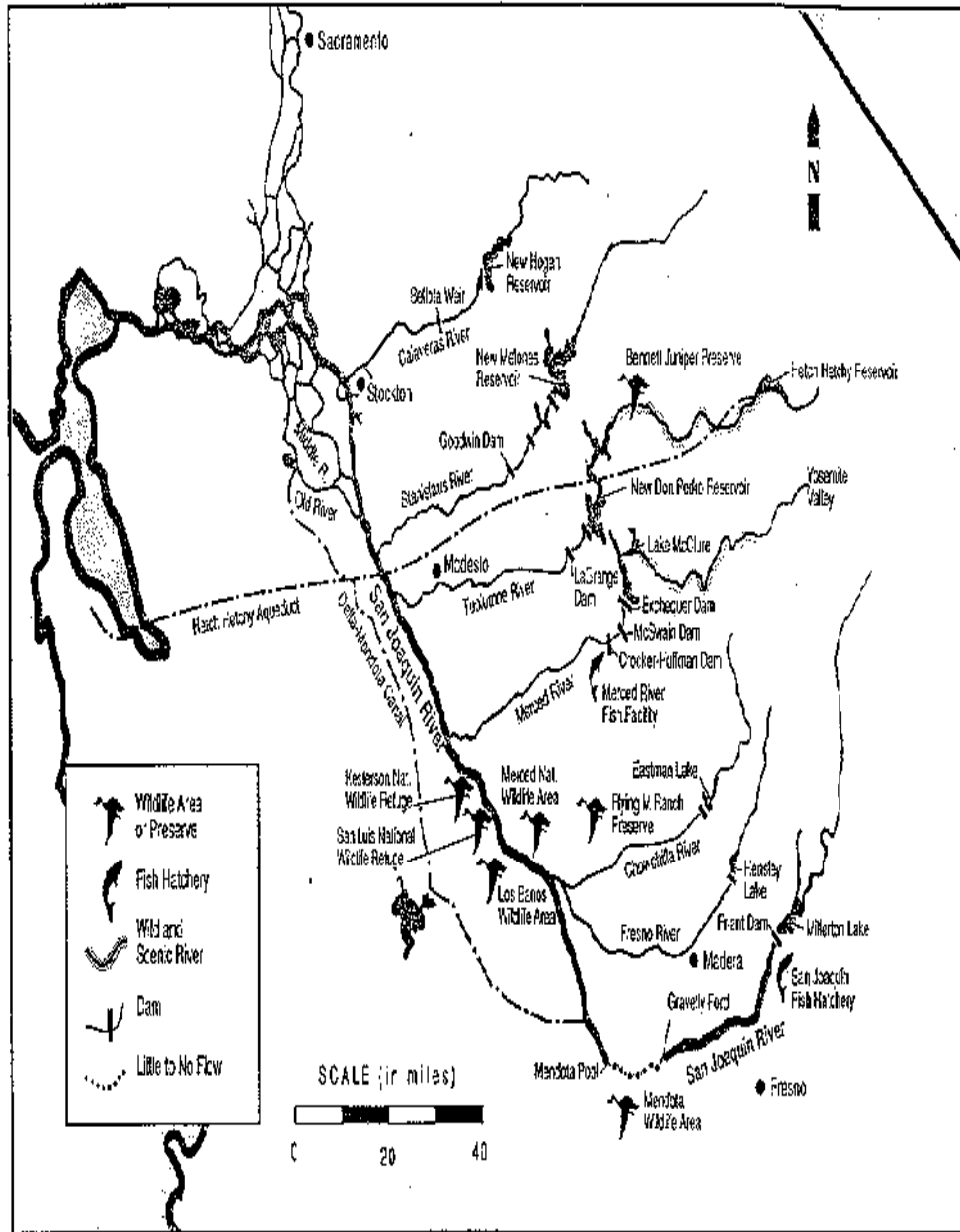
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The Sacramento River



The San Joaquin River



Preface

Purpose of the Report

In 1992, Congress authorized the Western Water Policy Review (Public Law 102-575, Title 30), a broad-based review of Western water policy and related legal and institutional issues. The legislation directs the President to carry out the investigation and send a report to Congress by October 2, 1997. Secretary of the Interior Bruce Babbitt chartered the Western Water Policy Review Advisory Commission to assist in this activity.

Part of the research for their report and recommendations included an investigation of how water is managed in Western river basins and watersheds, with an emphasis on the federal role. Six basins were selected for study: the Columbia, Colorado, Platte, Sacramento-San Joaquin, Truckee-Carson, and the Upper Rio Grande.

The Commission asked the researchers to address the following issues:

- What aspects of the federal water resource management programs are generally successful and widely supported?
- What are the critical water problems in the basin related to economic development, environmental protection, public health, Tribal self-determination, and public land management?
- With special emphasis on federal agencies and programs:
 - ➔ Which programs are working to solve these problems, which are not working and why?
 - ➔ What innovations are underway in governance, voluntary water marketing, water conservation efforts, a means for expediting water rights and approaches to scientific data that foster participation and agreement?
- What potential exists for a basin-wide commission for addressing these problems?
- What is the need for reducing, increasing or modifying the federal role?

-
- How can local watershed initiatives be integrated with, and contribute to, resolution of basin-wide problems? What should be the federal role in these activities?

The river basin studies and other research reports performed at the request of the Commission and the Commission's report and recommendations will be presented to Congress in the spring of 1998.

I. Background Information

A topographical map of the state of California reveals one particularly outstanding feature: a vast, oblong valley stretching down the interior of the state, 400 miles north-to-south and about 50 miles east-to-west. The Central Valley is bordered on the east by a formidable pair of mountain ranges—the Cascade and Sierra Nevada—and on the west by the less imposing Coast Range. Over 120 million years ago, before the Sierra Nevada and Coast ranges rose from the sea, the valley floor formed the bottom of an ancient ocean. Gradually, as sediment eroded from the mountainsides, the valley filled in.

The Central Valley is divided into two smaller valleys, the Sacramento and the San Joaquin, which are defined by their major rivers. The Sacramento River Basin encompasses 59,000 square miles. The river drains the inland slopes of the Klamath Mountains, the Cascade Range, the Coast Range and the western slopes of the northern Sierra Nevada. The Sacramento River stretches some 384 miles from its headwaters near Mount Shasta to its juncture with the San Joaquin River in the Sacramento-San Joaquin Delta, located just south of the city of Sacramento.

The San Joaquin Valley consists of two drainage basins, the northern San Joaquin Basin, which is discussed in this report, and a southern basin called the Tulare Basin. (The Tulare Basin is now a closed basin separated from the northern basin by a low divide. Only in very wet years does water from this area reach the San Joaquin River.) The San Joaquin River and its eight major tributaries drain about 32,000 square miles. The headwaters of the San Joaquin River begin nearly 14,000 feet above sea level at the crest of the Sierra Nevada. The river runs west down the mountains and foothills, then flows northwest to the Delta where it meets the Sacramento River.¹

The two rivers converge in the 1,153-square-mile Sacramento-San Joaquin Delta—a maze of channels and islands—which also receives fresh water inflow from the Cosumnes, Mokelumne and Calaveras rivers and other smaller streams. Historically, more than 40 percent of the state's run-off flowed to the Delta via the Sacramento, San Joaquin and Mokelumne rivers.²

The fresh water flows on through Carquinez Strait into San Francisco Bay, beneath the Golden Gate to the Pacific Ocean. As the rivers surge through the Delta, the fresh water flow is increasingly dominated by tidal salt water. Together, the San Francisco Bay/Sacramento-San Joaquin Delta Estuary form the largest estuary on the West Coast of the United States.

¹ San Joaquin River Management Plan, San Joaquin River Management Program Advisory Council, February 1995.

² Sacramento-San Joaquin Delta Atlas, California Department of Water Resources, 1993.

The Delta often is referred to as the heart of California's water system because it is here that the state's two largest water projects, the State Water Project (SWP) operated by the California Department of Water Resources (DWR) and the federal Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation (USBR), extract water to be delivered to the farms and cities that lie to the west and south. (The SWP's terminus is Lake Perris in southern California. The CVP service area ends in Kern County.) The Delta also is home to 25 percent of all warm water and sport fish, including the threatened Delta smelt. It also is a key migration route for anadromous fish, including the endangered winter-run Chinook salmon. Three hundred eighty animals can be found within the ecosystem; most of these are birds as the estuary offers important wintering habitat for the millions of traveling ducks and geese on the "Pacific Flyway," a major north-south migration route. Amphibians, reptiles and mammals also are found within the estuary.

The Delta, as we know it, is a human invention. Early explorers found a vast marsh covered with bullrushes, called tules, and teeming with fish, birds and other wildlife. Beginning with the Gold Rush, farmers built a network of levees to drain and "reclaim" the fertile Delta soil. By 1930, more than 1,000 miles of levees surrounded close to 500,000 acres of farmland. Many of those early farms remain in business today, even as the Delta has become the center of statewide water policy with the location of the CVP and SWP pumps.

If the Delta is indeed the heart of the system, then it is the Sacramento and San Joaquin rivers that are the major arteries that transport the vital fresh water to serve the CVP and SWP. Flowing from the north is the Sacramento River, the state's largest river. Carrying with it the flow of the Pit, McCloud, Feather, Yuba, and American rivers, and smaller tributaries, the Sacramento yields 35 percent of the state's developed water supply. Including its major tributaries, the Sacramento River and its tributaries yield an average annual water supply of 22 million acre-feet, about which 5 million acre-feet are diverted upstream before the river reaches the Delta. Meandering south through the Sacramento Valley, the river helps support the valley's 2.1 million acres of irrigated agriculture. The primary crops grown are rice, wheat, corn, alfalfa, deciduous orchard crops, tomatoes and other vegetables. The Sacramento River also provides rearing habitat for 70 percent of all salmon caught off the California coast.³

While one of the state's longest rivers, 290 miles, the San Joaquin River's average flow is only 3 million acre-feet. Major tributaries to the San Joaquin

³ California Water Plan Update, Executive Summary, Bulletin 160-93, California Department of Water Resources, October 1994.

from south to north are the Merced, Tuolumne, Stanislaus and Mokelumne rivers; the Mokelumne enters at the Delta. One of the most developed rivers in the West, the San Joaquin is perhaps California's hardest working and most fought-over waterway.

The San Joaquin river's natural flow at the Delta has been reduced through upstream water development and use. The farmers along the river who originally exercised riparian rights "exchanged" those rights in return to water from the CVP—water exported from the Delta via the Delta-Mendota Canal. Friant Dam, meanwhile, collects the water once used by these downstream users and diverts it to farms along the east side of the valley.

Because of its unique geography—with the Pacific Ocean to the west and the Sierra Nevada and Cascade mountain ranges forming an eastern border—California is hydrologically isolated from its neighboring states. Except for inflows from Oregon, some minimal outflows to Nevada and the sharing of Colorado River water with six other states and the Republic of Mexico, California's surface water supply is basically its own. Rivers and streams are most abundant in the northern part of the state, where the most precipitation occurs, and along the spine of the Sierra Nevada and Cascade ranges. Air cools as it rises, and because cool air can hold less moisture, it drops most of its moisture on the western slope of the mountains. Precipitation falling on the Coast Ranges, where common elevations are 2,000 to 4,000 feet above sea level, generally dissipates quickly. There, 75 percent to 90 percent of the runoff occurs before April. In the Sierra Nevada, however, much of the precipitation falls as snow at altitudes over 4,000 feet. The snowpack acts as a natural reservoir, releasing its water as temperatures rise over the spring and summer months. In the Sierra, mean annual runoff can peak in May and continue through July.

California's climate is considered Mediterranean and characterized by mild temperatures and long, dry summers—ideal conditions for growing a variety of fruits, vegetables and other crops. But the availability of water decreases significantly as one travels south. Near Redding, in the upper Sacramento Valley, annual precipitation averages 33 inches, while in the southern San Joaquin Valley near Bakersfield, precipitation is only about 6 inches a year. While the state's generally pleasant weather is one of its great attractions, it also can be unpredictable, with flooding followed by drought and few years of "normal" precipitation. On average, California receives about 24 inches of annual precipitation statewide, with 75 percent of the moisture falling in the northern third of the state. Yet most of the state's population and 75 percent of its water needs are in central and southern California.

Beginning in the early 20th century, local, state and federal officials embarked on a series of ambitious programs to move water from its source to

areas of need. Major dams in the Sacramento River Basin include Shasta Dam on the Sacramento River, Oroville Dam on the Feather River, and Folsom Dam on the American River. Major dams and reservoirs in the San Joaquin River Basin are Friant Dam on the upper San Joaquin River, New Melones Dam on the Stanislaus River, New Exchequer Dam on the Merced River, New Don Pedro and O'Shaughnessy dams on the Tuolumne River, and Camanche and Pardee reservoirs on the Mokelumne River.

In total, there are 7,000 water diverters in the Sacramento-San Joaquin River Basin. Many of those diversions are from the Delta itself, which houses the export pumps for the CVP and SWP, as well as those serving individual farmers and irrigation districts. The Delta supplies irrigation water for 200 crops, including 45 percent of the nation's produce and drinking water to two-thirds of the state's 30 million residents.⁴

⁴ CALFED Bay-Delta Program Phase 1 Final Report, September 1996.

II. Resource Issues

The Sacramento-San Joaquin River Basin is a vast geographic area with pockets of varied land use. While the historical development of the basin coincided with the Gold Rush, subsequent federal and state policies encouraged the region's agricultural development. Today both the Sacramento and San Joaquin valleys remain viable, productive farming areas, but the region is increasingly grappling with urban growth. In some areas, prime farmland is being replaced by suburbs as cities grow outward and land conversion becomes an attractive economic alternative. Environmental issues also have taken on a larger role in recent years. Efforts are being made to restore or protect wetlands, riparian habitat and endangered species. Here, too, preservation of open space is a major issue, as is the presence of pollutants from farm fields and city streets.

Because the state and federal governments constructed major water storage and distribution systems to tap the region's water resources, the Sacramento-San Joaquin River Basin also is influenced by outside forces. DWR, in its California Water Plan Update: Bulletin 160-93, predicted a 3.7 million acre-feet (in average years) shortfall to 9 million acre-feet (in drought years) shortfall in California's water supply by 2020 and an accompanying 53 percent increase in population. Water users throughout the state, particularly urban suppliers, are looking to augment their current supplies with water transfers. There is a great deal of interest in transferring water now used by agriculture in the Sacramento and San Joaquin valleys outside the basin. Within the basin, however, population also is expected to increase, and some local water districts fear they will run out of sufficient water if exporters target these sources.

Overall, the Sacramento-San Joaquin River Basin is a microcosm of water-related issues throughout the West—water rights, environmental restoration, water marketing and transfers, groundwater use, growth, water pollution. While it is difficult to develop an abbreviated list of resource issues within the basin, this report focuses on five issues in which the federal government has a major role: environmental restoration, water supply and flood management, the maintenance of federal water facilities, nonpoint source water pollution and the Bay-Delta. In more detail these issues are:

A. Environmental Restoration

The effectiveness and economics of environmental restoration as well as the science behind the decisions are issues facing stakeholders and agency staff within the basin. (The main stakeholders are agricultural, environmental and urban water interests. Other players include commercial and sports fishing groups, major businesses and public interest groups such as the League of Women Voters.) Many of the actions to remediate and improve the

environment are required by federal laws such as the Endangered Species Act (ESA), Central Valley Project Improvement Act (CVPIA) and the Clean Water Act (CWA).

While restrictions placed upon traditional water project operations because of these laws have generated complaints from stakeholders and some state agencies (and some efforts to revamp the laws), there is general acknowledgment that these laws have served as a "hammer" to facilitate ultimate cooperation.

The CWA and ESA, for example, were instrumental in the 1994 Bay-Delta Accord and the agreed-upon three-year water quality standards. Environmental groups sued EPA for not enforcing the CWA, creating a deadline for which the federal agency had to promulgate standards, while ESA restrictions on water exports encouraged users of the SWP and CVP to push for a resolution to the problem. Elsewhere within the basin, potential that the spring-run Chinook salmon may be listed under the ESA prompted diverse stakeholders and landowners to join forces on several tributaries to the Sacramento River to boost spring-run population and forestall such a listing.

When it comes to the CVPIA, agricultural stakeholders have expressed frustration that implementation of this law, passed in 1992, has proceeded so slowly. They also say that more money from the environmental restoration fund should be dedicated to projects, not studies. In the meantime, environmentalists also have pushed the U.S. Fish and Wildlife Service (FWS) and USBR to adopt the environmental components of the law and place more restrictions on traditional CVP users.

As work progresses on a comprehensive, collaborative Bay-Delta solution and implementation of the CVPIA, most of the focus on environmental restoration is on:

- **Science**—stakeholders have challenged decisions made by federal and state fishery and water quality agencies through the years on how "good" the science is behind a recommended action. With the shift toward ecosystem management, agency scientists are finding that there are many resource issues that require more research. Urban and agricultural interests increasingly have generated their own scientific evidence on environmental issues through the use of staff or consultant biologists and other scientists.
- **Effectiveness**—agencies and stakeholders both support real-time monitoring to ensure that fish flows, pumping modifications, spawning

habitat improvement and other programs that are implemented restore ecosystem functions and lead to increases in fish populations.

- **Economics**—with passage of Proposition 204, the \$995 million California water bond, the promise of additional federal funds through HR 4126, and the environmental restoration fund created by the CVPIA, stakeholders want to make sure projects are prioritized and that money is allocated to measures that will produce the most "bang for the buck." Water users have long complained about the cost of environmental "fixes," such as fish screens, but the availability of state and federal funds to help finance these items has encouraged grassroots efforts to protect fish and habitat.

B. Water Supply and Flood Management

The last decade is the consummate example of the California water dilemma: six years of drought from 1987-1993 followed by record rainfall and flooding in 1995 and 1997. There is an inherent tension between maintaining water supplies and guarding against floods because the state fluctuates between having too much water and not enough. Both the CVP and SWP were built to supply water and provide for flood control. Their reservoirs not only store water to provide water during dry months but also are used for storage and regulation of flood waters during months of heavy precipitation. (In the most recent flood event, data from DWR's Flood Center revealed that two reservoirs, New Don Pedro and New Melones, had encroached upon the flood storage space prior to the beginning of the storms on December 26, 1996.⁵)

While reservoirs in the foothills surrounding the Sacramento and San Joaquin valleys provide a place to store flood waters, a 1,760-mile system of federally designated levees in the floodplains below protect farmland and cities. The flood control system dates back to the late 1800s when the first plan to control the disastrous flooding, which periodically inundated the Sacramento Valley, was formulated by State Engineer William Hammond Hall.

Once called the "Nile of the West," the Sacramento River periodically overflowed its banks during the spring snowmelt. The Sacramento Flood Control Project, first authorized in 1917, consists of a system of levees, overflow weirs, pumping plants and bypass channels. During high flow, these bypasses carry many times the amount of water left in the Sacramento River around the urban area, most recently in the 1997 New Year's storms.

⁵ "California Water Plan News," March 1997. Volume 1, No. 4.

Flood control managers must keep enough reservoir storage space available to manage floods during heavy precipitation but water suppliers focus on storing enough water to protect against drought. While specific figures are hard to come by, the state's most recent drought caused at least \$1.1 billion in damages (mostly agricultural and green industry losses) as some farmers faced up to 100 percent cutbacks in their surface water supplies (many of these growers also had access to groundwater). Some cities called for up to 50 percent water savings from their customers.

With the state's population projected to reach 40 million by 2006, finding ways to stretch water supply to meet demand was the focus of DWR's California Water Plan Update: Bulletin 160-93. The report, released in 1994, confirmed the absence of a cushion between the state's water demand and water supply, forecasting a shortfall between 3.7 million acre-feet in "normal" years to as great as 9 million acre-feet in critically dry years. Although officials predict most of the state's projected urban growth will occur in the south coast region, the Central Valley also will become increasingly urbanized in the 21st century. In the 1980s, the valley was among the fastest growing regions in the state as thousands of acres of agricultural land were converted to urban and suburban uses.

Groundwater will be tapped to supply some new urban developments, but many areas of the San Joaquin Valley are faced with declining water tables. Even in the Sacramento Valley, where groundwater supplies are considered to be abundant, overpumping in some areas is cause for concern. While some would advocate mandatory groundwater management to protect these supplies, the agricultural and urban water interest groups strenuously oppose any statewide regulatory role. Instead, the passage of state legislation, AB 3030, in 1992 has prompted more than 60 water suppliers to adopt voluntary groundwater management plans. Elsewhere in the Sacramento River Basin, water users are concerned about protecting the area's groundwater from export, and there are organized, voluntary management efforts to prevent such export in the region currently underway in Butte, Colusa, Glenn, Shasta, Tehama and Yolo counties.⁶

On another front, USBR is faced with the task of developing a plan that would "replace" the 800,000 acre-feet (600,000 acre-feet in a dry year) of water allocated annually to the environment. The CVPIA directs USBR to develop and submit, within three years, a plan to increase the yield of the CVP to Congress. Measures to increase water yield include improvements in, modifications of, or additions to CVP facilities; water conservation; land fallowing; transfers and conjunctive use of groundwater and surface water.

⁶ California Water Plan Update, Executive Summary, Bulletin 160-93, California Department of Water Resources, October 1994.

Following the 1997 floods, which killed eight people, forced the evacuation of 120,000 people and caused an estimated \$2 billion worth of damage, there is interest in nonstructural solutions to flood control, the construction of setback levees to allow for intentional flooding in appropriate areas, and the development of more dams and offstream storage facilities and to provide better protection for the Sacramento and San Joaquin floodplains. These floodplains are becoming increasingly urbanized.

C. Maintenance of Federal Water Facilities

Construction of Shasta Dam (authorized by the Rivers and Harbors Act of 1937) began in the 1930s as the federal government initiated a public works program to provide jobs for citizens during the Great Depression. The initial features of the CVP were constructed between 1937 and 1951. Forty-five years later, maintenance of its dams, canals and power generators has become a major issue for CVP users and other water interests in California.

Some interests contend that the federal government has not adequately funded upkeep of the CVP facilities. The July 1995 failure of gate No. 3 at Folsom Dam on the American River further fueled concern. The spillway gate buckled during a routine raising, allowing 40,000 cubic-feet-per-second to spill from the dam. By the time officials were able to install temporary "stop logs" at the gate, 400,000 acre-feet of water was released from Folsom Reservoir.

Although deferred maintenance at Folsom received part of the blame for the gate failure, a subsequent investigation blamed the break on design failure. Still, the incident has increased awareness of the fact that the facility is now half a century old, and may require additional maintenance and repair money.

In the past, CVP water users have complained that Congress and the USBR have not allocated enough funds for maintenance. Environmentalists, however, say that the users also have fought through the years to keep their contributions to the federal treasury through water fees at a minimum.

D. Nonpoint Source Water Pollution

As throughout the West, water quality—particularly nonpoint source pollution—is a major issue in the Sacramento-San Joaquin River Basin. According to EPA officials, nonpoint source pollution is the No. 1 cause of the nation's remaining water pollution. The State Water Resources Control Board (SWRCB) lists the most prevalent sources of pollution in California

ivers and streams, in order of their occurrence, as agriculture, timber harvests, mining operations and urban runoff.

Polluted runoff can create both chronic and acute problems for fish and wildlife. Runoff and decomposing organic matter can rob streams of oxygen that fish depend upon. Toxic levels of pesticides can kill fish. Some pollutants—including some pesticides, metals such as mercury and elements such as selenium—accumulate as large animals eat smaller ones, until concentrations reach toxic levels. The resulting high concentrations can cause disease, diminish reproduction in animals and threaten human health.

In the San Joaquin River Basin, the main problems are salinity, selenium and sedimentation. At Vernalis, total dissolved solids (TDS) in the San Joaquin River range from 110 to as high as 900 milligrams per liter. During the summer irrigation season, some stretches of the San Joaquin River consist almost entirely of irrigation return flows. In comparison, the Sacramento River's TDS at Greene's Landing ranges from 50 to 150 milligrams per liter. The maximum contaminant level for TDS in drinking water is 500 milligrams per liter.⁷ Diversions upstream of the Delta all tend to increase the salt concentration in the San Joaquin River by reducing the amount of fresh water available for dilution.

Selenium also is a concern, although chemical analyses of plants, fish and waterfowl living in the Delta and San Francisco Bay do not indicate that selenium levels in the water are excessively high. Farther south, soil erosion from farms has washed tons of sediment into the San Joaquin River, reducing its channel capacity and carrying pesticides and fertilizer into the water, harming fish and wildlife.

In the Sacramento River Basin, the river carries away waste from abandoned mines, farms and growing cities. Farm runoff from agricultural drains has tested toxic to fish and the aquatic organisms they feed on. Winter rains wash pesticides from orchards and summer irrigation runoff muddies the river with sediment and organic matter. While cities and industrial users have treatment works and pollution permits, there have been permit violations in the Sacramento metropolitan area. The rapidly expanding cities also are creating more runoff.

Section IV of this report provides a closer look at two specific case studies of innovative efforts to remedy nonpoint source pollution—a watershed management program on the Sacramento River and a program to combat sediment loading on the San Joaquin River.

⁷ California Water Plan Update, Bulletin 160-93, Volume 2, California Department of Water Resources, October 1994.

E. The Bay-Delta

Estuaries are coastal areas where fresh water from rivers mix with ocean water and where water salinity is between the extremes of sea water and fresh water. Together, the Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay and south and central San Francisco Bay form such an estuary. The Delta region is 700 miles of waterways surrounding 57 reclaimed islands. Because all roads in California water policy lead to the Bay-Delta, this report will treat the estuary as a resource issue, not a specific geographic region. The Delta also is a microcosm of the other four resource issues: environmental restoration, water supply and flood control, maintenance of federal water facilities and nonpoint source pollution.

III. The Main Players

A. Federal Agencies (in alphabetical order)

1. National Marine Fisheries Service (NMFS)

Agency of the Commerce Department whose mission is to conserve, manage and develop living marine resources and to promote the continued utilization of these resources for the nation's benefits. NMFS coordinates protection of marine and anadromous endangered species under the federal ESA, including California's winter-run Chinook salmon. NMFS is a member of CALFED.

2. U.S. Army Corps of Engineers (Corps)

Agency of the Department of Defense whose mission is to develop, control, maintain and conserve the nation's navigable waters under the Rivers and Harbors Act and adjacent wetlands under the CWA. Through its water resources development program, the Corps oversees levee construction, dam construction and shore stabilization; as well as port maintenance dredging and deep water channel construction. It also develops guidelines governing flood control storage in federally funded reservoirs and monitors the operation of these reservoirs to assure compliance with the guidelines. The federal government, through the Corps, contributes funds to local flood control projects. A 404 permit from the Corps is required to place any structures in, or excavate, fill, or otherwise modify a navigable body of water or a wetland. The Corps is a major player on basin issues related to levee maintenance, wetlands and dredging.

3. U.S. Bureau of Reclamation (USBR)

Agency of the Department of Interior that constructs and maintains federal reclamation projects, including the CVP. The CVP provides water for irrigation, municipal and industrial use, hydroelectric power, and fish and wildlife. It also provides flood control. The USBR is signatory to the 1986 Coordinated Operations Agreement (COA) between the CVP and SWP and the 1994 Bay-Delta Accord. USBR also is a member of CALFED and is a lead agency in implementing the CVPIA.

4. U.S. Environmental Protection Agency (EPA)

Agency established in 1970 to protect, maintain, restore and enhance environmental quality and human health through regulation of air, water and land resources. EPA is responsible for enforcement of the CWA whose objective is to restore and maintain the quality of the nation's water. EPA became involved in the Sacramento-San Joaquin Delta through the CWA, charging that the state had inadequately protected the estuary's water quality. EPA also has oversight over the Corps' 404 permit process, including actions affecting wetlands, and is responsible for the administration of the Safe Drinking Water Act, Resource Conservation and Recovery Act, and the Comprehensive Environmental Response, Compensation and Liability Act, also known as "Superfund." EPA is a member of CALFED.

5. U.S. Fish and Wildlife Service (FWS)

Agency of the Department of Interior whose mission is to conserve, protect and enhance the nation's fish and wildlife and their habitats for the continuing benefit of the people. The agency's major responsibilities are migratory birds, candidate species, endangered species and fish. The agency also ensures compliance with the National Environmental Policy Act (NEPA), the Fish and Wildlife Coordination Act, the ESA, the Migratory Bird Conservation Act of 1929, and other laws dealing with wetlands, waterfowl and wildlife refuges. The FWS and USBR are the principal agencies responsible for implementation of the CVPIA. The FWS is a member of CALFED.

6. U.S. Forest Service (USFS)

Agency of the Department of Agriculture that manages approximately 20 million acres of national forest lands, about 20 percent of the land in California. By law, these lands are managed for timber, rangeland, fishery habitat, recreation, water supply and watershed protection. About 50 percent of the water supply in California originates in watersheds within national forests and the headwaters of most rivers and streams are found in national forests.

7. U.S. Geological Survey (USGS)

Agency of the Department of Interior that collects and maintains data, such as streamflow, on rivers and streams, to provide the understanding needed for the best use and management of the nation's water resources. USGS

collects data to determine quantity, quality and use of surface water and groundwater; conducts water resources appraisals; and coordinates all federal water data acquisition.

8. U.S. Natural Resources Conservation Service (NRCS)

Agency of the Department of Agriculture that provides technical assistance to local Resource Conservation Districts in conservation, development and productive use of the nation's soil, water and related resources. NRCS is involved in development of watershed management plans designed to prevent pollution of lakes and rivers.

B. State of California

There are three state agencies that play primary roles in the water issues within the Sacramento-San Joaquin River Basin. All are members of CALFED.

1. California Department of Water Resources (DWR)

DWR, under the direction of the State Resources Agency, has overall responsibility for managing the state's water resources. DWR's mission is to evaluate current and projected needs for water and development programs, direct the use of the resource, protect the public through water quality improvement, flood control and dam safety programs, and to assist local water agencies with funds, expertise and technical support. DWR operates the SWP and runs the federal-state Flood Operations Center.

2. California Department of Fish and Game (DFG)

DFG, under the direction of the State Resources Agency, has jurisdiction over and responsibility for resident and anadromous fish in all rivers and streams of the state, and for wildlife resources that use riparian habitat. It is responsible for administration of the California Endangered Species Act. DFG conducts a number of research programs relating to fish and wildlife propagation, fishing and hunting licenses, fish hatchery management, stream alteration permitting and fish planting.

3. State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards

The SWRCB and its nine Regional Boards regulate water quality in all of the state's waters. SWRCB also administers the state's permit system to appropriate and divert surface water. SWRCB sets water quality standards for inland waters, enclosed bays and estuaries, including flow and salinity standards in the Delta. The SWRCB, an agency of the California Environmental Protection Agency (Cal-EPA), also is responsible for implementing federal water quality standards through the CWA.

4. CALFED

Joint state-federal planning organization created in June 1994 to provide more coordinated action in the Bay-Delta. It is comprised of members of the California Water Policy Council and Federal Bay-Delta Council (formerly known as the Federal Ecosystem Directorate or Club-FED). CALFED has three broad goals: adoption of mutually acceptable state water quality standards (accomplished in May 1995); coordinated CVP/SWP operation to meet water quality standards and protect endangered species; and development of a long-term Delta solution to resolve water quality, water use efficiency and levee stability problems, and restore the ecosystem.

C. Major Stakeholder Groups

Myriad stakeholder groups representing agricultural, urban and environmental water interests are involved in the Sacramento-San Joaquin River Basin. These include individual water agencies and irrigation districts, environmental organizations, farm organizations and businesses. Below is an alphabetized list of the major stakeholder organizations involved in the basin, particularly in the Bay-Delta itself.

1. Association of California Water Agencies (ACWA)

Membership organization that represents 400 urban and agricultural water agencies on legislative matters, accounting for 90 percent of the water delivered in the state.

2. The Bay Institute of San Francisco

Environmental organization that advocates maintenance of fresh water flows in the Bay and Delta for water quality purposes, and related research and advocacy activities.

3. California Business Roundtable

Organization of the principal officers of the state's largest companies whose goal is to improve the overall economic climate in California. The Roundtable became involved in the Bay-Delta in 1994 when 10 chief executive officers for top firms sent letters to the Wilson and Clinton administrations urging resolution of the stalemate over Delta water quality standards. In 1996, the Business Roundtable, along with the California Farm Bureau Federation, California Manufacturers Association and California Chamber of Commerce, issued reports on financing options for water-related infrastructure and water transfers in California.

4. California Urban Water Agencies (CUWA)

Membership organization that represents 12 of the state's largest urban water agencies, in northern and southern California, which service over two-thirds of California's urban water users. CUWA has played an active role in Bay-Delta issues, including the production of alternative standards in 1994 that led, in part, to the Bay-Delta Accord.

5. Central Valley Project Water Association

Membership organization that represents the users of the Central Valley Project.

6. Environmental Defense Fund (EDF)

National advocacy environmental group of scientists, environmentalists and attorneys that has played a key role in the Bay-Delta.

7. Natural Resources Defense Council (NRDC)

Nonprofit organization of lawyers and scientists that uses research and legal action to protect the nation's natural resources.

8. Nature Conservancy

Membership organization that purchases land to set up private reserves and provides consultation for private landowners interested in environmentally sound management. The conservancy owns preserves in the Sacramento and San Joaquin valleys.

9. Northern California Water Association

Membership organization that represents water users in the Sacramento River Basin on water rights and other legislative issues.

10. Pacific Coast Federation of Fishermen's Associations (PCFFA)

Membership organization that advocates protection of West Coast fishing habitats, and lobbies for the group's interests in West Coast legislatures and Washington, D.C. In the Sacramento-San Joaquin River Basin, PCFFA has joined forces with landowners in certain watersheds to try and boost Chinook salmon populations without an ESA listing.

11. San Joaquin River Exchange Contractors Water Authority

Authority that represents the four San Joaquin River exchange contractors to monitor environmental, legal and legislative issues that impact the contractors, and to protect the contractors' water rights. The contractors used to draw their water directly from the San Joaquin River, but "exchanged" that for a substitute water supply drawn from the Delta when USBR built Friant Dam.

12. San Joaquin Tributary Agencies

Umbrella organization that represents the five water districts that divert and distribute water from upstream tributaries to the San Joaquin River.

13. State Water Contractors

Membership organization that represents 27 of the 29 agencies that receive water from the SWP. Nine of those agencies are in the Sacramento or San Joaquin Valley.

IV. Efforts to Address the Problems

A. Environmental Restoration

The Central Valley—once an immense seasonal wetland, regularly flooding from the Sierra foothills to the Coast Range—has been forever transformed by agricultural and urban development and flood-control and reclamation projects. Over the past 100 years, 90 percent of the valley's original seasonal wetlands have been lost. The fisheries have been changed both by the extinction of some native species and the introduction of non-native fish. Early human activities such as hydraulic mining, overfishing, logging and railroad construction also had a negative impact on native salmon and steelhead.

Early efforts to address environmental resources in the Sacramento-San Joaquin River Basin focused primarily on mitigation—ways to lessen the impact of a water project (dam, reservoir or canal) or other land-use modification on aquatic and terrestrial species. When the CVP was designed and built, fish hatcheries, fish ladders and other facilities were included to help maintain fishery populations and allow fish to navigate around dams and pumps. Not every dam is laddered, however, and some of these structures have proved inadequate.

In the late 1960s and early 1970s, society's values shifted from conquering nature to coexisting with and protecting nature. Passage of a series of laws at the federal level mirrored that change. These laws include the ESA (1973), CWA (1972), NEPA (1969) and "Wild and Scenic Rivers" Act (1968). California has similar state legislation to protect water quality, endangered species, wild and scenic rivers, and require environmental consideration in the planning process through the California Environmental Quality Act (CEQA).

By the 1980s, the state's tremendous population growth, wide diversity of natural habitats and sheer number of endangered species (131 in 1995) led to a collision between environmental restoration and environmental restrictions. Because many endangered species live in or along streams, the effort to protect these species has had a major impact on water projects. Since the late 1980s, the precipitous decline in Central Valley salmon and steelhead runs has been attributed to a variety of natural and manmade factors including drought, overfishing, unfavorable ocean conditions, pollution, introduced and predator species, habitat destruction, high water temperatures, and the water projects. In the world of California water, the conflict was exacerbated by the severe 1987-1993 drought, the fact that no

new dams have been added to the system since 1979, and several key legal decisions that favored the environment.⁸

In the Sacramento River, habitat restoration efforts were fueled by efforts to restore the winter-run Chinook salmon, listed as a federally threatened species and a state endangered species in 1989. (It is now classified as a federally endangered species.) Operational restraints were spelled out in the National Marine Fisheries Service (NMFS) Biological Opinion in 1992, 1993 and 1995, but USBR made changes in CVP operations as early as 1987. Major changes implemented to improve conditions for the winter-run salmon include bypassing hydropower production at Shasta Dam in order to release low-level, cold water from mid-July to mid-October for fish spawning (a practice no longer necessary with completion of the new, \$80 million temperature control device); closing the Delta's Cross Channel gates from February 1 through May 30 to keep migrating adults in the main waterway; raising the gates at Red Bluff Diversion Dam from September 15 through May 15 to aid fish passage; and curtailing annual CVP water deliveries by about 300,000 acre-feet.

Passage of the 1992 CVP Improvement Act (CVPIA) was perhaps the first wholesale effort to provide for environmental restoration in the Sacramento and San Joaquin valleys. An ambitious law, the act was one of 40 titles contained in the Reclamation Projects Authorization and Adjustments Act of 1992 (Public Law 102-575). Title 34, the CVPIA, brought about the most significant changes to the CVP in 50 years.

Since the law became effective Jan. 1, 1993, the FWS and USBR have worked to implement the act. This is not an easy task given the breadth of the operational changes, restoration goals and environmental review required by the law, and the CVPIA's ambiguous language. "Early on in the process, everybody was saying they were in Washington when it was written and that they had helped put the act together and that this was what they meant," said a FWS biologist. "It is hard to decipher Congress' intent with the act."

The CVPIA requires, for example, that up to 800,000 acre-feet of CVP yield (600,000 acre-feet in dry years) be dedicated annually to environmental uses

⁸ These key decisions include *National Audubon Society v. Superior Court* (33 Cal. 3d 41) in which it was decided that the public trust doctrine applies to Los Angeles' right to divert water from Mono Lake tributaries (1983); *U.S. v. State Water Resources Control Board* (182 Cal.App.3d 82) in which Judge John Racanelli ruled that the SWRCB must balance all beneficial uses of the waters that flow through the Delta, consumptive and instream, to protect the public trust (1986); and *California Trout v. SWRCB* (207 Cal.App. 3d 585) in which the court held, in a separate challenge to Los Angeles' Mono Basin water rights, that fish are a public trust resource (1989).

such as instream flows for fish. The law does not, however, spell out how much of the water is to be used upstream of the Delta, how much is to be used on which river system, or how much—if any—is allowed to be captured for export downstream after it has been used upstream for environmental purposes.

*"Upon enactment of this title, the Secretary of Interior shall dedicate and manage annually 800,000 acre-feet of CVP yield for the primary purpose of implementing the fish, wildlife and habitat restoration purposes and measures authorized by this title; to assist the state in its efforts to protect the waters of the Bay-Delta; and to help meet such obligations as may be legally imposed upon the Central Valley Project under state or federal law following the date of enactment of this title, including but not limited to additional obligations under the federal ESA." **Section 3406 (b)(2) of Public Law 105-75.***

Confusion over the use of the 800,000 acre-feet extends to the 1994 Bay-Delta Accord. The water quality standards outlined in this document, and subsequently adopted by the SWRCB, generally boost Delta outflow by 400,000 acre-feet annually. Environmentalists believe the amount of water in the accord is insufficient and that all the people who signed the accord knew that more environmental water would come from the CVPIA. Some water exporters believe exactly the opposite—that only accord water is unavailable for export after being released for the environment.

*"Central Valley Credits. All CVP water provided pursuant to these Principles shall be credited toward the CVP obligation under Section 3406 (b) (2) of the Central Valley Project Improvement Act to provide 800,000 acre-feet of project yield for specified purposes." **Institutional Credits, Section 3 of the December 15, 1994 Principles for Agreement on Bay-Delta Standards Between the State of California and the Federal Government (otherwise known as the Bay-Delta Accord.)***

The question, says the FWS, is whether the CVPIA allows Interior to make assumptions beyond the accord. FWS argues that NEPA allows you to do that and that the FWS interpretation allows water use beyond the figures in the accord. "Does FWS have the right to go beyond the agreement or is it etched in stone?" asked a FWS biologist. "FWS feels it has the responsibility to use all the 800,000 acre-feet for the environment. Ag and urban water users say FWS hasn't justified the need. That information is not known because we've never had the water before. It's tough to justify the additional flows because you need to evaluate them."

The argument goes beyond mere semantics because there are some who fear the dispute over the 800,000 acre-feet could be the undoing of the three-year Bay-Delta Accord signed in December 1994. (The accord generally is expected to be extended in December 1997.) The debate also illustrates two important points:

1) The two agencies responsible for implementing the CVPIA, the USBR and the FWS, have different mission statements and outlooks on natural resource issues. FWS is mainly a regulatory agency, assigned to protect wildlife and enforce the ESA. USBR is a resource development agency. With adoption of its new mission in 1992, the USBR has placed more emphasis on environmental protection and management of natural resources rather than project construction.

2) Water users—especially agricultural contractors—view the CVPIA as a regulatory vehicle designed to punish them in favor of the environment. The Bay-Delta Accord, however, has attracted a wide base of support mainly because it was a collaborative effort that included the stakeholder community.

Recognizing this, Interior has made a concerted effort since 1995 to inform and engage the environmental community and water users—especially the CVP's agricultural contractors—in the effort to implement the CVPIA. Part of the reason for this action is to forestall congressional changes to the 1992 law. The so called "Garamendi Process," led by Deputy Interior Secretary John Garamendi, has helped resolve some of the controversy.

As far as criticism that the FWS and USBR are moving too slowly to implement the law, one USBR employee believes that the "process is as important as action. It goes beyond public workshops and meetings. Without frequent interaction with the people you have major chaos. Huge public resources are at stake and you do need a ponderous, deliberate public process to make these decisions."

1. Science

The goal of the CALFED Bay-Delta Program's ecosystem restoration program is to restore the ecosystem functions of the natural environment that enables native fish, wildlife and plants to flourish. It aims to take advantage of natural processes rather than further disrupt the system to create healthy but artificial conditions.⁹

⁹ CALFED Bay-Delta Program Phase I Final Report, September 1996.

This is a significant distinction because there was once a focus -- at least among some -- of restoring the Delta to its pristine, pre-Gold Rush era of vast tule marshes. The CVPIA's Anadromous Fish Restoration Program (AFRP) goal is to double the natural production of six fish to levels not less than twice the average levels attained during the period of 1967 to 1991. Advocates of wetland protection and restoration often compare the Central Valley's estimated 4 million acres of marshland in the 1850s with the remaining 500,000 acres today.¹⁰

Discussion of restoring portions of the Sacramento-San Joaquin River Basin to pre-project conditions drew heated rhetoric from water users. Beneath the rhetoric is a critical question: What should be the target? Is the goal to restore the basin to its condition in 1848, before the Gold Rush? In 1937, before the CVP was built? In 1967, before the SWP was constructed? In 1986, before the most recent drought?

"There is no model of an undisturbed estuarine system the size of the Delta," said a state fisheries biologist. "The trapping of sediment upstream behind the dams, the change in flow patterns, the introduced species, have all changed the system. The San Joaquin River, for example, used to support spring-run Chinook salmon. Friant Dam eradicated the spring-run. The San Joaquin is now being managed for fall-run Chinook, a race that was introduced into that river system. We can replicate a healthy system in the San Joaquin but we can't recreate the natural system because the spring-run are gone. It's the same on the Sacramento River. The Sacramento River's temperature was very rarely below 56 degrees below Keswick Dam, but we are now artificially managing the system for winter-run. On both systems, before the dams, the spring-run and winter-run thrived because they were designed to go above the dams into the cooler headwaters of the streams."

CALFED's ecosystem goals, however, are criticized by other biologists who say the program has set objectives and targets, but has failed to establish the ecosystem baseline. In addition to developing an agreed-upon ecosystem restoration goal for the Sacramento-San Joaquin River Basin, thorough scientific data is needed to adequately monitor the system to determine whether restoration efforts are working.

Why is science important? Sound ecosystem science supports sound ecosystem policy. Gaps in the science base undermine federal policies and decisions, creating a critical situation as our environment becomes less resilient to impacts. The science base must be able to withstand legal

¹⁰ Water Use for Rice Farming, CH2M Hill, 1992.

challenges, and should be objective and independent in the development of policy or management alternatives.¹¹

Despite years of environmental study and review of the Sacramento-San Joaquin River Basin, there is growing agreement that many basic questions cannot be answered because more research is needed. There are a variety of reasons for the insufficient scientific information. For one thing, it is only in recent years that natural resources management has begun to shift to the concept of ecosystem management. No studies have been conducted on the entire ecosystem. What studies have been done, for the most part, looked at a specific portion of the basin. This research has centered mainly on impact analysis—state and federal agencies, for example, study the impact of the SWP, CVP and proposed new projects on the environment.

The Interagency Ecological Program (IEP), for example, has spent almost 30 years studying the effect of the water diversions on the Delta—not studying the Delta *per se*. The cooperative program was formed in 1970 in an effort to better coordinate environmental studies and aquatic monitoring in the Bay-Delta. Participating federal agencies are USBR, FWS, USGS, the Corps, EPA and NMFS. State agencies are DWR, DFG and the SWRCB. The IEP currently manages 60 program elements that evaluate various water quality and biological components of the system. Its data base is one of the largest in the world for an estuary and is used to provide long-term monitoring trends, evaluate environmental impacts and provide management alternatives. (The IEP's 1996 fiscal year budget was \$12 million.)

Despite the IEP's work, some scientists say a lot of issues remain inadequately studied in large part because there is no single entity assigned to do these studies. Even studies conducted by scientists at the University of California or other educational institutions come with a funding stipulation—topics chosen for study require research funds. In recent years, some water agencies and irrigation districts have hired their own biologists. While the agency-stakeholder cooperative efforts underway can benefit from the addition of more research money and expertise, these stakeholder biologists often are responsible for determining whether a specific water use impacts a specific fish.

There is a note of irony in today's debate over lack of scientific knowledge. Water users and officials at USBR and the state DWR have complained vociferously in recent years that the water projects have been unfairly

¹¹ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies, Volume II, Implementation Issues, Report of the Interagency Management Task Force, November 1995.

targeted in the environmental degradation of the Sacramento-San Joaquin River Basin—more attention needs to focus on other issues such as pollution. However, it is these very users and agencies that paid for and conducted much of the scientific information that does exist—data focused on the effect of the water projects on the environment.

The ecosystem has been studied only in recent years as policy-makers began to focus on this tenet of the ESA instead of the historic individual species protection. While politics are a major reason for the shift toward broader environmental protection, the scientific community also has pressed for the change, saying that habitat loss and fragmentation have contributed to the decline of many species. Ecosystem management, they say, will provide the best opportunity to restore and protect larger pieces of habitat and the biodiversity of natural communities.

In 1996, a team of nine water agency and environmental organization scientists, led by the Metropolitan Water District of Southern California (MWD), developed a comprehensive review of existing case studies and scientific literature devoted to restoration of aquatic and riparian habitats. They reviewed and cataloged over 2,000 abstracts and some 700 research papers and reports to examine the practical application of ecosystem restoration principles in the Bay-Delta.¹²

The scientists determined that "without the requirement to exactly duplicate a specific impacted habitat, the Bay-Delta restoration effort can be focused on the structure and functions of the ecosystem, and on restoration of many habitat types throughout the ecosystem."¹³

The 1996 report was presented to CALFED, which could help the entity determine where additional focused research and pilot projects are needed to provide more information about ecosystem functions and the natural processes of habitat. However, it needs to be recognized that the best and most complete data may not always be available when decisions are required. Therefore, participants should strive to develop a consensus about the reliability and usefulness of the data that are available.¹⁴

¹² Habitat Restoration in Aquatic Ecosystems: A Review of the Scientific Literature related to the Principles and Practices of Habitat Restoration, Team of Bay-Delta Stakeholder Scientists, 1996.

¹³ Habitat Restoration in Aquatic Ecosystems, A Review of the Scientific Literature related to the Principles and Practices of Habitat Restoration, Team of Bay-Delta Stakeholder Scientists, 1996.

¹⁴ The Keystone National Policy Dialogue on Ecosystem Management, Final Report, October 1996.

2. Effectiveness

Environmentalists see the CVPIA and comprehensive CALFED Bay-Delta Program (along with the funds generated by and for these activities) as an opportunity for what is probably the largest scale environmental restoration project in the United States. They fear that federal and state agencies have been too slow to appreciate the scale of the program and think the FWS and the California DFG, in particular, need to be re-tooled to take a leadership role in the development of environmental restoration projects rather than mitigation of existing water projects and proposed land use changes.

For the water users in the Sacramento-San Joaquin River Basin, the conflict over natural resources issues and water supply have led to tension between them and federal agencies. The water users are looking for results: they want proof that a certain amount of water used for instream benefits or the development of a physical barrier on a water diversion will work—that fish populations will increase.

For any environmental restoration effort in the basin to succeed, adequate scientific research, test programs and proper monitoring are needed. This information can assist in the use of "adaptive management: a continuing process of action-based planning, monitoring, researching and adjusting to achieve management goals for an ecosystem."¹⁵ Because adaptive management provides for redirection of projects or programs based on new information and evidence, it has broader appeal to a wide range of agency officials and stakeholders.

Adaptive management also allows for flexibility, something the interagency scientist team concluded was vital to success in its analysis of restoration studies and programs. "A restoration program should be comprehensive in scope, but flexible in approach. Initial restoration efforts should be widely dispersed and adequate in scope to provide meaningful tests of restoration success. Monitoring should be adequate to permit the benefits of the restoration efforts to be assessed, and to guide later efforts."¹⁶

But the use of adaptive management brings up several key questions:

¹⁵ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies, Volume II, Implementation Issues, Report of the Interagency Ecosystem Management Task Force, November 1995.

¹⁶ Habitat Restoration in Aquatic Ecosystems, A Review of the Scientific Literature Related to the Principles and Practices of Habitat Restoration, Team of Bay-Delta Stakeholder Scientists, 1996.

- What new information should compel an adjustment to the management strategy?
- What threshold should trigger this adjustment?
- Who will decide when and how to make adjustments?
- What are the definitions and thresholds of acceptable results?¹⁷

3. Red Bluff Diversion Dam

Some of the most extensive efforts to develop an effective environmental solution have occurred at Red Bluff Diversion Dam, a feature of the CVP. Completed in 1964, the dam spans the entire width of the Sacramento River southeast of the city of Red Bluff and diverts water into the Tehama-Colusa and Corning canals for farmland on the west side of the Sacramento Valley and three national wildlife refuges. Although the dam as constructed includes fish ladders and fish counting structures on either side to allow for upstream salmon migration, subsequent research revealed that the ladders were inadequate and that young outmigrating salmon had difficulty getting past the dam without being eaten by predator fish or being entrained in the headworks of the canal.

Since the late 1980s, the USBR has worked to make this facility more fish friendly. (Efforts to protect the endangered winter-run Chinook salmon also require the dam gates to be raised for up to eight months a year to improve fish passage.) In 1990, USBR completed a \$17 million renovation of the dam, which included the installation of 32, state-of-the-art, 19-foot-diameter rotating drum screens to keep fish out of the Tehama-Colusa Canal.

In 1991, USBR initiated its Red Bluff Diversion Dam Fish Passage Program, an intensive study to identify a "reasonable, cost-effective, long-term solution to fish passage problems at the dam," and find a way to deliver water to the two canal systems when the diversion dam gates are raised.¹⁸

Part of the study includes a four-year Research Pumping Plant Program in which two types of pumps are being evaluated to determine if the units cause any physical injuries to or over-stress young salmon. Two Archimedes screw-type pilot pumping plants and one centrifugal internal helical

¹⁷ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies, Volume II, Implementation Issues, Report of the Interagency Management Task Force, November 1995.

¹⁸ Red Bluff Fish Passage Program Research Pumping Plant Evaluation, pamphlet, U.S. Bureau of Reclamation.

screw-type pilot pumping plant have been installed at the dam site. As the water is pumped into the Tehama-Colusa Canal Forebay, young wild and hatchery salmon are experimentally passed through the pumps, diverted from the canal by the drum screens and examined at a separate collection facility.

The pilot pumping plant, whose installation was completed in May 1995, has had a number of setbacks, mostly of a mechanical nature, which have generated some criticism from CVP water users. "The science is not there," said one agricultural water stakeholder. "They tried the drum screens for the T-C Canal. That didn't work. They tried the Archimedes screw pump. That didn't work. Now they have a siphon test program. They have spent 10s of millions of dollars and there is no solution."

USBR officials, however, say the drum screens have proved to be effective. The question that remains, they say, is whether you can run the fish through a pumping plant, by the screens, through a bypass system and back to the Sacramento River without doing any damage to them.¹⁹

That question, they say, will ultimately be answered when the pilot project is completed in several years, and that the whole point of such a lengthy study is to ensure that the science is there to ensure an effective solution.

The program has had its share of problems. The Archimedes screw pumps cracked after about 1,000 hours of operation. USBR officials subsequently determined that the structure was improperly constructed so that the metal "welds" could not handle metal stress. In the end, USBR paid to fix the pumps itself as it continues to seek a reimbursement from the company that constructed the facility.

Because the pilot pumping plant can only operate at certain times of the year under certain conditions (the presence of outmigrating salmon juveniles are necessary but the pumps cannot operate when the endangered winter-run is outmigrating), the study will take several years to complete. For farmers, the pumping restrictions for the winter-run can limit their supply of irrigation water at a critical point during the growing season. The program lost between one and two years because of the mechanical problems; the original schedule for release of a report was 1998 or 1999.

¹⁹ The basic difference between the two types of pumps is speed. The Archimedes screw-pumps are relatively slow, with 350 revolutions per minute. The centrifugal pump has 1,000 to 2,000 revolutions per minute. Because of the slower revolution, it is generally believed that the Archimedes pump is less harmful. Biologists are trying to determine whether young salmon are harmed by the increase in turbulence with the centrifugal pump.

The Red Bluff Diversion Dam illustrates an interesting dilemma: which comes first, the science or the physical fixes? Data is needed to determine what needs to be done, but demonstrated use of a solution that is a bit more experimental may be needed to get that information. Agency staff often find themselves caught in the middle as stakeholders call for solutions, yet then question the science behind an agency decision.

4. Pilot Projects

CALFED Bay-Delta Program officials are facing this issue as they work to develop their ecosystem restoration program. Pilot projects with continual monitoring may help. For example, biologists believe the addition of shallow riverine habitat along the waterways upstream of and in the Delta will create more rearing habitat for young fish. But how deep is shallow riverine habitat? One way to find out is through experimentation. "We need to construct a 3-foot pilot area, a 4-foot pilot area and a 6-foot pilot area and monitor their use by species," said a biologist.

Stakeholders also complain about the amount of time and paperwork required in order to gain project approval. Yet without this process, the federal government could find itself subject to complaints of mismanagement of taxpayer money and lacking sufficient proof of environmental harm or betterment. Another area in which stakeholders complain is the overlap between federal and state requirements. For example, DFG, FWS and NMFS all have their own fish screening criteria, which differ from one another.

"In order to install a fish screen, you have NEPA, CEQA, ESA, state and 404 permit compliance. There's so much paperwork you're looking at years before you start turning a spade in the ground," said one agricultural stakeholder. "But it's hard to be critical because those are the facts of life. You could streamline the laws and paperwork some, but the only way to change the law is to go to Congress, and they could change it to something worse. You need perseverance."

5. Economics

An ecosystem is an interconnected community of living things, including humans and the physical environment with which they interact. As such, ecosystems form the cornerstone of sustainable economics. The goal of the ecosystem approach is to restore and maintain the health, sustainability and

biological diversity of ecosystems while supporting sustainable economies and communities.²⁰

California's \$760 billion annual economy is ranked seventh in the world. Because much of the state's water that drives that economy originates in the Sacramento-San Joaquin River Basin and must move through the Delta, what happens in the basin affects the entire state—even though many residents are not cognizant of where their water comes from. How to pay for the environmental and ultimate physical (construction) fixes to this ecosystem is a major issue facing the state's policy-makers, water users, conservationists and taxpayers.

In the November 1996 election, voters took steps toward a solution when they approved by a 63 percent to 37 percent margin the second-largest water bond in California history—the \$995 million Proposition 204, the "Safe, Clean, Reliable Water Supply Act." (The general obligation bond will be repaid with tax dollars over 30 years. Repayment of the bonds, according to the legislative analyst's office, will total about \$1.8 billion or \$71 million a year.) The \$995 million general obligation bond measure includes \$193 million for immediate expenditure on physical improvement to the Delta. This portion includes \$93 million to finance California's share of implementation of the federal CVPIA. Other programs that will receive money are Category III Delta environmental projects, \$60 million; Delta levee improvements, \$25 million and South Delta barriers, \$10 million.

Three days after the election, the first meeting of the newly formed Ecosystem Roundtable was held. The members of this stakeholder group, co-chaired by Gary Bobker of the Bay Institute, Greg Gartrell of Contra Costa Water District and Jason Peltier of Central Valley Project Water Association (representing the environmental, urban and agricultural communities), will help federal and state agencies identify and select ecosystem restoration projects to be funded. The roundtable now is working with technical experts to determine a sound and systematic selection of the type of projects that should be funded. Among those being considered are riparian restoration, fish screens, water quality efforts, floodplain/wetland ideas and channel management.

Proposition 204 also includes \$235 million to provide loans and grants to communities to finance construction of wastewater treatment plants, water recycling projects and agricultural drainage treatment works. The Flood Control Subvention Program will receive \$60 million.

²⁰ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economics, Volume II, Implementation Issues, Report of the Interagency Ecosystem Management Task Force, November 1995.

The final \$390 million in Proposition 204 is to finance the future CALFED Bay-Delta Ecosystem Restoration program. This money, however, cannot be spent unless certain milestones are reached.

In February 1997, the Clinton administration announced plans to seek \$143 million in additional federal funds for USBR's 1998 fiscal year budget to finance improvements in the Bay-Delta. The administration also will seek an additional \$286 million for the next two years. The money still must be approved by Congress.

With the signing of the Bay-Delta Accord, officials established the Category III program, an estimated \$60 million annual commitment over the life of the three-year accord to identify and finance physical improvements to the Bay-Delta watershed (stretching up into the Sacramento Valley and down the San Joaquin Valley). Much of the initial funding came from MWD. Two of the initial Category III projects approved for funding that have been completed are:

- Relocation of the pumping station at M&T Ranch on Big Chico Creek in the Sacramento Valley and installation a fish screen to protect and restore spring-run chinook salmon. Category III funds: \$1.5 million.
- Installation of fish screens on five water diversions in the Suisun Marsh to protect Delta smelt and outmigrating salmon smolts. Category III funds: \$450,000.

It will be several years before continued monitoring will determine the effectiveness of these Category III projects.

Although water users, landowners and water district managers resent the imposition of federal environmental laws, the statutes have proven to be "hammers" to induce cooperative efforts to protect fish and habitat. In the Sacramento Valley, for example, proposals to pursue an ESA listing of the spring-run Chinook salmon led to a flurry of stakeholder-led efforts to improve habitat, remove fish obstructions and screen diversions in an attempt to restore the fish and avoid further federal mandates.

These same stakeholders have applied for federal and state funds, available primarily through the CVPIA and CALFED Bay-Delta Program to help finance some of these environmental improvements. "The federal agencies regulate you to death," said one agricultural water stakeholder. "The federal rules are so expensive, but the federal funds are critical to getting projects done. Locally based groups need funding and partnerships from the federal government."

6. Deer Creek

The potential listing of the spring-run Chinook salmon as an endangered species and a possible "wild and scenic river" designation prompted Deer Creek landowners to form the Deer Creek Watershed Conservancy in 1995. Through the conservancy, landowners within the watershed are working with state and federal regulatory and resource management agencies to protect and restore the creek's habitat.

Located in the upper Sacramento Valley, Deer Creek joins the Sacramento River south of Red Bluff. Deer Creek is an important spawning area for the Sacramento River's remaining spring-run salmon. One of four Chinook runs found in the system, the number of spring-run have decreased dramatically in recent years. In 1982, an estimated 21,000 spring-run salmon were in the Sacramento River system. In 1993, only 1,300 adults returned to spawn.

Environmental groups, concerned about this decline, suggested filing for endangered species status as early as 1989. Commercial fishermen oppose such a listing because it would place further restrictions on the ocean salmon fishing season. In 1992, fishermen, farmers and others formed the Spring-Run Work Group to develop a consensus-based habitat improvement plan and avoid the need for listing the spring run. In 1996, the state Fish and Game Commission declined to list the spring-run under the California ESA. Environmentalists sued and in 1997, a superior court judge directed the commission to list the spring-run as a "candidate" species, which provides limited protection for one year.

Interest in protecting Deer Creek also raised the potential of a "wild and scenic river" designation. However, landowners along the creek feared this would draw kayakers, rafters and other recreation seekers, resulting in overuse, loss of privacy and potential trespassing. There also was concern that additional recreation would harm the adult spring-run salmon that reside each summer in deep pools in Deer Creek prior to spawning. In the end, the stakeholders joined forces to support state legislation that bans construction of new dams on the upper sections of Deer and Mill creeks, which flow out of Lassen National Park, but stops short of wild and scenic restrictions.

The bill was approved unanimously in 1995 by the Assembly and Senate and signed into law by the governor. This new law accomplished the purpose of "wild and scenic" protection while safeguarding private property rights and the salmon. Supporters of the program say this collaborative approach by interested stakeholders to develop "tailored" legislation could be a model for others.

7. Butte Creek

On nearby Butte Creek, 35 miles of the creek will be restored to pristine condition as local water users, FWS and DFG work to consolidate and remove at least four of the 11 dams and diversion facilities on the creek that impede spring-run Chinook salmon passage between the Butte Slough Outfall and Centerville Head Dam where the salmon spawn.

Butte Creek is one of only five Sacramento River tributaries to support a natural spring-run. As late as the 1960s, the creek supported a spring-run of 4,000 adults with a maximum of 20,000 in 1960.²¹ The numbers of spring-run declined dramatically in the 1987-1992 drought. In 1987, only 14 fish returned to spawn, although that number had rebounded to 400 by 1993. In 1995, 7,500 spring run returned to spawn; in 1996, 1,400, according to DFG.

In 1992, the Western Canal Water District (WCWD), which operates two dams roughly mid-way up the creek, developed a proposal to remove the facilities and replace them with an inverted diversion siphon 850-foot long inverted diversion siphon under Butte Creek. The estimated \$6 million project was attractive to DFG and FWS officials who urged the district to expand the proposal and seek state and federal funding. In its AFRP draft report released in 1995, FWS gave highest priority ranking to more than a dozen fish restoration projects on Butte Creek, including the WCWD proposal.

The expanded project, estimated at \$8.2 million, will allow for the removal of two other dams—McGowan and McPherrin. The project is to be split evenly among three sources of funding, the CVPIA restoration fund, Bay-Delta Accord Category III funds and the WCWD users themselves. Construction of the siphon and distribution canals is expected to begin on Nov. 15, 1997. The dams will not be removed until August 1998, however, in order to prevent disturbance of spring-run salmon. (Point Four Dam was removed in 1993.)

Similar spring-run successes have occurred on Mill Creek where, with the cooperation of the Los Molinos Mutual Water District, a water bank was created to release pulse flows of water during critical migration periods. Prior to that, diversions caused the stream to dry up before it reaches the Sacramento River.

Other activities under way on Butte Creek to improve spring-run fish passage include the recently constructed fish ladder at Oakee Dam, the

²¹ Upper Sacramento River Fisheries and Riparian Habitat Management Plan, January 1989.

relocation of the M and T Ranch diversion, and plans to build fish ladders and/or install fish screens at Gorrill, Adams and Durham-Mutual dams.

On Big Chico Creek, M&T Ranch has relocated its diversion from the mouth of Big Chico Creek to the Sacramento River, which will leave more water in the creek for migration. Ground broke on the project in June 1996, which is jointly funded by the federal government, Category III and private interests. Cost of the \$4.5 million project will be split between the CVPIA, \$2.2 million; Category III, \$1.5 million: Wildlife Conservation Board, \$500,00; Ducks Unlimited, \$150,000; and FWS, \$150,000. In 1997, another grant from the federal government helped fund the position of watershed coordinator for Big Chico Creek. Butte Creek also received funding for a similar position.

B. Water Supply and Flood Management

The 1990 census confirmed that California is the most urbanized state in the nation, with more than 80 percent of its residents living in metropolitan areas of 1 million or more. Although officials predict most of the state's projected urban growth will occur in the south coast region, the Central Valley also will become increasingly urbanized in the 21st century.

In its January 1995 report, "The Central Valley's New Towns, Destiny or Disaster," the American Farmland Trust found that seven of the valley's 11 counties—Fresno, Kern, Madera, Merced, San Joaquin, Stanislaus and Sutter—are considering a total of 18 proposals for new towns. According to the state Department of Conservation, the San Joaquin Valley lost 21,498 acres to urbanization between 1990 and 1992. The valley ranked No. 1 in converting lands from agricultural to urban uses.

According to the 1990 census, the Sacramento River region, including the city of Sacramento, had a population of 2.2 million, a 32 percent increase from the 1980 census. The region's population is expected to more than double by 2020. The San Joaquin River Region's 1990 population was 1.4 million, an increase of 41 percent from the 1980 census. Fueled by a suburban housing boom in the west San Joaquin Valley near Tracy for Bay Area commuters, several counties expect their populations to double by 2010.²²

For the Sacramento region, DWR forecasted an average year 33,000 acre-feet to drought year 829,000 acre-feet water shortfall for 2020. For the San Joaquin region, DWR forecasted an average year 40,000 acre-feet to drought

²² California Water Plan Update, Bulletin 160-93, Volume 2, California Department of Water Resources, October 1994.

year 274,000 acre-feet shortfall. Water transfers, wastewater reclamation and demand reduction were identified as potential sources of supply in both regions. Noting that the Sacramento River region's most attractive surface water facilities have been built—with most studies to increase supplies focused on producing water for export—DWR did say a few attractive reservoir sites remained, although none was far enough in the planning process to be completed in the next 30 years.²³

With onstream storage projects in California stalled since the 1970s—witness the failure of Auburn Dam supporters to win congressional funding in 1994 and 1996—offstream storage is a reasonable option. In the 1980s, DWR was planning to build a new offstream facility south of the Delta near the current San Luis Reservoir (a joint state-federal facility). Hampered by costs, conflict over Delta exports and environmental concerns, the project has been put on hold.

As part of its effort to find a long-term Delta solution, the CALFED Bay-Delta Program is analyzing the amount and location of additional potential offstream water storage and how much additional water might be available for export. Under the various proposed scenarios, new north-of-Delta offstream storage could be as great as 3 million acre-feet, in-Delta storage as great as 600,000 acre-feet and south-of-Delta offstream storage as great as 1.5 million acre feet. This storage component is designed to provide added flexibility to the existing system and assist the region in meeting Bay-Delta water quality standards, not necessarily to meet all the water demands identified by DWR in its Bulletin 160-93.²⁴

In addition to CALFED's investigation of storage options and work by the state and federal agencies to increase water supply reliability in the region, local governments also are developing plans to meet future demands. The Sacramento Water Forum has been meeting for two years. With the guidance of a professional facilitator, 42 stakeholders on the lower American River—environmentalists, agricultural representatives, water agencies and others—are working on solutions to water controversies and problems.

The Sacramento group has identified several key issues that could require negotiation and compromise with other water users. These issues include lower American River flows that provide adequate water supplies, but protect the environment (instream flows), identifying sustainable levels of groundwater pumping and possible groundwater management. A Foothills

²³ California Water Plan Update, Bulletin 160-93, Volume 2, California Department of Water Resources, October 1995.

²⁴ CALFED Bay-Delta Program Phase I Final Report, September 1996.

water group, representing El Dorado and Placer counties, also has been formed to address future water needs. The Sacramento and Foothills interest groups have held joint planning sessions in an effort to resolve mutual issues.

Ten months of negotiations between Sacramento city and county interests and the East Bay Municipal Utility District (EBMUD), for example, has led to an agreement to pursue a joint project to provide EBMUD with water from the American River and protect the river's fishery and water quality. The tentative agreement calls for EBMUD to take its water from the Sacramento River after the water has run the length of the lower American River rather than just below Folsom Dam. Talks continue with San Joaquin County interests on consideration of a plan to allow water not used by EBMUD in wet years to be diverted to San Joaquin County.²⁵

California's future growth is accepted by most as inevitable, but key questions remain: how the state will grow; where that growth will occur; and what—if anything—should be the link between water supply and new development. In 1994, the debate over water and growth reached the California Legislature. Although an initial bill requiring a city or county to submit plans for a new development to a water agency for approval died, California did pass legislation (SB 901) in 1995 establishing a stronger link between growth and water. Under SB 901, water agencies can use CEQA to determine if there is sufficient water to serve a new development. If the agency says it can't find adequate water for the development, it declares a significant impact under CEQA. If a significant impact finding is made, city or county planners can approve the development by overriding a water district by citing other economic considerations, or elect to mitigate the finding by developing new supplies or requiring the developer to develop new water supplies.

The federal government's role in helping to meet future water supplies is somewhat controversial. CVP water users favor construction of additional facilities or modification of current water facilities to increase CVP yield. Environmentalists, however, strongly favor using water conservation, wastewater reclamation projects, water transfers, and retirement of farmland with agricultural drainage problems to "develop" additional water.

1. Water Marketing and Transfers

²⁵ East Bay Municipal Utility District newsletter.

Water marketing is the transfer, lease or sale of water or water rights from one user to another. Water can be and has been traded between agricultural users, from farms to cities, and even from agricultural and urban users to the environment to provide water for wetlands or instream flows.

During the 1987-1993 drought, water transfers took place between areas that could temporarily reduce usage and areas that faced critical shortages, many facilitated by the state of California's innovative Drought Water Bank.

Despite these developments and state legislation designed to facilitate transfers, the topic remains a controversial one in California. The advantage of water marketing is that it allows a shift in water use without the cost of building new dams and reservoirs. Because farmers have the rights to 80 percent of the state's developed water, they are the focus of much of the interest in enhancing urban or environmental water supplies.

Environmentalists, economists and some business leaders favor the creation of an open market to facilitate the transfer of water from agricultural to urban users, contending that the market should determine the price paid for water and the quantity of water involved in a transaction. They believe that farmers need a financial incentive to pursue water marketing. Agricultural interests, however, are concerned about the third-party effects cause by transfers. (Third-party impacts are direct and indirect economic, social or environmental effects of a water transfer on a party other than the seller or buyer.)

However, there is general acknowledgement that transfers, mainly from agricultural to urban areas, are a foregone conclusion to help meet future water demands. Many of the counties now submitting water needs assessment reports to DWR for its next update of the California Water Plan, Bulletin 160-98, suggest new supplies for further growth will come from water marketing. The biggest questions are how to ensure fair financial compensation and protect rural communities and the environment.

While in the past, USBR's role in water marketing may have been limited to its regulatory authority over the CVP and the use of its delivery facilities because state law governs water rights, the CVPIA greatly advanced the concept of water marketing.

The law allows individual CVP users to sell CVP water for a profit to any other entity, including those outside the CVP service area. (Transfers outside the service area also require approval of the SWRCB, the agency that governs water rights in California.) Transfers must be approved by the secretary of the Interior, and those that involve more than 20 percent of the CVP water under long-term contract also must be approved by the local

irrigation district. Transfer of CVP surface water is prohibited if it would increase long-term adverse impacts on groundwater supplies or if such a transfer would result in significant reduction in the quantity of water supplies used for fish and wildlife.

CVP water users have complained that routine transfers within a CVP service area are more difficult under the CVPIA because of the "increased red tape." USBR officials, however, say these transfers are handled much as they were in the past. A programmatic, pre-approval process to satisfy NEPA requirements has been in place for three years that facilitates the ability to move water within the same service area. The process is much the same as before, officials say, although there now is the need to fulfill additional public notification requirements.

The CVPIA also directs USBR to acquire (from willing sellers) supplemental water to carry out the act's anadromous fish restoration program and further directs Interior to acquire, over a 10-year period, specified quantities of water for refuge water supply. In May of 1997, the USBR announced a proposed agreement with the San Joaquin River Exchange Contractors in which the Exchange Contractors would transfer up to 40,000 acre-feet of water to the CVP Improvement Act Interim Water Acquisition Program during the summer. Among the ultimate users of the transferred water were the San Luis National Wildlife Refuge and Los Banos Wildlife Management Area. The water would help prepare these wetland areas prior to the arrival of migratory waterfowl.

The issue of transferring water outside the CVP service area has been a contentious one—made more difficult by the differing viewpoints of individual CVP farmers, CVP irrigation districts and people concerned about third-party impacts. The first long-term transfer proposal under the CVPIA between MWD and the Areias Dairy Farm in the San Joaquin Valley generated tremendous controversy. There was much debate whether the Central California Irrigation District, which supplies water to Areias' farm, should handle the water sale because it held the contractual water right. Areias' initial proposal was to make up the sold surface water with groundwater pumping and surrounding landowners worried that the additional pumping would aggravate existing overdraft. There also were concerns that the agreement would cause a wave of water transfers from the region to southern California. In the end, the transfer did not proceed.

Another groundwater banking/transfer proposal between MWD and the Arvin-Edison Water Storage District, a Friant-Kern Canal contractor, is now undergoing USBR review under the CVPIA. It, too, has generated controversy in the agricultural community.

2. CVPIA Replacement Water

The purchase of water from willing users is one possible means the USBR has to increase the yield of the CVP to replace the 800,000 acre-feet allocated annually to the environment under the mandate of the CVPIA.

In accordance with the CVPIA stipulation to develop a "least-cost plan" for increasing the yield and "to minimize adverse impacts, if any, upon existing CVP contractors and to assist the state of California in meeting its future water needs," the Mid-Pacific Region released a yield increase plan in 1995.

Although the law directs the Secretary of the Interior to develop and submit a plan to Congress to "increase, within 15 years after the date of enactment, the yield of the CVP by the amount dedicated to fish and wildlife purposes," the law does not include language to implement such a plan. Further action by Congress will be required before the plan can be put in place.

In addition to water transfers, the report identified other sources of yield increase including conjunctive use of groundwater and surface water, purchase of water available from land fallowing, agricultural and urban conservation, urban wastewater reuse and enlargement of one existing offstream storage facility.

In general, the report made these findings:²⁶

Action	Estimated potential yield
Purchase of water from local suppliers	180,000 acre-feet
Conjunctive use	910,000 acre-feet
Land fallowing	1,200,000 acre-feet
Agricultural and urban conservation	445,000 acre-feet
Water reuse	200,000 acre-feet
Enlarged offstream storage (Farmington)	30,000 acre-feet

These items can be divided into demand reduction and supply increase actions. The largest potential annual supply increase option is conjunctive

²⁶ Least-Cost CVP Yield Increase Plan, U.S. Department of Interior, October 1995.

use, the operation of a groundwater basin in coordination with a surface water system to increase total supplies and enhance water supply reliability. The basin is recharged artificially and/or naturally in years of above average precipitation so there is more groundwater to extract in years of below-normal surface water supplies.

The concept may be simple, but the practice is difficult, and often controversial. Technical questions about a groundwater basin's safe yield and recharge rate must be answered. A financial commitment to construct expensive duplicate systems for surface and groundwater delivery must be made. Legal issues of who has rights to the water—surface or ground—are big challenges. Political and institutional issues emerge when competing agencies consider who will operate and benefit from the conjunctive use system.

Perhaps the biggest political hurdle is the fact that conjunctive use requires groundwater management, a controversial topic in itself in California—one of only two states in the West without a comprehensive, statewide groundwater management code. In the 1950s, DWR suggested using the Sacramento Valley's groundwater to help meet water demands south of the Sacramento-San Joaquin Delta. The idea sparked a controversy over groundwater transfers that lingers today.

Land fallowing also is a politically charged issue in California. Since the late 1980s, retirement of some lands on the west side of the San Joaquin Valley has been identified as one way to remedy problems of agricultural drainage and selenium. During the drought, some farmers chose to fallow fields and sell water supplies to the state's Drought Water Bank, an action decried by some community activists for its third-party impacts. More recently, land fallowing has emerged as a critical issue in the Imperial Valley as citizens debate the proposal to transfer some water to the San Diego area. Land fallowing originally was included as a means to conserve water in the CALFED Bay-Delta Program's water use efficiency component. But after some controversy, land fallowing was dropped and the efficiency program now focuses on water recycling and reuse, and urban and agricultural water conservation.

Four levels of land fallowing were identified in the Least-Cost CVP Yield Plan based on their wide range in costs, \$55 per acre-foot to \$255 per acre-foot. Recognizing the potential for political conflict, the plan suggests that "impacts can be mitigated by requiring that land fallowing be temporary, part of normal agronomic rotation and dispersed throughout the Central Valley. ... In order to respond to [political] concerns, land fallowing should

only occur with complete local agency, government, organization and public partnerships."²⁷

Other options to increase CVP yield include modification of CVP/SWP operations, enlargement of existing CVP reservoirs and construction of new facilities, weather modification, snowpack management, desalination, and water importation. USBR eliminated most of these options because of timing considerations, because cost does not place them in the first 3 million acre-feet of lowest-cost yield increase options, and because there is substantial concern over environmental effects.

Water supply reliability has become a big issue among urban and agricultural water users since the most recent drought. Complaints of a "regulatory drought" imposed upon exporters, most notably the CVP contractors on the west side of the San Joaquin Valley, have been aimed at federal laws (ESA and CVPIA) that require modification of water project operations to improve environmental resources. The constraints of the current Delta export system hamper transfers from north of the Delta sellers to south of the Delta buyers. In an effort to keep the parties at the table and develop an acceptable Delta fix, the CALFED Bay-Delta Program established water supply reliability as one of its four core goals.

With CALFED's push toward some sort of storage component in its ultimate fix and the recent floods, renewed attention is focused on an offstream reservoir site in the Sacramento Valley that has been studied for 20 years.

3. Sites Reservoir

Studied as a potential reservoir since the 1950 by DWR and the USBR, the Sites project would be located about 10 miles west of Maxwell in Antelope Valley across the drainage of Stone Corral and Funks creeks. The main dams and most of the project would lie in Colusa County, but the reservoir itself would extend into Glenn County. Three projects of various capacities have been evaluated for the site, 1.2 million acre-feet, 1.8 million acre-feet and 3 million acre-feet. The largest option would be formed by extending the project into the Hunters and Logan creeks' drainages.²⁸

Existing conduits for Sites Reservoir are the Tehama-Colusa Canal and the Glenn-Colusa Irrigation District's canal. The basic scenario calls for water to

²⁷ Least-Cost CVP Yield Increase Plan, U.S. Department of Interior, October 1995.

²⁸ Reconnaissance Survey, Sites Offstream Storage Project, State Resources Agency and DWR Northern District, July 1996.

be diverted from the Sacramento River during the winter months when the irrigation canals would not be in use. Releases from the reservoir would be made during the irrigation season back down these canals in exchange for water that otherwise would be diverted from the Sacramento River, allowing the undiverted summer flows to be available for other uses.²⁹

Sites Reservoir could provide more flood storage space in the winter months—allowing operators of Shasta Dam to increase the flood margin space—and provide additional water for the environment, Delta exporters and local water users. For example, Sites Reservoir could supply water to the 140,000-acre, water-short Tehama-Colusa Canal service area.³⁰

4. Flood Management

Other structural flood management options being discussed in the wake of the January 1997 floods include the construction of dams on the Yuba and Bear rivers and Cottonwood Creek, enlargement of river outlets and lowering of spillways at Folsom Dam on the American River, enlargement of Friant Dam on the San Joaquin River, development of set-back levees³¹ in the San Joaquin Valley, and construction of a bypass system on the lower San Joaquin River below the Merced River.

Another idea is to require that more storage space be provided for flood flows in existing reservoirs during wet months. Since 1988, flood control agencies in the city of Sacramento have had an agreement with the USBR to provide additional flood storage space in Folsom Reservoir on the American River. In general, this plan allows for up to 600,000 acre-feet of flood storage during the winter compared to the traditional 400,000 acre-feet. (The plan also coordinates storage with three upstream hydropower reservoirs.) Benefits from this plan were witnessed in the January 1997 storms when reoperation allowed for controlled releases from Folsom Dam and kept American River flows within the high-flow design limit. However, there are some hydrologists who maintain that the reoperation system would not have been successful if the January 1997 storms had been centered in the American River watershed.

²⁹ Reconnaissance Survey, Sites Offstream Storage Project, State Resources Agency and DWR Northern District, July 1996.

³⁰ Interview with agricultural stakeholder.

³¹ Because set-back levees are built farther back from the river channel than traditional levees they allow for more natural travel of the river and provide a greenbelt area for possible flooding.

A more controversial issue is floodplain management. Following the 1993 Mississippi River flood, the Interagency Floodplain Management Review Committee, chaired by Gen. Gerald Galloway, recommended changing current flood management policies to reduce development in floodplains, including relocating residents from low-lying areas. Approximately 8,000 homes were bought or relocated by the federal government following the Mississippi flood.

The committee's review of that flood event found that the loss of wetlands and upland cover and modification of the landscape significantly increased runoff; that many people at risk do not fully understand the nature and the potential consequences of that risk; nor do they share fully in the fiscal implications of bearing that risk, and that there is a need for clear definition of floodplain management responsibility among all levels of government.³²

The committee's report, commonly referred to as the "Galloway Report," made a number of recommendations, including:

- Improve coordination of activities through enactment of a floodplain management act which establishes a national model for floodplain management, clearly delineates federal, state, tribal, and local responsibilities, provides fiscal support for state and local floodplain management activities, and recognizes states as the nation's floodplain managers; activate the Water Resources Council to coordinate federal and federal-state-tribal activities in water resources; as appropriate, reestablish basin commissions to provide a forum for federal-state-tribal coordination on regional issues; and establish an Interagency Task Force to develop a coordination strategy to guide the multiple federal programs dealing with watershed management.
- Improve marketing of flood insurance; enforce lender compliance rules; reduce repetitive loss outlays by adding a surcharge to flood insurance policies following each claim under a policy; require those behind levees that provide protection against less than the standard project flood discharge to purchase actuarially based insurance; increase the waiting period for activation of flood insurance policies from five to 15 days to avoid purchases when flooding is imminent; and provide for purchase of mitigation insurance to cover cost of elevating, demolishing or relocating substantially damaged buildings. Reduce the amount of post-disaster support to those who were eligible to buy

³² Sharing the Challenge: Floodplain Management into the 21st Century, Report of the Interagency Floodplain Management Review Committee to the Administration Floodplain Management Task Force, June 1994.

insurance but did not to that level needed to provide for immediate health, safety and welfare.

- Give full consideration to all possible alternatives for vulnerability reduction, including permanent evacuation of floodplain areas, flood warning, flood-proofing of structures remaining in the floodplain, creation of additional natural and artificial storage and adequately sized and maintained levees and other structures.
- Establish an information bank to provide timely gathering and dissemination of critical water resources information for managing floodplains and for operating during a disaster.³³

The lack of flood insurance for many of the households flooded in California's 1997 New Year's event is an example of the continued need to educate the public about the risks of flooding, and require flood insurance in vulnerable areas. As with the debate over the state vs. local role in linking growth and water supply planning, the topic of floodplain management is sure to spark questions of private property rights and whether the federal government should get involved in local land-use decisions. Following the 1997 California floods, California Gov. Peter Wilson appointed a Flood Emergency Action Team (FEAT) to look into immediate and long-term flood response.

In the FEAT report released in June 1997, 65 actions were recommended to improve floodplain management and emergency response. However, building in undeveloped floodplains was not addressed in that report. Instead, FEAT recommended that another task force be established to evaluate land use policies in undeveloped floodplains, develop nonstructural flood control strategies and consider mandatory flood insurance in a report due March 1, 1998.

In a February 18, 1997, Memorandum from the Executive Office of the President, federal agencies were directed to "fully consider relevant options including nonstructural alternatives during evaluation and review of levee repair and reconstruction projects and associated restoration necessitated by California's floods."

President Clinton's proposed 1998 budget includes \$44.7 million for federal levee restoration projects along the Sacramento and American rivers, and asks Congress to approve the money for this year to expedite repairs. Money for the 1995 flood repairs to roads, bridges and other infrastructure from the

³³ Sharing the Challenge: Floodplain Management into the 21st Century, Report of the Interagency Floodplain Management Review Committee to the Administration Floodplain Management Task Force, June 1994.

Federal Emergency Management Agency (FEMA) did not arrive until 1996. And while many communities did receive FEMA grant funding to buy out or elevate homes along creeks, there was not enough money to go around. Sacramento County, for example, sought about \$9 million in grant funds but did not receive any.

C. Maintenance of Federal Water Facilities

Since the inception of the Reclamation program in 1902, the federal government has invested more than \$16 billion in water resource and hydropower facilities.³⁴ In 1993, estimates of federal capital costs of the CVP alone, USBR's largest facility, were \$3.4 billion. Although some minor construction continues in the 1990s (the \$80 million temperature control device at Shasta Dam for example), maintaining and upgrading the 50-year-old project is USBR's major responsibility today. Given the age of the CVP, normal wear-and-tear and technological advances could require additional major facility upgrades—and a need for funding—over the next 20 years.

The CVP's main features were constructed between 1937 and 1951. Construction of Shasta Dam began in 1938 and was completed in 1945. Friant Dam was constructed between 1939 and 1944. The Tracy Pumping Plant was completed in 1951. Folsom Dam was completed in 1956. Even New Melones Dam, the last major CVP feature, is nearly 20 years old—it was completed in 1979.

The cost of some replacement items for the CVP is spread out over the life of the project. Other items, such as periodic replacement of a pump, are planned for and included in the Replacements, Additions and Extraordinary Maintenance (RAX) list. However, staff at the USBR Mid-Pacific Region and CVP water users found that the traditional operation and maintenance budgetary programs did not always provide adequate funding or flexibility. As are all federal agencies, USBR is required to develop budget priorities two years in advance, including money to maintain CVP facilities and provide for any additional upgrades. It can be difficult to tell how much maintenance money may be needed that far down the road. Staff may determine, for example, that \$8 million is needed to maintain certain facilities. Two years later, it may turn out that \$11 million is needed. Emergencies also can impact CVP maintenance.

³⁴ Reclamation's Strategic Plan, U.S. Department of the Interior, Bureau of Reclamation, 1992.

"As priorities change, the operation and maintenance money is shifted. No year is a normal year in the CVP. There's always some change and money would be shifted out of the RAX program for higher priorities," said a USBR employee. "It's easy to say 'Let's take the money from the RAX fund' because it's mostly contract work, easy to identify, the facility is still operating, and it's easy to slide to next year."

With adoption of its 1992 strategic mission, the USBR set a goal "to provide a maintenance and improvement program for Reclamation facilities which ensures reliable, safe and economic service." One of the strategies outlined in the document to meet this goal was to "pursue alternative sources of financing for operation, maintenance and replacement activities."³⁵

An independent study of USBR's safety of dams program requested by Commissioner Eluid Martinez was released in May 1997. The study concluded that the dam safety program conducted by the Association of State Dam Safety Officials is effective and overseen by "highly competent" staff. Among other findings, the study stated that one of the greatest factors affecting the future success of the dam safety program will be "its ability to secure adequate funding." The report recommended two additional positions, an independent dam safety officer and a facilities security officer to improve the USBR's program.³⁶

Since 1992, USBR's Mid-Pacific Region has taken aggressive steps to ensure money slated for major work is protected from changes. The region also has identified one person to coordinate the RAX program and oversee the budget process so a certain block of money can be set aside for the repairs. The Mid-Pacific Region also has worked to develop innovative partnerships with CVP power and water users to conduct both routine maintenance and finance project upgrades.

Under the present system, USBR seeks an operation and maintenance appropriation two years in advance. The money is distributed to the users to fund the costs of operation and maintain the facility. They then collect the money back through fees, which are paid to USBR. Under the new approach, the users themselves pay directly for the operation and maintenance of a facility. The local users have better control of where the money goes and can make the decision to do more maintenance—and generate the funds to pay for it through water fees. The USBR provides staff expertise and maintains oversight of the operation and maintenance program.

³⁵ Reclamation's Strategic Plan, U.S. Department of the Interior, Bureau of Reclamation, 1992.

³⁶ USBR Mid-Pacific Region press release, March 27, 1997.

1. Tehama-Colusa Canal Authority

The first agreement for the new program was signed in October 1996. In the agreement between the Tehama-Colusa Canal Authority (TCCA) and USBR, TCCA agreed to:

- Operate, maintain and repair the entire Tehama-Colusa and Corning Canal systems for 25 years.
- Directly bill the water agencies it serves for operation, maintenance and repair.
- Act as a fiscal agent for USBR and collect all USBR charges and pass them on to the federal agency once a month.

TCCA officials say the agreement ultimately will save the water users money because it has a lower overhead than the USBR Mid-Pacific Region, reducing the costs of repairs. The agreement also gives TCCA more control over what repairs to make, reduces red tape, and provides them with a sense of identity as an enterprise agency—the authority generates its own money and pays its own bills. "Before we were glorified custodians of the canal," said one TCCA official.

However, TCCA officials were unhappy to see that the cost savings associated with the agreement were not reflected in USBR's budget. If the USBR is successful with negotiating similar agreements with the Friant Water Users Authority and San Luis & Delta-Mendota Water Authority, CVP users estimate an annual savings of \$12 million in maintenance and repair costs—money they say should then be cut from USBR's Mid-Pacific Region budget. Even if that money is used for additional CVP maintenance, they say the users will have to pay the costs in the long run.

On the power side, the Western Area Power Administration and Northern California Power Authority have agreed to pay USBR \$21 million to upgrade three generators at Shasta Dam. USBR staff said it is difficult to get appropriations for such large projects and that this plan provides the power users assurances of continued power production, and that the money actually gets to where it belongs. The upgrade also will increase power production at the dam by 30 percent to 40 percent. Through the agreement with the Mid-Pacific Region, the Western Area Power Administration and Northern California Power Authority will be entitled to receive a portion of that additional power.

2. Folsom Dam

The issue of deferred maintenance was scrutinized in 1995 after the failure of the spillway gate at Folsom Dam. As early as 1988, USBR staff had recommended that Folsom Dam's gates be re-painted to control corrosion and that the bolts be inspected. However, that work was deferred in order to fund higher priority maintenance items elsewhere in the CVP and meet other congressionally required programs or priorities, such as environmental restoration. There were reports of as much as \$60 million in backlogged CVP maintenance items, but a USBR employee at the Mid-Pacific Region said the backlog is more in the order of \$13 million.

Although deferred maintenance at Folsom received part of the blame for the gate failure, a subsequent investigation blamed the break on design failure. Members of the multi-agency, multi-disciplinary forensics team concluded in its November 1996 report that corrosion on the loaded side of steel trunnion pins increased trunnion friction over time, which induced loads in the strut braces. The failure occurred when the strut brace loads exceeded the strut-brace connection bolt capacity. The team included experts from USBR, the Corps, DWR, California Department of Transportation, McClellan Air Force Base, Osaka University of Japan and Woodward-Clyde Corporation.

The investigation revealed that the design of the gate, although in accordance with standards in effect when installed, did not include trunnion pin friction in the design loads for the structure. New mathematical tools made possible with computers now allow the calculation of forces in secondary brace members because of trunnion friction. These tools were not available to the designers of the original Folsom Dam gates. "The state-of-the-art changed between now and what it was back then," said a USBR employee.

After the gate failure and experts' findings, USBR spent \$12.5 million to strengthen the other radial-arm gates at Folsom Dam and build a new gate No. 3. Funding for that effort came from the CVP construction budget, not the normal operation and maintenance budget. The incident also prompted an examination of dams throughout the state for similar gate construction/operation to determine the safety of these structures.

3. Changes in Technology

The gate failure and rehabilitation of Folsom Dam's other gates illustrates an important point—some items that are classified as "maintenance" are

really advances in technology. Whether funding for such major improvements should come from the CVP's maintenance or construction budgets, or perhaps from a new category, is an important issue facing the USBR.

At Friant Dam on the San Joaquin River, an alkaline reaction from the cement reacting to the aggregate has caused certain areas of the concrete dam to expand, creating alligator cracks in the face of the dam and placing more pressure on the dam's gates. In order for the drum gates to operate properly, USBR staff have had to periodically shave the edges of the metal of the two outside gates. Mid-Pacific Region officials knew that the gates would become inoperable at some point, but the Friant Dam replacement gates were moved down on the RAX list several times as maintenance priorities changed. The gates are now slated for replacement, with \$4 million of the total \$6.6 million cost in this year's budget. The remaining money will come from next year's RAX budget. The total cost of the project represents about 50 percent of the fiscal year 1997-98 RAX budget.

Other money may come from environmental statutes. One example is the CVP's Tracy Pumping Plant fish facility in the Delta. The 50-year-old facility's trash screen and fish louvers are corroded from the salt water influence of San Francisco Bay. The plant's outmoded fish louver facility also must eventually be replaced with a screened facility, a requirement of the CVPIA. Such environmental fixes under the law also require a state share of 25 percent, which would lessen the project's impact on the federal budget.

"The maintenance agreements with the users will take a lot of money off budget," said a former USBR employee. "It's a good solution to operation and maintenance issues because the whole movement in federal government is to cut the budget and keep the deficit down. You could use new models of this type of funding westwide. The water and power users can decide what they want to do to keep the facility that serves them in good shape. The users are biting the bullet. It's a major step forward for the users to pay for the canal upkeep."

4. Federal Levees

There are 1,760 miles of Corps' project levees in the Central Valley that are constructed and repaired according to requisite standards. Project levees are operated and maintained by the state Reclamation Board and local reclamation districts. Reclamation districts are created when a group of landowners form a local agency in accordance with state law and tax themselves for flood control, reclamation purposes and water supply.

The Corps levees run along the Sacramento River from near Chico through the Delta and from east of Fresno to Stockton on the San Joaquin River. Following the floods of 1986, there has been an ongoing levee rehabilitation program, which first targeted the population centers along the Sacramento River system. Some of the levees that gave way in the 1997 floods were sections of federal project levees that, for the most part, were scheduled for repair. The Corps rehabilitation schedule giving highest priority to urban centers and repair work was, unfortunately, not fast enough to strengthen all the levees, which was partly due to funding limitations.

D. Nonpoint Source Water Pollution

To combat nonpoint source pollution, officials at the federal, state and local levels are increasingly turning to watershed management, a comprehensive, integrated approach to assess and control all sources of pollution within a watershed or river basin. Much of the focus of such an approach is on gaining voluntary, cooperative agreement from everyone in the watershed to adopt Best Management Practices (BMPs) to reduce polluted runoff.

In California, several hundred watershed management programs are underway. In 1996, the SWRCB and the nine Regional Boards adopted a new Watershed Management Initiative in which water quality monitoring, assessment, planning, standard setting, permit writing, nonpoint source management, groundwater protection and other staff work focuses on targeted watersheds. With the support of officials at EPA's Region 9, funding for the Watershed Management Initiative comes through modified administration of two existing grant programs, sections 205(j) and 319(h) of the Clean Water Act. The goal is to concentrate existing federal and state funds on pollution problems watershed by watershed rather than program by program.

It is through watershed management that federal and state water quality officials believe they will get the most "bang for the buck" in their ongoing efforts to further clean up water pollution. SWRCB and EPA officials emphasize that their goal is a grassroots-based, not top-down, approach to watershed management. Financial incentives, they say, through pooled federal grant funds and state money will encourage stakeholders to engage in such an approach, as will the specter of potential regulation.

"We want forums of stakeholders to take on these issues," said an EPA employee. "But the flip side is EPA, the Regional Boards and the State Board need to sit at the table. The bottom line is we have a statutory duty to implement laws and oversee water quality standards and permits. These are our responsibilities."

1. Sacramento River Watershed Program

Perhaps one of the most ambitious Watershed Management Initiatives is the Sacramento River Watershed Program, which was inaugurated in February 1996. Initial funding for the program has been provided through an EPA grant to Sacramento County for a Sacramento River Toxic Pollutant Control Program (SRTPCP), a multi-year partnership with the Central Valley Regional Quality Control Board and EPA Region 9 to bring the Sacramento River into compliance with toxic pollutant standards. The goals of the SRTPCP are to implement a basin-wide water quality monitoring program; develop site-specific water quality standards where appropriate; identify and evaluate alternative pollutant control options; and develop a technically feasible, cost-effective and implementable program.

Much of the length of the Sacramento River violates water quality standards for pesticides, copper and mercury. Toxicity monitoring using standard bioassay test species has detected ambient toxicity more than 50 percent of the time in the river and in several of its major tributaries. Some of this ambient toxicity can be linked to pesticides and metals, but the source for much of it is unknown. The boundaries of the SRTPCP include the Sacramento River from the Oregon border to the town of Rio Vista, located about 35 miles south of the city of Sacramento.

The SRTPCP funding was used to initiate the broader Sacramento River Watershed Program and gain stakeholder input, with much of the initial effort focused on allaying fears that the downstream interests through SRTPCP would somehow dictate to upstream interests. The watershed program spent much of 1996 on preliminary issues, such as adoption of a mission statement "to ensure that current and potential uses of the watershed's resources are sustained, restored and, where possible, enhanced, while protecting the long-term social and economic vitality of the region." The watershed program also established six subcommittees in addition to the SRTPCP Grant Subcommittee to promote environmental protection and collaboration among stakeholders: the Biological/Habitat Assessment Subcommittee; Education Subcommittee; Funding Subcommittee; Monitoring Subcommittee; Tributary Watershed Subcommittee; and the Toxics Subcommittee. A Coordinating Committee was established to coordinate the activities of the entire watershed program, facilitate the exchange of information within the group and assist with additional support and steering. There is no set membership on the subcommittees and their meetings are open to anyone.

Today, more than 750 people are on the Sacramento River Watershed Program's mailing list. Employees with the Central Valley Regional Water Quality Control Board, EPA Region 9, Sacramento Regional County

Sanitation District and Larry Walker and Associates (a consulting firm) oversee the program. "One goal of watershed management is to make the job of meeting water quality standards easier," said one employee. "But watershed management takes a lot of time and patience. There are so many stakeholders involved you have to spend a lot of time in the process to develop trust."

In 1997, the Sacramento River Watershed Program hopes to implement the first phase of the comprehensive monitoring program; conduct educational workshops on groundwater, drinking water issues and mercury; release a "state of the watershed" report summarizing what is known about toxics in the watershed; develop and implement a strategic plan for outreach and funding; and develop specific objectives to accompany the more general mission statement adopted in 1996.

2. Success Story on the San Joaquin -- Reduced Sediment Loading

Sediment loading is a major problem in the San Joaquin River. Some sediment washes into the San Joaquin from Coast Range tributaries, which do not have dams or other structures to trap sediment, but the major cause is irrigation-induced soil erosion, which also carries pesticides into the river. Studies indicate that the West Stanislaus Study Area is the main contributor of nonpoint source sediment problems in the San Joaquin River, with erosion producing an average of 9 tons of sediment to the river per acre per year, or a total of 1.2 million tons of sediment per year. Organochlorine pesticide residues, such as the banned but persistent DDT, are absorbed by the sediment and carried into the river with farm drainage. Studies of fish tissue taken from the river show levels of up to 2.2 mg/kg wet weight DDT, greater than the guidelines of 1.0 mg/kg wet weight recommended by the National Academies of Science and Engineering for the protection of wildlife.³⁷

Located about 70 miles southeast of San Francisco, the West Stanislaus Study Area includes 200 square miles of irrigated orchards and fields. Roughly bounded by Interstate 5 and the California Aqueduct on the west, the Stanislaus River on the north, the San Joaquin River on the east, and the Merced River on the south, it includes the towns of Patterson, Crows Landing and Newman. For the farmer, erosion removes topsoil, reduces levels of soil organic matter and contributes to the breakdown of soil structure, creating a less favorable environment for plant growth. In the water, nutrients no longer available to plant growth can accumulate, leading to problems with algae blooms and deposition of the eroded materials can

³⁷ West Stanislaus Sediment Reduction Plan, Central Valley Regional Water Quality Control Board and West Stanislaus Resource Conservation District, 1992.

damage fish habitat, degrade water quality and reduce the San Joaquin River's channel capacity.³⁸

Established in 1991 by the U.S. Department of Agriculture (USDA) under its 1990 "Water Quality Initiative" to reduce nonpoint source pollution in the San Joaquin River, the West Stanislaus Hydrologic Unit Area Project (HUA) created an integrated approach of information and education, technical assistance and cost-sharing to help farmers develop voluntary best management practices (BMPs) to reduce erosion. The West Stanislaus Resource Conservation District serves as the local, grass-roots agency in the partnership program. Primary USDA agencies involved in the HUA are the Natural Resources Conservation Service (NRCS), Farm Service Agency and the University of California Cooperative Extension. More than 20 other local, state and federal agencies are participating or cooperating in various degrees. (RCDS are special districts formed for the purpose of addressing local resource conservation needs under Division 9 of the California Public Resources Code.)

The West Stanislaus HUA, one of 36 nationwide, has completed six years of implementing BMPs in which cost-sharing programs encourage farmers to reduce erosion with return drainwater systems, switch from furrow to micro-irrigation (sprinklers), convert from tillage to non-tillage practices and plant cover crops. The West Stanislaus HUA also is a test site for innovative evaluation and use of polyacrylamide (PAM) foam particles that reduce the amounts of sediment and pesticide residue leaving fields in furrow irrigation tailwater. With PAM, the clay particles in the soil clump together and drop to the bottom of the furrow, staying on the field and out of the drain water. Field trial results in the HUA indicate a 90 percent to 95 percent reduction in soil loss and a corresponding reduction in pesticides.³⁹

As of 1996, approximately 24 percent (30,568 acres) of the total West Stanislaus HUA have been treated with structural and managerial BMPs with a:

- Cumulative savings of 1,300 pounds of DDT isomers from off-site impacts.
- Cumulative savings of 718,953 tons of sediment from off-site impacts.

³⁸ Soil Quality Information Sheet, "Soil Quality Resource Concerns: Soil Erosion," Natural Resources Conservation Service, 1996.

³⁹ "An Integrated Approach for Water Quality: The PAM Connection -- West Stanislaus HUA, California," M. McElhiney and University of California Cooperative Extension.

- Cumulative average irrigation efficiency before BMPs installed equals 58 percent.
- Cumulative average irrigation efficiency after BMPs installed equals 80 percent.
- Controlled drainage practices have been implemented on 10,415 acres.⁴⁰

E. The Bay-Delta

As in many parts of the semi-arid West, California's water history is one of conflict. Farmers vs. miners, north vs. south, agriculture vs. cities, and environmentalists vs. water developers. For much of the past 20 years, dissension focused on the Sacramento-San Joaquin River Basin—especially the Delta. The many state and federal agencies—and their sometimes conflicting agendas—illustrates how complicated and controversial issues in the basin can be.

For the Delta itself, that changed in 1994. In June, state and federal government officials announced that they had signed a framework agreement in which they agreed to coordinate CVP/SWP operations to meet water quality standards and protect endangered species; adopt mutually acceptable state water quality standards; and develop a long-term strategy to resolve fish and wildlife, water supply reliability, levee stability and water quality problems. In December 1994, water stakeholders and state and federal officials announced a compromise set of water quality standards for the Delta (the "Principles for Agreement on Bay-Delta Standards Between the State of California and the Federal Government") and signed the landmark Bay-Delta accord.

Before there was CALFED, there was Club-FED. The Federal Ecosystem Directorate (Club-FED) took four federal agencies—USBR, FWS, NMFS and EPA—with often-diverse points of view on Delta water and environmental issues and helped them speak with one voice. When Club-FED was developed in 1993, the struggle between state officials and federal agencies over who would control water quality and water quantity issues in the Bay-Delta was at its height. On the state side, the governor established a water policy council of his water-related agencies. In 1997, Club-FED changed its name to the Federal Bay-Delta Council.

⁴⁰ West Stanislaus Hydrologic Unit Area 1996 Annual Report.

The state-federal controversy over the Delta began in 1987 when EPA notified the SWRCB that the water quality standards it had adopted in 1978 were inadequate to protect the estuary. When a state fails to adopt water quality standards adequate to protect a designated use, the CWA requires EPA to "promptly" adopt such standards. Because the SWRCB was in the process of modifying these standards, EPA deferred adoption of new standards to the state.

The SWRCB conducted a lengthy set of hearings to determine modifications to Water Right Decision 1485 (D-1485) and the Delta Water Quality Control Plan, but did not adopt new standards. A draft water quality plan released in 1988 was withdrawn amid heavy criticism. The SWRCB did adopt a salinity plan in 1991, parts of which were rejected by EPA, but said the water rights/outflow document was at least three years away. In 1992, at the direction of Gov. Wilson, the SWRCB did develop a set of interim standards (D-1630). A year later, Wilson ordered that these standards also be withdrawn on the grounds that the federal government's enforcement of the ESA had permitted the federal government to preempt the state in water allocation issues. Wilson also criticized what he called the federal agencies' piecemeal efforts to resolve issues in the Delta, prompting the formation of Club-FED.

"Club-FED definitely helped provide a forum. Before, we were shooting SCUD missiles back and forth," said a former USBR employee. "The memos between the agencies were a mission in rhetoric."

With Wilson's withdrawal of D-1630, the federal government was ready to step in. EPA proceeded to develop the Bay-Delta standards it had promised in 1987 to promulgate under authority of the federal CWA—in part because of a lawsuit filed by environmental interests. A court settlement with the environmental groups gave EPA until Dec. 15, 1993, to release a set of draft water quality standards and until Dec. 15, 1994, to adopt those standards. However, federal officials recognized that the EPA probably lacked authority to enforce any salinity standards it might adopt for the Bay-Delta and its tributaries because salinity standards require not a reduction in the discharge of pollutants, but reductions in fresh water diversions. Federal officials had tentatively concluded that the authority to reallocate water supplies from California water users to the environment was vested not in EPA but in the SWRCB.⁴¹

Release of EPA's draft standards prompted the by-now-familiar outcry that they were unfairly putting fish before people, but this time, the stakeholders

⁴¹ University of Colorado Law Review, *The Bay-Delta Accord: A Stride Toward Sustainability*, Elizabeth Ann Rieke, Volume 67, Issue 2, Spring 1996.

and the state and federal agencies were more ready to negotiate than negate the proposal.

Part of the reason for this was the federal agencies' decision to send a clear message that something needed to be done in the Bay-Delta, but that EPA was prepared to be flexible in its approach; coordinate their activities and seek input from the state and the stakeholders; and build stakeholder pressure upon Gov. Wilson and President Clinton for approval of and implementation of water quality standards.⁴²

By Dec. 15, 1994, the state and federal agencies and stakeholders joined together in peace to announce the Bay-Delta Accord. In sharp contrast to the previous federal vs. state argument over water quality standards, EPA committed in the 1994 accord that it would withdraw its federal standards as soon as the SWRCB adopted a final water quality plan consistent with the accord. In May 1995, the SWRCB did adopt its own standards. In general, they increase Delta outflow by 400,000 acre-feet in normal years and up to 1.1 million acre-feet in critically dry years over previous requirements in the 1978 Decision 1485.

The spirit of cooperation that led to the accord has carried over to CALFED. In addition to the Bay-Delta program, the state-federal-stakeholder CALFED Operations Coordination Group (Ops Group) has forged added understanding of competing missions and goals. The Ops Group's charge is to coordinate CVP and SWP project operations under requirements of the state-adopted Delta water quality plan. Flows and fish data are shared by seven federal and state water and wildlife agencies in an effort to reach collective decisions on water project operations. Originally established in the May 1994 Framework Agreement between the state and federal agencies, the Ops Group was expanded to include stakeholders with the signing of the accord. Between 40 and 50 people now attend the monthly meetings to discuss project operations, allowing for more understanding of how practical questions of day-to-day water project operations can impact the overall goals of protection of environmental resources.

The CALFED Bay-Delta Program was established in May 1995. Its main charge is to identify so-called Category III short-term environmental fixes for funding and develop a long-term Delta solution. While these efforts have centered on the estuary, CALFED also is attempting to address some problems within the wider watershed on the Sacramento and San Joaquin rivers.

⁴² University of Colorado Law Review, *The Bay-Delta Accord, A Stride Toward Sustainability*, Elizabeth Ann Rieke, Volume 67, Issue 2, Spring 1996.

The CALFED Bay-Delta Program has achieved an unprecedented level of cooperation to date, but it has required a monumental undertaking of agency coordination, stakeholder involvement and money. State of California members of CALFED are the Resources Agency, and DWR and DFG; and the California Environmental Protection Agency, including the SWRCB. At the federal level, participating agencies are the U.S. Department of the Interior, including the USBR and FWS; EPA; and the U.S. Department of Commerce, including the NMFS.⁴³ Six additional federal agencies, the U.S. Army Corps of Engineers, which has served as a cooperating agency, the U.S. Natural Resources Conservation Service, an entity of the U.S. Department of Agriculture, Bureau of Land Management, U.S. Forest Service, U.S. Geological Survey and Western Area Power Administration became full-fledged or cooperating members of CALFED in mid-1997.⁴⁴

"It's an awkward mix of agencies with different missions, priorities and staff," said a CALFED staff member. "Some of the agencies are regulatory, some are planning and it's not easy to work together."

CALFED is not a separate government agency. It is a joint state-federal entity and much of its staff is on loan from other state and federal agencies. Consultants also handle a lot of the research. CALFED is not in either the state or federal budgets as a separate agency and does not have a definite source of revenue.

Public participation and input is principally through the 32-member Bay-Delta Advisory Council (BDAC), which is chartered under the Federal Advisory Committee Act and includes representatives of stakeholder and public interest groups chosen jointly by the governor of California and secretary of the Interior. Stakeholders also provide input toward program design and problem-solving.⁴⁵ As the process continues, there will be more need to reach beyond the 100 or so people actively involved in CALFED to the state's 32 million residents to gain public support for a solution. Fifteen years after a divisive state campaign over a Peripheral Canal, changes to the Delta export system remains an emotional issue.

Directed by the requirements of CEQA and NEPA, CALFED staff to date have spent much of their time identifying an appropriate range of solutions and developing a list of Bay-Delta alternatives. The list of physical fixes has now been reduced to three as staff develops a conceptual environmental

⁴³ CALFED Bay-Delta Program Phase 1 Final Report, September 1996.

⁴⁴ Interviews with CALFED staff.

⁴⁵ CALFED Bay-Delta Program Phase 1 Final Report, September 1996.

impact report (EIR). A preferred alternative was scheduled to be selected in the fall of 1997. A more-detailed, project-specific EIR will then be conducted with the ultimate solution to be implemented in fall 1998.

CALFED's public hearings and workshops have won praise from environmentalists for being more balanced, more fair and more inclusive than past Delta deliberations. Some people, however, have expressed impatience that the process is moving too slowly.

The main lesson for the CALFED staff has been that "you can't succeed with an agency doing planning alone or interest groups doing planning on their own. It takes stakeholder interest and a parallel planning process." Other lessons learned since the program's inception include getting input at the earliest planning level and forcing interest groups to stay at the table with deadlines and schedules. Too much enthusiasm and moving ahead without stakeholder involvement were two mistakes cited. "It is a work in progress," said a CALFED staff member "The big question still is when to present information to the public, and there has been friction on the inside because we're 'planning' too fast. You need to gain the agencies' support as well as the stakeholders."⁴⁶

As the multi-agency, multi-stakeholder process proceeds, the biggest challenge, perhaps, is to retain a shared vision of what the process hopes to accomplish. With the final "fix" to be chosen by the federal and state governments, it is important that none of the different stakeholder groups feels that it "lost" when the solution is selected.

Whatever alternative is selected as the physical and environmental fix for the Delta, questions of who will operate it and how it will be implemented will have to be addressed. For the stakeholders, these are key concerns. The question of trust could be a deciding factor in the success or failure of this most-recent effort to resolve the Bay-Delta's plumbing and environmental woes. The underlying question among some stakeholders is if they support the development of an isolated transfer facility, albeit a smaller channel than envisioned with the former Peripheral Canal, how can they be assured it is operated in an environmentally sound manner? On the other side, how can water users be sure that the environmental community will not try to prevent construction of any type of water supply fix once the habitat improvements are in place? These issues are of such importance; BDAC has formed its own assurances work group to explore these concerns.

⁴⁶ Interviews with CALFED staff.

At the July 1996 California Assembly Process: Bay-Delta Institutional Issues conference sponsored by POWER, Public Officials for Water and Environmental Reform, 100 stakeholders addressed the issue of assurances. In their Assembly Statement, participants identified five essential elements that must be addressed about the operation of the Bay-Delta solution:

- "Stakeholders must be in agreement on the starting point of the program. If some believe that they are owed something based on past commitments whereas others do not share this belief, conflict will inevitably arise.
- "The solution must be clearly understood, so no confusion can arise later about whether or not the course remains true.
- "Elements of the Bay-Delta solution must move forward according to the agreed upon plan, so that no one is left out as others benefit.
- "Stakeholders and the public must be involved in developing the management system and in ongoing decision-making.
- "The management system must operate flexibly within a fixed framework of principles. Goals and principles should remain steady to serve as a guide for flexible programs."

With an estimated price tag of \$4 billion to \$8 billion for the solution, funding also will be a major issue. To date, CALFED has not established a definite financing plan but is exploring two main funding sources: specific users and the general public. Options to receive money from the users include revenue bonds, water rates, assessments and fees. From the public, potential funding sources include general obligation bonds, statewide fees, and federal funds. At this point, there is not unity among stakeholders for financing with each group claiming the others will benefit more from a solution.

V. Institutional Issues

A. Agency Conflict

As outlined in Section III, there are at least 10 federal agencies with major roles in the Sacramento-San Joaquin River Basin's water resource issues. Programs administered by other federal agencies also have some influence over water in the basin. State agencies have a critical purpose in the basin's water resources management, and there often is conflict between federal, state and local authorities over their roles.

Redundant federal and state laws add to the confusion. Water quality in California, for example, is regulated by the SWRCB's statutes and the federal CWA, and it is sometimes difficult to identify which section of which law takes precedence. Adding a further wrinkle, the section 404 wetland permit is managed separately by the Corps, although the EPA then has final say over its implementation. Or a project may be approved for a 404 permit by the Corps, but that permit is not certifiable by the SWRCB.

Agency structure may pose a barrier to public communication by baffling citizens who seek information. Even parties within the federal government have difficulty finding out where to go or who to contact to get certain pieces of information. Coordination is critical to get agencies to share information, conduct joint scientific research or planning, and involve the public (stakeholders) in the effort to manage on an ecosystem level. It is important for individual agencies to adopt a common mission rather than focusing only on individual missions.

The location of offices can add to the disjointed approach to these issues. Decisions made at the local level may not always be supported at the regional level, or in Washington, D.C., at the highest level. Stakeholders often decry the image of "someone in Washington dictating how to solve a 'local' problem," but those same interest groups are quick to appeal unpopular decisions to higher managers, or even elected officials. Some agencies (or individual managers) may allow for more decision-making at the local or field level than others, making it difficult for employees from different agencies to work together.

"The agencies don't have a lot of delegation," said a CALFED staff member. "There are several layers of people who can't make decisions. They attend meetings, but a lot of times no decision is made, or you think we have come to a decision only to have that decision undone at the next meeting by someone else with more power."

"It's easy to get things delayed. You postpone a decision because you want more information, relative data, or are hoping some event will alleviate the

impact of your decision—for example there will be sufficient natural flows—and reduce the hardships," said a USBR employee.

In addition to "turf" issues, the legislative mandate for some agencies can hamper the effort to create a broader, more inclusive approach to natural resource issues. Federal agencies are authorized by specific legislation and budget authority to pursue particular missions. Although the concept of adaptive management in an ecosystem has broader appeal to a wide range of agency officials and stakeholders, the approach can cause apprehension and confusion in an ecosystem management plan about who should be involved in management decisions and when decisions should be made.⁴⁷

B. The Federal Advisory Committee Act (FACA)

Efforts for agencies to work together can be hampered by the Federal Advisory Committee Act (FACA), which was enacted in 1972 to diminish the influence of special interests in public policy making. Its goal is to ensure broad public participation in the formation and implementation of federal policy. At the time of its passage, Congress was concerned that there was no accountability over the great number of federal citizen advisory committees that existed, and that these committees had become a fifth branch of government.

Anytime the federal government solicits advice from two or more public members, FACA is invoked. Inter-jurisdictional coordination efforts between federal agencies also can invoke FACA, requiring the establishment of a formal advisory committee. This entails establishing a charter and creating a formal public process with open meetings, Federal Register notification, opportunities to testify, and the maintenance and publication of a written record of the proceedings.

The Clinton administration has imposed stringent limitations on the creation and use of FACA advisory committees. Executive Order 12838 (February 10, 1993) directs each executive department and agency to terminate at least one-third of its advisory committees subject to FACA. The order also prohibits creation or sponsorship of new advisory committees subject to FACA except where (1) required by statute or (2) the agency finds that "compelling considerations necessitate creation" of the committee and the Director of the Office of Management and Budget approves the advisory

⁴⁷ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economics, Volume II, Implementation Issues, Report of the Interagency Ecosystem Management Task Force, November 1995.

committee. Federal agencies also have been sued for alleged FACA violations, which can chill interest in creating committees.⁴⁸

There is some concern that FACA can hamper work at an ecosystem level because staff from different federal agencies can get in trouble if they form workgroups to discuss and try to resolve issues. Informal discussions around common interests, issues and concerns that are essential to improved ecosystem management among diverse public, private and civic groups can inadvertently run afoul of FACA.⁴⁹

Although it is possible for community-led ecosystem management efforts to involve the federal government in an informational capacity rather than as the convener or an official member of the committee and avoid FACA requirements, agency staff still may face FACA restrictions in their efforts to create more collaborative programs to address environmental issues.

C. Environmental Laws

There are a significant number of federal statutes that govern the use of and require the protection of natural resources. These laws include NEPA and the ESA. Implementation of these laws fall to agency staff, and a great deal of time and staff resources are spent on meeting the specific requirements of these laws.

NEPA requires federal agencies to consider the effects of their actions on the environment, most commonly through preparation of an environmental impact statement (EIS) or environmental impact report (EIR). At the beginning of the process, the lead federal agency developing the EIR or EIS is required to consult with any other federal agency that has jurisdiction or special expertise. NEPA encourages public (stakeholder) involvement by requiring that agencies allow for public comment on draft and final EIRs, and hold public hearings or meetings where appropriate.

NEPA is a lengthy, deliberative process that can take as long as three years. For one recent EIR on a wastewater treatment plant, the final document required CD ROM format because it was so long. NEPA itself, some say, is somewhat ambiguous in nature because it does not include any definitions of terms such as adequate disclosure.

⁴⁸ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economics, Volume II, Implementation Issues, Report of the Interagency Ecosystem Management Task Force, November 1995.

⁴⁹ The Keystone National Policy Dialogue on Ecosystem Management, Final Report, October 1996.

The 1973 federal ESA is designed to protect species and subspecies of plants and animals that are of "aesthetic, ecological, educational, historical, recreational and scientific value." It also protects the listed species' "critical habitat," the geographic area occupied by the species at the time of listing. The federal law applies to federally funded or authorized projects and is administered by FWS and NMFS. Although the ESA does have an ecosystem component, the law most commonly has been used to gain protection for specific plants and animals.

The ESA can hamper ecosystem management because of duplication of state and federal programs, inadequate authority to develop "pre-listing" agreements, conflicting habitat management requirements when two or more listed species are in the same area, and insufficient discretion for administrators, and land, water and resource managers in implementing the ESA.

In addition, FWS and NMFS staff members spend much of their limited budget and personnel fulfilling ESA Section 7 consultation duties, limiting their ability to participate in interagency, ecosystem activities.

D. Budgets

The inability to build inter-organizational budgets from diverse sources often constrains ecosystem management. Currently, each federal agency develops its own proposed budget without any consideration of areas in which funding and issues may overlap with another agency. Agency budgets traditionally have been based on previous funding history, emergencies, commodities or enforcement requirements. There is no one place to go to find out what agencies are spending on the Bay-Delta ecosystem. Nor is there a comprehensive priority setting process.

Budgets also are prepared two years before the money is allocated. Priorities may have changed by the time the budget is considered, but it is often too late for an agency to make changes. An additional problem is the fact that time limitations on funds require appropriated funds to be spent within a one- or two-year timeline—ecosystem restoration programs often do not have any guaranteed funding for subsequent years.

The budget process directly reinforces the organizational status quo by creating competition among offices and agencies for funding, especially in these times of tight or shrinking budgets. Division of responsibility for authorizations and appropriations among congressional committees can make interagency budget coordination difficult. Because agency budgets are appropriated under different congressional committees and authorities, there

is no assurance of consistent perspectives or priorities, and budget considerations are subject to varying constraints and competing interests.⁵⁰

A lack of flexibility in funding also can hamper progress on multi-agency, ecosystem programs. Historical concerns over accountability for expenditures have led Congress to establish reprogramming procedures that constrain agency ability to reprogram and respond quickly to changed conditions or unforeseen events.⁵¹

When CALFED was created, for example, the USBR's Mid-Pacific Region was able to shift employees and funds to provide a significant contribution to the new state-federal agency. The FWS, NMFS and EPA by comparison have only placed one staff member each within the new program because managers were unable to shift funds and program priorities for a variety of reasons.

"The budget cycle is limiting and not very flexible. At both the state and federal level, you can only make a request once a year to change the budget," said a CALFED staff member. "This can encumber the process."

Other budgetary constraints that can make interagency cooperation and planning difficult include:

- A lack of funding certainty. If one agency loses money for a multi-agency project it can jeopardize the entire project.
- Limitations imposed by mandate. Some federal agencies are limited by existing law to physical boundaries for expenditure or guided by varying cost-sharing agreements. The Corps, for example, has specific federal-state-local formulas for specific types of projects, and it is difficult to make modifications to projects.
- Difficulties in transferring and pooling funds. The ability to transfer funds varies tremendously among federal agencies. Unless there is specific authorization for interagency funding such as provided by the Council on Environmental Quality Management Act, interagency

⁵⁰ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economics, Volume II, Implementation Issues, Report of the Interagency Ecosystem Management Task Force, November 1996.

⁵¹ The Ecosystem Approach: Healthy Ecosystems and Sustainable Economics, Volume II, Implementation Issues, Report of the Interagency Ecosystem Management Task Force, November 1995.

financing may be disallowed under Section 612 of the 1995-96 Treasury and Postal Appropriations Act.⁵²

A specific budget concern within the Sacramento-San Joaquin River Basin is the CVPIA Restoration Fund. Fees per acre-foot of water delivered (\$6 per acre-foot for agricultural users, \$12 per acre-foot for urban users and \$6.50 per-acre-foot in the Friant Division) are required under the 1992 law for restoration purposes. There is now \$80 million in the fund. With the exception of the temperature control device at Shasta Dam, most of the money has gone toward studies to implement the act. There is a big concern among CVP users that the money is not being spent on appropriate projects in an expedited manner. Water users also favor somehow putting that fund in a separate account so interest earned on the money goes back into the CVPIA Restoration Fund—not the national treasury as a whole.

"There's a concern from both environmentalists and farmers that all we're doing is spending money on what CVPIA directs us to do; that we're not spending it quickly enough," said a USBR employee. "But the problem is the responsibility for designing a restoration program was handed over to FWS, an agency that has never prepared for that."

E. Staff and Technology

The federal agencies are in the process of reorganizing to allow for a more holistic approach for resource issues. This may require some changes in staffing structure, interagency cooperation and perhaps additional employees. New technologies such as GIS, the Geographic Information System, can help lead to management on a watershed basis rather than issue specific, but these are labor-intensive projects that may require more training.

There are two general shortcomings despite the gains in technology. Data consistency and comprehensive coverage are more limiting than information system capability. For example, the GIS has a well-demonstrated potential as an environmental and socioeconomic analysis and data base management tool, many of the fundamental data layers necessary for a national or even statewide spatial data infrastructure remain incomplete. Also, information systems are mainly known by computer specialists, not the general public or general staff members.

⁵² The Ecosystem Approach: Healthy Ecosystems and Sustainable Economics, Volume II, Implementation Issues, Report of the Interagency Ecosystem Management Task Force, November 1995.

VI. Recommendations

A. Environmental Restoration

Ongoing efforts to restore the Sacramento-San Joaquin River Basin's environmental resources will benefit greatly from a continued focus on ecosystem management. Ecosystem management may be more expensive in the short-run because it emphasizes integrated, multi-disciplinary, multi-organization planning. However, ecosystem management should ultimately be more cost-effective because the solutions are more practical and enduring.

Ecosystem management will require a number of changes to existing federal scientific policies and procedures, including:

- The coordination and sharing of scientific data. If scientific studies conducted by agencies and universities were better coordinated, this could increase the financial and personnel resources to allow for more data collection and appraisal.
 - ➔ One possible method is to develop a scientific working group to cross agency lines and involve university professors and graduate students.
- The development of common scientific terms and definitions. Without the use of common terms, it will be difficult to coordinate scientific information and develop a comprehensive data base.
- Communication among scientists must be encouraged. In the modern era, interagency and university scientific communication may be facilitated through expanded use of the Internet.
- The augmentation of existing scientific studies. The state and federal agencies and universities should be directed to conduct new, focused research to improve knowledge of the ecosystem as a whole.
 - ➔ One possible method is to establish a scientific advisory panel to identify research needs, design new programs, and prepare and review research proposals.

Ecosystem management can be encouraged by effective use of existing federal environmental statutes such as NEPA and the ESA. While some people would stress the need to seek congressional changes in these laws, recent experience seeking cooperative solutions in the Sacramento-San Joaquin River Basin demonstrate that it would be possible to:

- Determine whether it is necessary to administratively "tweak" existing environmental laws to build consensus and reach ecosystem management decisions.
- Facilitate the NEPA planning process by encouraging the engineering and environmental agencies to agree on the environmental baseline, even as they disagree on the impacts and negotiate.
- Another approach would be for the federal agencies to voluntarily conduct strategic environmental analyses to improve and coordinate federal plans and programs in accordance with NEPA policies. These could then serve as a guide for future specific EIRs and help develop a commonly shared vision of an ecosystem.
- Continue efforts to increase the ESA's flexibility. Changes made in 1995 by the Clinton administration guarantee that landowners with endangered species on their property who agree to a habitat conservation plan will not be subject to a later demand for more land or greater financial commitment if the plan is adhered to, even if the species' needs change over time or a new plant or animal is granted ESA protection.
- Review the FACA restrictions and determine whether any changes are necessary. Judicial interpretations by Elizabeth Ann Rieke at the Natural Resources Law Center at the University of Colorado School of Law suggest that FACA is not as much a problem as once thought ("Resource Management at the Watershed Level: An Assessment of the Changing Federal Role in the Emerging Era of Community-Based Watershed Management.") If it is necessary to change FACA:
 - ➔ One approach would be to amend FACA to facilitate flexible and collaborative efforts to reach ecosystem solutions.
 - ➔ Another approach would be to amend the ESA, NEPA and other natural resource acts to eliminate the FACA requirement.

Existing financing laws and budget rules can constrain the federal agencies' effectiveness at developing ecosystem management plans and creating partnerships with state and local agencies and the grass-roots stakeholders who are most directly affected by federal laws. Partnerships offer the federal government the opportunity to stretch federal dollars and improve efficient management of natural resource issues in the West. Partnerships, however, require some openness about the budget numbers and programs. In order to establish more cooperative efforts to find solutions to natural resource issues on an ecosystem basis the federal agencies need to:

- Focus their activities on the issues in a particular ecosystem and make efforts to develop coordinated, integrated action plans, especially at the field level.
- Acknowledge that there is a need to share financial information among agencies that are working to develop ecosystem management programs.
- Establish mechanisms to increase coordination of budget planning and execution to ensure that ecosystem budgets reflect an agreed-upon vision and strategic plan.
- Develop mechanisms for coordinating budget requests of the agencies involved followed by coordination with congressional committees.
- Develop budgets that reflect priority needs under the ecosystem approach and enhance budget structures to allow a flexible, interdisciplinary approach.

Specific ways to accomplish these goals could include:

- Allowing for quarterly rather than yearly changes in existing budgets.
- Developing more of a "block fund" format in which locals can apply for funds and set priorities. This, however, requires more trust in the federal government. Such a system also needs to somehow allow for additional congressional budgetary changes for pet projects.
- Integrating internal budget processes among those organizations that will jointly contribute to meeting resource management objectives.
- Investigating the benefits of multi-year budgeting.

B. Water Supply and Flood Management

California is facing unprecedented growth in the 21st century. Although officials predict most of the state's projected urban growth will occur in the south coast region, the Central Valley also will become increasingly urbanized in the 21st century. How to supply that projected growth with sufficient water and improve floodplain safety are two major issues for the Sacramento-San Joaquin River Basin.

In the past, the federal government played a major role in the construction of water supply and flood control facilities within the basin. Today a more

appropriate role for the federal agencies might be to provide technical assistance and funding, but allow the state and stakeholders to develop solutions. With this in mind the Western Water Policy Review Advisory Commission should consider:

- Directing the USBR to continue to work with DWR to encourage water users to adopt AB 3030 voluntary groundwater management plans, which would then allow for the development of locally controlled conjunctive use programs.
- Directing the USBR to continue to investigate ways in which to "replace" the 800,000 acre-feet (600,000 acre-feet in a dry year) of CVP water allocated annually to the environment under the CVPIA. In order to implement this plan, however, further action by Congress is needed.
- Supporting voluntary water transfers between willing sellers and willing buyers by facilitating transfer requests made under the CVPIA and allowing the use of CVP water delivery facilities for wheeling arrangements, where appropriate.
- Directing the Corps and FEMA to review the floodplain management and flood insurance recommendations in the 1994 document "Sharing the Challenge: Floodplain Management into the 21st Century, Report of the Interagency Floodplain Management Review Committee to the Administration Floodplain Management Task Force" June 1994 report (the Galloway report) for possible adoption.
- Directing the Corps and USBR to work with state and local agencies on:
 - ➔ Developing new flood control and offstream water storage facilities such as Sites Reservoir where appropriate.
 - ➔ Improving levee design and construction (including setback levees)
 - ➔ Exploring nonstructural ways in which to improve flood management.

C. Maintenance of Federal Water Facilities

The federal government has invested billions of dollars in the water projects that serve the Western United States, including the CVP. Billions more have been invested in the levees that protect millions of people from floods. Given

the age of the CVP facilities, providing adequate maintenance will continue to be a major issue. The USBR's Mid-Pacific Region has made great efforts in recent years to improve CVP maintenance by fencing off its RAX (Replacements, Additions and Extraordinary Maintenance) budget and seeking funding from water and power users. The Western Water Policy Review Advisory Commission should give consideration to:

- Encouraging the continued effort to develop innovative sources of CVP maintenance funding such as the agreements with water and power users now being developed by USBR's Mid-Pacific Region.
- Recognizing that big ticket one-time fixes such as the Friant Dam gate replacement, may require additional congressional appropriations.
- Encouraging the state and stakeholder communities to facilitate levee construction and improvement by pooling funds and engineering expertise.

D. Nonpoint Source Water Pollution

Nonpoint source pollution is a major issue in the Sacramento-San Joaquin River Basin. To fight such pollution, officials at the federal, state and local levels are increasingly turning to an integrated approach to assess and control all sources of pollution within a watershed or river basin. Much of the focus of such an approach is on gaining voluntary, cooperative agreement from everyone in the watershed to adopt Best Management Practices (BMPs) to reduce polluted runoff.

With the support of officials at EPA's Region 9, the SWRCB and its Regional Boards have developed funding for a Watershed Management Initiative. The program, initiated in 1996, attempts to modify administration of two existing grant programs, sections 205(j) and 319(h) of the CWA to concentrate existing federal and state funds on pollution problems on watersheds rather than individual programs. The Western Water Policy Review Advisory Commission should support these innovative efforts by:

- Encouraging the continued use of the state-developed Watershed Management Initiative and allowing for the continued combination of federal grant programs.
- Continuing to support the multi-agency, stakeholder developed Sacramento River Watershed Program to improve the water quality of the Sacramento River and its major tributaries.

- Continuing to support the innovative West Stanislaus Study Area's integrated approach of information and education, technical assistance and cost-sharing to help farmers develop voluntary BMPs to reduce erosion.

E. The Bay-Delta

All roads in California water policy lead to the Bay-Delta. With development of the joint state-federal planning entity, CALFED, great progress has been made in developing a mutually acceptable Bay-Delta solution. Major decisions lie ahead, however, as CALFED moves toward recommending one physical fix for the Delta.

Before one can determine how to structure a continuation of CALFED, one must first decide what the federal government's continuing role in the Bay-Delta should be. CALFED as it exists today is designed to assist the coordination of a solution from a local grass roots up and financially coordinate federal—and state—agency efforts on a watershed basis. Historically, there was a focus on improving coordination and cooperation among federal, state and local water management entities through basin planning and management structures, particularly on a river-basin scale. The Water Resources Planning Act of 1965 provided for the establishment of federal/state river basin commissions upon request of the governor(s) within a basin. Seven such commissions covering about 40 percent of the West were ultimately established (there was none in California). All the basin commissions were abolished in 1981 along with the U.S. Water Resources Council, a mechanism for federal coordination established by the same act, by cutting off federal appropriations.

The commissions were directed to prepare and keep current a "comprehensive, coordinated joint plan for the region and to recommend priorities for implementation." However, a General Accounting Office report pointed out that the commission members had not been delegated meaningful authority; as a consequence, incentives for participation and levels of participation declined.

There have been some suggestions that the Western Water Policy Review Advisory Commission recommend resurrection of a regional basin commission with an entity such as the U.S. Water Resources Council to enable the federal government to oversee federal resource programs not from Washington, D.C., but from a regional, basin level.

In California, the continuation of CALFED could fill a similar role as a river basin commission. Many water interests see continuation of CALFED or

development of a similar entity to implement and oversee at least part of the chosen Delta solution as a critical means of ensuring a centralized, united effort to resolve Delta issues. How much power such an entity would have is a major issue. Some believe it should handle only environmental issues while others believe it should be a separate agency with planning, implementation and financing authority.

The ability to compel the stakeholders and the state of California to follow through with the physical Bay-Delta solution rests in part on the federal government's ability to withhold funding or enforce federal statutes. It was the combination of federal funding promises and the "hammer" of the ESA and CWA that pushed the state and stakeholders to accept a Bay-Delta Accord. For that reason, the Western Water Policy Review Advisory Commission may want to:

- Recommend that CALFED continue in some form to implement the chosen Delta solution, coordinate agency budgets and programs and facilitate stakeholder involvement. However, it is important to ensure that the federal agencies retain some control over federal dollars allocated to CALFED. While the \$143 million in the president's budget for USBR to continue its role in CALFED is a good start, it also is crucial to also ensure adequate funding to allow other federal agencies, particularly NMFS and FWS, full participation in CALFED.
- Review the possibility of re-establishing river basin commissions or watershed management councils that include federal, state and stakeholder involvement; keeping in mind that any such commission would need "teeth" through control of the federal purse strings.
- Encouraging other federal and state agencies to get more involved in CALFED by appointing people within those agencies to serve as liaisons with CALFED and ensuring better review of—and input into—CALFED proposals.
- Identifying a process to address the ecosystem uncertainties facing CALFED. Perennially dedicate a portion of CALFED's ecosystem budget to answering important resource questions to help implement the ecosystem restoration program. CALFED could dole out money and assignments. Levees, for example, are overseen by the Corps and DWR but there is no effort to bring the agencies' programs together. The CALFED Bay-Delta Program could determine the best way to deal with the levees, define responsibilities and allocate funding. Stakeholders should continue to play a formal role in deciding how to spend ecosystem restoration dollars through the Ecosystem Roundtable or a similar forum.

- Considering whether a CALFED approach would work for other states or river basins. California is somewhat unique because of its population, the number of endangered species, the fact that it does not share its water with another state, and has a strong state water planning agency, but CALFED may prove to be a good example for places such as the Columbia River Basin and Colorado River Basin to encourage federal-state-stakeholder cooperation.

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